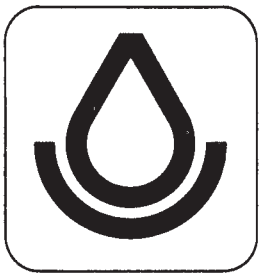
SOIL SURVEY

Addison County Vermont



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
and Forest Service
In cooperation with
VERMONT AGRICULTURAL EXPERIMENT STATION AND
VERMONT DEPARTMENT OF FORESTS AND PARKS
Issued October 1971

Major fieldwork for this soil survey was done in the period 1941-64. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Forest Service, U.S. Department of Agriculture; the Vermont Agricultural Experiment Station; and the Vermont Department of Forests and Parks. It is part of the technical assistance furnished to the Otter Creek and White River Natural Resources Conservation Districts.

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

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Addison County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

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

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Use of the Soils for Recreational Development."

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

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

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

U.S. GOVERNMENT PRINTING OFFICE: 1971 O—383-179

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington D.C. 20402

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Issued October 1971

SOIL SURVEY OF ADDISON COUNTY, VERMONT

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, IN COOPERATION WITH VERMONT AGRICULTURAL EXPERIMENT STATION AND VERMONT DEPARTMENT OF FORESTS AND PARKS

ADDISON COUNTY is in western Vermont, midway between the northern and southern boundaries of the State (fig. 1). It is bounded on the west by Lake Champlain, and in the east it extends into the Green Mountains. The county has a land area of 785 square miles. Middlebury, which is in the approximate center of the county, is the largest village and the county seat. West of Middlebury is the Champlain Valley.

Presently, the land area in trees and that used for farming are nearly equal. Most farming is in the Champlain Valley and the White River Valley. Farmland in the hilly and mountainous parts of the county is gradually being converted to other uses, such as recreational developments and country homes, or it is reverting to woodland.

How This Survey Was Made

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

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons

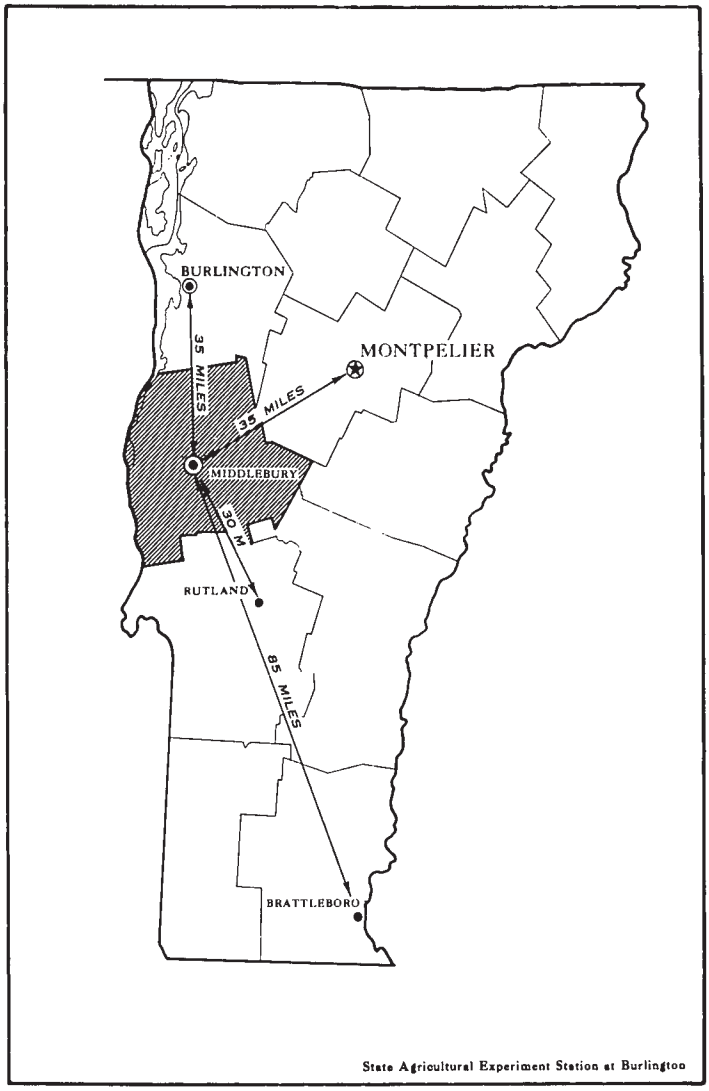

Figure 1.—Location of Addison County in Vermont.

that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Vergennes and Panton, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Melrose fine sandy loam, 8 to 15 percent slopes, is one of several phases within the Melrose series.

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

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

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

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

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Covington and Panton silty clays is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rock land is a land type in Addison County.

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

The soil scientists set up trial groups of soils on the basis of yield and practice tables and other data they have collected. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map in this publication shows, in color, the soil associations in Addison County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is also useful in determining the value of an association for a watershed, for woodland, for wildlife habitat, for engineering projects, for recreational areas, and for community development. A general soil map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The seventeen soil associations of Addison County are described in the following paragraphs.

Soils That Formed in Water-Deposited Material in the Champlain Valley

The soils that make up these associations are in the western half of the county in the Champlain Valley. They formed mainly in water-deposited material that ranges from sand to clay in texture. Also, there are areas of organic soils consisting of Muck and Peat. The soils are generally level to moderately sloping, and the associations comprise the main farming areas in the county.

1. Vergennes-Covington association

Gently sloping and moderately sloping, moderately well drained to poorly drained, clayey soils; on broad lake plains and terraces

This association is the largest in the county and occupies about 36 percent of the total acreage. Clayey soils are dominant in the association. The landscape is an undulating to rolling lake plain that is dissected by streams in many places. Rocky knolls and narrow ridges are prevalent, mainly in the eastern part. The association extends north and south the entire length of the county and from Lake Champlain to the foothills of the Green Mountains .

Vergennes soils are moderately well drained, clayey, and mainly gently sloping or moderately sloping. They comprise 60 percent of the association. Covington soils also are clayey, but they are somewhat poorly drained or poorly drained. They occupy the lowest positions of the landscape and make up 20 percent of the association. The remainder of the association is made up of the well-drained, loamy Nellis soils, the somewhat excessively drained Farmington soils, the somewhat poorly drained to poorly drained, clayey Panton soils, and the very poorly drained Livingston soils. Farmington and Nellis soils occupy the higher knolls and narrow ridges. These areas are commonly shallow to limestone bedrock or are stony and rocky. Panton and Livingston soils prevail in similar positions as the Covington soils.

This association is more suitable for farming than any others in the county. Dairying is the major farm enterprise. Most of the association has been cleared of trees and is farmed. The main crops are corn, hay, and pasture. Orchards are present on the higher and better drained sites. Artificial drainage is commonly needed for removing excess water from the Covington, Panton, and Livingston soils. Stoniness is seldom a limitation on the clayey soils in this association, but stones and bedrock outcrops limit farming on the higher ridges of the Nellis and Farmington soils. Many of the higher ridges are still wooded because of the rockiness or stoniness. Flooding is a hazard on the narrow bottom lands, especially those in the eastern part of the association.

In many places the steep banks along Lake Champlain are severely eroded by wave action. Structures placed immediately adjacent to the lake are subject to damage by erosion and by slumping of soil material.

2. *Covington association*

Nearly level, dominantly somewhat poorly drained and poorly drained, clayey soils; on lake plains

This association occupies about 4 percent of the county. It is in the lowest part of the landscape in the towns of Ferrisburg, Panton, and Addison in the western part of the Champlain Valley. The association is dominantly nearly level but includes small gently sloping or moderately sloping escarpments and knolls. The Dead Creek Waterfowl Area, which is permanently under water, also lies within this association.

The Covington soils make up about 80 percent of this association. These soils are somewhat poorly drained and poorly drained and, therefore, are excessively wet during the spring and other wet periods. The Panton soils are also present and occupy similar positions as the Covington soils, but they differ from the Covington soils mainly in their lighter colored surface layer. The remainder of the association is comprised of slightly higher knolls and escarpments of the moderately well drained, clayey Vergennes soils.

Most areas of this association have been cleared of trees and are now used for farming. Dairy farming is the major farm enterprise; and corn, hay, and pasture are the major crops grown in this association. Birdsfoot trefoil is grown for seed in some areas. Excess wetness is the major limitation in using the soils for farming. The slowly permeable clay restricts internal drainage and causes surface water to drain slowly. Water ponds on the surface for short periods of time in the spring and following hard rains. Farm machinery also is easily bogged down when the soils are wet, and during some years it is difficult to harvest crops. Farmers have installed artificial drainage in many areas to overcome the limitation of excess wetness.

3. *Swanton-Elmwood association*

Nearly level and gently sloping, moderately well drained to poorly drained, loamy soils; in depressions and on broad flats

This association occupies about 1 percent of the county. It lies mainly in the northwestern part of the county in the towns of Ferrisburg and Panton. A small area is in the town of New Haven. This association consists mainly of a nearly level, low-lying area within the Champlain Valley. It is similar to association 2 but differs in that a high percentage of the acreage is occupied by soils that are made up of sandy or loamy material over clayey material.

The somewhat poorly drained and poorly drained Swanton soils occupy about 60 percent of the association. These soils are comprised of loamy material that overlies clayey material at a depth of about 20 to 30 inches. Swanton soils lie in the lowest part of the association and, therefore, have a high water table during the spring and other prolonged wet periods. The Elmwood soils, coarse variant, comprise about 30 percent of the association. Unlike the Swanton soils, they consist of sandy material over the clayey material, and they have better natural drainage. They occupy the slightly higher positions and have better surface drainage than the Swanton soils. Minor soils make up the rest of the association. They are the somewhat excessively drained, gravelly Stetson soils and the moderately well drained to poorly drained, sandy Duane and loamy over sandy Walpole soils. Small areas of bottom lands also are present, as well as areas of Muck and Peat 5 to 10 acres in size.

Most of the acreage in this association is farmed, except for areas that are difficult to drain artificially. Dairying is the major farm enterprise; and hay, pasture, and corn are the major crops grown in this association. Birdsfoot trefoil also is grown for seed in areas that are adequately drained. Excess water, on the surface and in the soil, is the main limitation for farming. Excess wetness delays tillage in spring and hinders harvesting of crops if fall is wet. Small woodlots still remain where it is difficult to use artificial

drainage. Gray birch is prevalent in these undrained areas.

4. Raynham-Amenia association

Level to moderately sloping, poorly drained to moderately well drained, loamy soils; on broad flats and in depressions

This association comprises about 1 percent of the county. Poorly drained soils are dominant in the association, but moderately well drained and well drained soils also occur. Small creeks and drainageways dissect the association in many places, and rocky knolls and narrow ridges are in some places. Two areas of this association are present in the northeastern part of the Champlain Valley in the town of Monkton. This association occupies broad lowlands in the foothills of the Green Mountains. Several areas of Muck and Peat lie in these same lowlands.

The Raynham soils are somewhat poorly drained or poorly drained, mainly level, and loamy. They comprise about 70 percent of the association. Because they occupy the lowest positions, these soils commonly have a high water table and are excessively wet, unless they are artificially drained. The moderately well drained, loamy Amenia soils make up about 15 percent of the association. These gently sloping or moderately sloping soils occupy slightly higher positions and have better surface and internal drainage than the Raynham soils. Minor soils are the somewhat poorly drained or poorly drained Swanton soils, the well-drained Melrose soils, and the well-drained Salmon soils. These minor soils make up the remaining 15 percent of the association.

Most areas of this association have been cleared of trees and are now used for farming. Dairying is the major farm enterprise. The main crops are corn, hay, and pasture. Artificial drainage is commonly needed for removing excess water from the Raynham soils. The major limitation for growing farm crops is the excess wetness of the dominant soils, as a result of a high water table.

5. Winooski-Limerick association

Nearly level or depressional, moderately well drained to poorly drained, loamy soils; on bottom lands subject to flooding

This association lies along the major rivers and creeks in the county. It occupies about 1 percent of the county. Loamy soils that are subject to flooding are dominant in the association. These soils occupy the bottom lands that are mainly adjacent to Otter Creek, Middlebury River, and New Haven River. Other areas of this association are adjacent to other creeks and rivers throughout the county, but these areas are too small to show on the general soil map.

The Winooski soils are moderately well drained, loamy, and level. They comprise about 50 percent of the association. These soils occupy the slightly higher bottom lands or low terraces. The Limerick soils also are loamy and level, but they are poorly drained. They occupy the lower bottom lands in about 40 percent of the association. Although both the Winooski and Limerick soils are subject to flooding, the Limerick soils tend to be flooded more frequently. The well-drained Hadley soils are minor soils on the higher terraces and bottom lands. They make up the remaining 10 percent of the association. Some areas of the Hadley soils are above normal overflow and are seldom flooded.

Most areas of this association have been cleared of trees and are farmed intensively. The main crops are corn, hay, and pasture. Flooding is a limitation for growing crops during the spring and other wet periods. In addition, the Limerick soils have a high water table and are excessively wet unless artificial drainage is provided. Flooding also is a potential hazard in using the soils for recreation and community development.

6. Muck and Peat association

Level, very poorly drained, organic soils; in depressions and stream valleys

This association comprises about 3 percent of the county. The largest area is in the southern part of the county along Otter Creek in the towns of Whiting and Leicester. Smaller areas are in the northern part of the county, in the towns of Monkton and Bristol, and in the southern part of the county, in the towns of Bridport, Shoreham, and Orwell. This association lies in the lowest areas of the landscape and, therefore, the soils have a high water table.

Muck and Peat make up about 95 percent of the association. Muck and Peat formed from the remains of plants and animals associated with a high water table. Water is at the surface or covers it during the wettest periods of the year. Where Muck and Peat are adjacent to creeks or rivers, they are also subject to periodic flooding. Small areas of poorly drained mineral soils also are present and make up the remaining 5 percent of the association. These soils also have a high water table and occur on small, slightly higher knolls within the landscape. The three areas of this soil association adjacent to Lake Champlain are comprised of Fresh water marsh and soils of the bottom lands. The areas of Fresh water marsh are covered by shallow water most of the year. The soils of the bottom lands are subject to flooding during spring and other wet periods.

Most of this association is seldom farmed. It is now idle or is used to a limited extent for pasture. The excess wetness, the lack of adequate drainage outlets, and the poor potential for farming when once drained are severe limitations to the use of this association for farming and for community development. The organic material has poor stability and poor capacity to support loads. Therefore, it has severe limitations that affect its use for buildings or other intensive development. The association is well suited to development as habitat for wetland wildlife.

7. Colton-Stetson-Adams association

Level to moderately steep, excessively drained and somewhat excessively drained, sandy soils; on old lake beaches and terraces

This association makes up about 2 percent of the

county. It consists of old lake beaches and terraces that are comprised mainly of gravelly sand and sandy soils. Most areas of the association border the eastern part of the Champlain Valley or are along the major streams within the foothills of the Green Mountains. The largest area of this association lies within and adjacent to the village of Bristol.

The Colton soils are dominant in the association and make up about 60 percent of it. These soils are excessively drained and formed in gravelly sand. They are droughty during prolonged dry periods. The Stetson soils make up about 20 percent of the association. They differ from the Colton soils mainly in that they have a finer textured subsoil. The Adams soils comprise 10 percent of the association and consist of sandy material. Minor soils, which make up the remaining 10 percent of the association, are the moderately well drained Duane soils and the somewhat poorly drained or poorly drained Walpole soils.

Farming and woodland are the main uses of the soils in this association. The steepest soils in the association are presently used as woodland and are most suitable for this use. The less sloping soils are used for growing corn, hay, and pasture. Because the soils are gravelly and sandy, they tend to be droughty and have a low capacity to supply plant nutrients. This association also is a good potential source for sand and gravel; sand and gravel pits prevail throughout the association. The dominant soils also provide good foundations for buildings.

Soils That Formed in Glacial Till in the Champlain Valley

The soils that make up these associations lie in the western half of the county in the Champlain Valley. They formed in glacial till and are commonly stony. The soils occupy the ridges and hills that rise above the broad lake plain.

8. Farmington-Nellis association

Gently sloping to moderately sloping, excessively drained to well-drained, loamy soils that lie on ridges and are dominantly shallow over limestone bedrock

This association makes up about 3 percent of the county. It comprises the higher ridges and knolls in the Champlain Valley. The ridges and knolls are generally ½ mile to 2 miles wide and extend 1 to 4 miles north and south. Outcrops of limestone bedrock are common.

The dominant soils, which comprise 80 percent of the association, are the somewhat excessively drained, shallow, loamy Farmington soils. These soils formed in loamy material that overlies limestone bedrock at a depth of 10 to 20 inches. They are commonly stony and rocky and are gently sloping to very steep. Nellis soils, which make up about 15 percent of the association, are well drained and deep and are mainly gently sloping or moderately sloping. In contrast to the Farmington soils, they are underlain by bedrock at a depth of more than 40 inches. Minor soils, which make up the remaining 5 percent of the association, are the moderately well drained Vergennes soils, the somewhat poorly drained or poorly drained Covington soils, and small areas of Rock land. The Vergennes and Covington soils are finer textured than the dominant Farmington and Nellis soils.

The soils of the major part of this association, mainly the moderately sloping Farmington soils, are too stony or rocky to be used intensively for farming. Some areas of the Nellis soils have been cleared of stones and are now used for farming. The major crops are hay, pasture, and to a lesser extent, corn. The influence from limestone bedrock makes the soils in this association especially suitable for growing alfalfa.

9. Nassau-Dutchess association

Sloping to steep, excessively drained to well-drained soils that lie on ridges and are dominantly shallow over slate bedrock

This association makes up about 1 percent of the county. It is in the extreme southwestern part of the county in the town of Orwell. The landscape is rolling or hilly uplands; the relief is determined by the underlying slate bedrock. The soils in this association are similar to those in association 10, but on a larger acreage they are shallow and steep.

The Nassau soils make up 90 percent of the association and consist of somewhat excessively drained or excessively drained, loamy soils that are shallow to bedrock. The Dutchess soils, which make up 10 percent of the association, are deep, well-drained, loamy soils. They formed in material similar to that in which the Nassau soils formed, but they do not have slate bedrock at a depth of less than 20 inches. The Nassau soils and Dutchess soils are gently sloping to steep. Both soils are stony, but the Nassau soils also have many rock outcrops.

The present use of the soils in this association is mainly as woodland. However, areas of the Dutchess soils that have been cleared of stones are used for farming. Major crops in these farmed areas are corn, hay, and pasture. The outcrops of bedrock, the shallow depth in many places, and the abundance of stones on the surface are severe limitations to use for farming throughout the association. Erosion by water also is a potential hazard where a protective cover of vegetation is not maintained.

10. Dutchess-Nassau association

Moderately sloping to steep, well-drained to excessively drained, loamy soils that are dominantly deep over slate bedrock

This association makes up about 1 percent of the county. It consists of two areas in the southwestern part of the county in the towns of Orwell and Whiting. This association consists of a rolling upland within the Champlain Valley. Bedrock outcrops are common in part of the association, and stoniness is prevalent on most of the soils.

The Dutchess soils make up 80 percent of the association. They are deep, well drained, and loamy. Stones are common on the surface in many areas. The Nassau soils, which are somewhat excessively drained

or excessively drained and shallow to slate bedrock, make up 15 percent of the association. Rock outcrops are present in areas of the Nassau soils. The Dutchess and Nassau soils are gently sloping to steep. The remainder of the association is comprised mainly of the well-drained, loamy Nellis soils.

This association is made up of soils that are similar to those in association 9, but it has a larger proportion of deep soils than association 9. The slopes also are more gentle, and, therefore, the soils in this association have greater potential for farming than those in association 9. Many areas have been cleared of trees and are now farmed. The major crops are corn, hay, and pasture. Stoniness limits use for farming in most areas of the association. Erosion also is a potential hazard where the soils are moderately sloping or steep.

11. Nellis-Amenia association

Level to moderately sloping, well drained to moderately well drained, loamy soils that are dominantly deep

This association comprises about 3 percent of the county. It consists of high elongated ridges and knolls, mainly in the eastern and southern parts of the Champlain Valley. These ridges and knolls are ½ mile to 1½ miles wide and 1 to 4 miles long in a north-south direction.

The Nellis soils make up 45 percent of the association. These soils are well drained, deep, and loamy. They are mainly gently sloping or moderately sloping. The Amenia soils make up 35 percent of the association. They also are deep and loamy, but unlike the Nellis soils, they are moderately well drained. The Amenia soils are level or gently sloping and occupy lower positions on the landscape than the Nellis soils. The minor soils, which account for the remaining 20 percent of the association, are the shallow Farmington soils and the somewhat poorly drained and poorly drained Massena soils. Farmington soils occupy the steeper slopes in the association, where rock outcrops are present. Massena soils occupy the lowest lying areas; excess water is a limitation on these soils.

At one time, most of the soils in this association were too stony for farming, but farmers have removed the stones in many areas and the present use is farming. Areas still remain that are too stony or rocky for growing farm crops. These areas are presently wooded or are idle. A few orchards also are in this association.

Soils of the Green Mountains and Associated Foothills

The soils that make up these associations lie in the eastern half of the county on the main range and foothills of the Green Mountains. They are dominantly well drained, loamy, and moderately sloping to steep. Moderately well drained to poorly drained soils occupy the lower slopes and foothills. Most of the acreage in these associations is wooded because the soils are too stony, too rocky, or too steep for farming.

12. Lyman-Berkshire-Marlow association

Steep to very steep, excessively drained to well-drained, loamy soils that are shallow to deep over bedrock; on main ranges

This association is the steepest and most mountainous association in the county. It occupies 19 percent of the county. Most of the association occupies the main ranges of the Green Mountains, but a few areas are in the foothills of the Green Mountains and in the Champlain Valley. Forests cover most of this association; a large acreage is in the Green Mountain National Forest.

The Lyman soils make up 55 percent of the association. These soils are somewhat excessively drained or excessively drained and are shallow to bedrock. They are extremely rocky and stony in most areas. The Berkshire soils make up 25 percent of the association, and the Marlow soils comprise 20 percent. The Marlow and Berkshire soils are both well drained and deep. The Marlow soils differ from the Berkshire soils mainly in that they have a slowly permeable hardpan within 30 inches of the surface. The Marlow and Berkshire soils also are stony or extremely stony and steep or very steep. Rock land also is present in the association, especially on the bluffs adjacent to the Champlain Valley. Very little soil material occurs in areas of Rock land. Minor soils are the Berkshire soils that are moderately sloping and the moderately well drained, loamy, Peru soils.

Most areas in this association are too rocky, stony, and steep for farming. Trees are growing on most areas of the association, but the steep slopes and rocky soils also hinder use as woodland. The Long Trail passes through this association; therefore, hiking is a recreational use.

13. Berkshire-Marlow, sloping, association

Moderately sloping, well-drained, stony, loamy soils; on foothills

This association comprises about 12 percent of the county. It occupies the moderately sloping foothills of the Green Mountains. This association has soils similar to those in soil association 14. It differs in that the soils are moderately sloping rather than steep.

The Berkshire and Marlow soils are dominant in the association. Berkshire soils comprise about 45 percent of the association, and the Marlow soils comprise about 40 percent. The Berkshire soils are deep, well drained, and loamy. Most areas that are not now farmed are stony or extremely stony. The Marlow soils also are well drained and loamy, but a hardpan is present at a depth of less than 30 inches. Minor soils are steep Peru, Cabot, and Berkshire soils; and there are some small areas of Rock land. The Peru and Cabot soils are moderately well drained to poorly drained and occupy the lower slopes. Minor soils occupy 15 percent of this association.

Most areas of this association are presently in trees. The less sloping and less stony areas are used for dairy farming. A large part of this association is in the Green Mountain National Forest. Stoniness and

moderate slopes are the main limitations to use for farming. Areas that are farmed intensively are subject to erosion unless conservation measures are used. Recreational uses are increasing in the association, and the potential for such uses is good.

14. Berkshire-Marlow, steep, association

Steep, well-drained, stony, loamy soils; on foothills

This association makes up about 6 percent of the county. It lies adjacent to soil association 12 but has a smaller proportion of Rock land and of shallow soils. This association is characterized by steep and very steep soils that are stony and rocky.

The Berkshire soils comprise about 50 percent of the association, and the Marlow soils comprise about 40 percent. Both of these soils are well drained and loamy, but the Marlow soils have a hardpan at a depth of 15 to 30 inches. These soils are stony, and in some places rock outcrops are present. Minor soils make up the remaining 10 percent of the association; they are the somewhat excessively drained or excessively drained, shallow Lyman soils and areas of Rock land.

The steep slopes and generally stony and rocky soils are severe limitations to the use of this association for farming. Most areas are presently woodland and are generally suited for this use. Recreational use is increasing, and the area has potential for this use.

15. Calais-Cabot-Buckland association

Moderately sloping to steep, well-drained to poorly drained, stony, loamy soils; on lower slopes of main ranges

This association lies entirely in the town of Granville and comprises about 1 percent of the county. It occupies the lower slopes of the main range of the Green Mountains.

Calais soils make up about 70 percent of the association. These soils are deep, well drained, loamy, and mainly moderately sloping to steep. The Cabot soils occupy 15 percent of the association and are somewhat poorly drained or poorly drained and loamy. The Cabot soils occupy the lower side slopes that receive seepage water from the hills. The Buckland soils, which are mainly sloping or moderately sloping, make up about 10 percent of the association. These soils are moderately well drained, deep, and loamy. Other soils are the Glover and Berkshire soils, which occupy the remaining 5 percent of the association. Glover soils are shallow to bedrock and are somewhat excessively drained to excessively drained. Rock outcrops are present in the areas of Glover soils. The Berkshire soils are well drained and occupy the moderately sloping and steep areas of the association. Small bottom lands and drainageways are present. These bottom lands are subject to seasonal flooding.

Most of this association is presently in forest. Some of the less sloping soils have been cleared of trees and stones and are farmed to a limited extent. The bottom lands are farmed in local areas where flooding is less severe.

16. Berkshire-Cabot-Peru association

Moderately sloping, well-drained to poorly drained, stony, loamy soils; on lower slopes and foothills

This association makes up about 4 percent of the county. It occupies lower side slopes and foothills of the Green Mountains.

The dominant soils are the well drained, loamy, moderately sloping Berkshire soils. These soils comprise about 50 percent of the association. The Berkshire soils are stony and subject to erosion if not protected by vegetation. The Cabot soils make up 25 percent of the association. These soils are somewhat poorly drained or poorly drained and occupy the lower slopes that receive seepage. The Peru soils also occupy the lower slopes, but they are moderately well drained. Peru soils make up 20 percent of the association. The remaining 5 percent of the association is made up of the excessively drained Stetson and Colton soils, the shallow Lyman soils, and very poorly drained Muck and Peat.

Much of this association was once used as farmland, but it has been allowed to revert back to woodland. The presence of many stone fences is evidence that these soils were once farmed. The Cabot and Peru soils have a limitation of excess wetness and, therefore, require artificial drainage if used extensively for farming.

17. Peru-Cabot association

Gently sloping to moderately sloping, moderately well drained to poorly drained, stony, loamy soils; on lower slopes and foothills

This association makes up about 2 percent of the county. It occupies the lowest positions on side slopes of the foothills of the Green Mountains. This association has the highest proportion of excessively wet soils in the Green Mountains and their foothills.

Peru soils make up 50 percent of the association. They are moderately well drained, loamy, and gently sloping or moderately sloping. The Cabot soils occupy about 40 percent of the association. They are somewhat poorly drained or poorly drained and loamy. Stoniness is a limitation on both of the major soils, and many areas are now extremely stony. Minor soils are the well-drained Berkshire soils and the shallow, somewhat excessively drained Lyman soils.

This association has been cleared of trees and stones in many areas and was once used for farming. Some areas are still used for farms, but many have been abandoned and have grown up to trees and brush. Excess wetness limits the growing of farm crops unless artificial drainage is provided.

Descriptions of the Soils

This section describes the soil series and mapping units of Addison County. The approximate acreage and the proportionate extent of each mapping unit are given in table 1.

A general description of each soil series is given,

and this is followed by brief descriptions of the mapping units in that series. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Suggestions for the use and management of each mapping unit are given in the description of that unit. Listed at the end of the description of each mapping unit is the capability unit in which the mapping unit has been placed. The capability designation for each mapping unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Many terms used in the soil descriptions and in other sections of the survey are defined in the Glossary at the back of this publication. Many terms also are defined in the "Soil Survey Manual" (*20*).

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Adams loamy fine sand, 0 to 5 percent slopes	1,677	0.3	Elmwood fine sandy loam, coarse variant, 8 to 15 percent slopes	218	(1)
Adams loamy fine sand, 5 to 12 percent slopes	607	.1	Farmington extremely rocky silt loam, 5 to 20 percent slopes	11,753	2.3
Adams loamy fine sand, 12 to 30 percent slopes	515	.1	Farmington extremely rocky silt loam, 20 to 50 percent slopes	11,805	2.3
Adams loamy fine sand, 30 to 50 percent slopes	253	.1	Farmington stony silt loam, moderately deep variant, 3 to 8 percent slopes	891	.2
Amenia stony loam, 0 to 8 percent slopes	2,779	.6	Farmington stony silt loam, moderately deep variant, 8 to 15 percent slopes	1,000	.2
Amenia stony loam, 8 to 15 percent slopes	598	.1	Farmington stony silt loam, moderately deep variant, 15 to 25 percent slopes	725	.1
Amenia extremely stony loam, 0 to 15 percent slopes	3,483	.7	Farmington stony silt loam, moderately deep variant, 25 to 50 percent slopes	490	.1
Amenia extremely stony loam, 15 to 25 percent slopes	659	.1	Farmington-Nellis rocky complex, 5 to 12 percent slopes	1,008	.2
Berkshire and Marlow stony loams, 0 to 3 percent slopes	283	.1	Farmington-Nellis rocky complex, 12 to 20 percent slopes	471	.1
Berkshire and Marlow stony loams, 3 to 12 percent slopes	4,019	.8	Farmington-Nellis rocky complex, 20 to 30 percent slopes	311	.1
Berkshire and Marlow stony loams, 12 to 25 percent slopes	1,604	.3	Fresh water marsh	3,026	.6
Berkshire and Marlow extremely stony loams, 3 to 20 percent slopes	37,891	7.5	Hadley very fine sandy loam	154	(1)
Berkshire and Marlow extremely stony loams, 20 to 50 percent slopes	57,932	11.5	Hadley very fine sandy loam, frequently flooded	1,335	.3
Buckland extremely stony loam, 3 to 15 percent slopes	769	.2	Limerick silt loam	2,111	.4
Buckland extremely stony loam, 15 to 25 percent slopes	213	(1)	Limerick silt loam, very wet	1,737	.3
Cabot stony loam, 0 to 8 percent slopes	570	.1	Livingston clay	5,857	1.2
Cabot extremely stony loam, 0 to 15 percent slopes	10,473	2.1	Livingston clay, flooded	3,488	.7
Calais and Glover soils, 5 to 20 percent slopes	2,263	.5	Lyman-Berkshire rocky complex, 5 to 12 percent slopes	170	(1)
Calais and Glover soils, 20 to 50 percent slopes	2,518	.5	Lyman-Berkshire rocky complex, 12 to 20 percent slopes	271	.1
Canandaigua silt loam	992	.2	Lyman-Berkshire very rocky complex, 5 to 20 percent slopes	2,178	.4
Cobbly alluvial land	348	.1	Lyman-Berkshire very rocky complex, 20 to 50 percent slopes	40,222	8.0
Colton gravelly sandy loam, 0 to 5 percent slopes	3,617	.7	Massena stony silt loam, 0 to 3 percent slopes	355	.1
Colton gravelly sandy loam, 5 to 12 percent slopes	2,276	.5	Massena extremely stony silt loam, 0 to 8 percent slopes	1,555	.3
Colton gravelly sandy loam, 12 to 30 percent slopes	3,201	.6	Melrose fine sandy loam, 0 to 3 percent slopes	1,320	.3
Colton gravelly sandy loam, 30 to 50 percent slopes	1,265	.3	Melrose fine sandy loam, 3 to 8 percent slopes	1,406	.3
Covington silty clay, flooded	4,284	.3	Melrose fine sandy loam, 8 to 15 percent slopes	576	.1
Covington and Panton silty clays	40,284	8.0	Melrose fine sandy loam, 15 to 25 percent slopes	321	.1
Duane fine sandy loam, 0 to 5 percent slopes	715	.1	Melrose fine sandy loam, 25 to 50 percent slopes	325	.1
Duane fine sandy loam, 5 to 12 percent slopes	246	(1)	Muck and Peat	14,103	2.8
Dutchess stony loam, 3 to 8 percent slopes	584	.1	Nassau-Dutchess rocky complex, 3 to 8 percent slopes	376	.1
Dutchess stony loam, 8 to 15 percent slopes	260	.1	Nassau-Dutchess rocky complex, 8 to 15 percent slopes	289	.1
Dutchess stony loam, 15 to 25 percent slopes	93	(1)	Nassau-Dutchess rocky complex, 15 to 25 percent slopes	228	(1)
Dutchess extremely stony loam, 3 to 15 percent slopes	952	.2	Nassau extremely rocky silt loam, 3 to 25 percent slopes	3,911	.8
Dutchess extremely stony loam, 15 to 50 percent slopes	579	.1			
Elmwood fine sandy loam, coarse variant, 0 to 8 percent slopes	3,622	.7			

See footnote at end of table.

TABLE 1.—*Approximate acreage and proportionate extent of the soils* —Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Nellis stony loam, 3 to 8 percent slopes	3,985	.8	Stetson gravelly fine sandy loam, 0 to 5 percent slopes	1,528	.3
Nellis stony loam, 8 to 15 percent slopes	2,428	.5	Stetson gravelly fine sandy loam, 5 to 12 percent slopes	1,643	.3
Nellis stony loam, 15 to 25 percent slopes	952	.2	Stetson gravelly fine sandy loam, 12 to 30 percent slopes	1,785	.4
Nellis extremely stony loam, 3 to 15 percent slopes	3,753	.7	Stetson gravelly fine sandy loam, 30 to 50 percent slopes	697	.1
Nellis extremely stony loam, 15 to 50 percent slopes	1.773	.4	Swanton fine sandy loam	6,113	1.2
Peru stony loam, 0 to 5 percent slopes	209	(1)	Vergennes clay, 2 to 6 percent slopes	76,462	15.2
Peru stony loam, 5 to 12 percent slopes	836	.2	Vergennes clay, 6 to 12 percent slopes	19,344	3.8
Peru stony loam, 12 to 20 percent slopes	449	.1	Vergennes clay, 12 to 25 percent slopes	18,125	3.6
Peru extremely stony loam, 0 to 20 percent slopes	13,323	2.7	Vergennes clay, 25 to 50 percent slopes	4,826	1.0
Peru extremely stony loam, 20 to 50 percent slopes	7,687	1.5	Vergennes rocky clay, moderately shallow variant, 2 to 6 percent slopes	588	.1
Quarry	23	(1)	Vergennes rocky clay, moderately shallow variant, 6 to 12 percent slopes	404	.1
Raynham silt loam, 0 to 6 percent slopes	2,394	.5	Vergennes rocky clay, moderately shallow variant, 12 to 25 percent slopes	194	(1)
Raynham silt loam, 6 to 12 percent slopes	913	.2	Walpole silt loam	1,535	.3
Raynham silt loam, 12 to 25 percent slopes	707	.1	Winooski very fine sandy loam	2,261	.5
Rock land	20,416	4.1	Gravel pits	10	(1)
Salmon very fine sandy loam, 2 to 6 percent slopes	272	.1	Mines and pits	29	(1)
Salmon very fine sandy loam, 6 to 12 percent slopes	106	(1)	Rubble land	12	(1)
Salmon very fine sandy loam, 12 to 50 percent slopes	208	(1)	Total land area	502,400	100.0

[1] Less than 0.05 percent.

Adams Series

The Adams series consists of deep, sandy, excessively drained soils that do not retain moisture well, or are droughty. These soils formed in water-deposited sands derived from quartzite or schist. They are nearly level to moderately sloping in most places but are steep or very steep in some places.

The Adams soils occur mainly along the eastern edge of the Champlain Valley where it merges with the foothills of the Green Mountains. There are also small scattered areas in the foothills of the Green Mountains.

The Adams soils are loose and open, and they crumble readily in the hands. All of the layers are very sandy, and air and water pass through them freely.

These soils are used mainly for corn, hay, and pasture. There are many sand pits in areas of these soils.

Profile of an Adams loamy fine sand in woodland in Starksboro town, about ¼ mile east of Vermont Highway No. 116, and about 1 mile south of the Chittenden County line:

A1—0 to 4 inches, dark yellowish-brown (10YR 3/4) loamy fine sand; weak, very fine, granular structure; friable; many grass and tree roots; medium acid; abrupt, smooth boundary.

B21ir—4 to 10 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; structureless (single grain); very friable; many grass and tree roots; strongly acid; abrupt, smooth boundary.

B22ir—10 to 16 inches, yellowish-brown (10YR 5/8) fine sand; structureless (single grain); very friable; common tree and grass roots; medium acid; abrupt, wavy boundary.

C1—16 to 25 inches, light olive-brown (2.5Y 5/6) fine sand; structureless (single grain); very friable; common tree roots; medium acid; clear, smooth boundary.

C2—25 to 34 inches +, light olive-brown (2.5Y 5/4) fine sand; structureless (single grain); very friable; few tree roots; medium acid.

The A1 horizon, or the Ap horizon in cultivated areas, has a hue of 5YR or 10YR, a value of 3 or 4, and a chroma of 3 or 4. It is loamy fine sand or fine sandy loam. In some places under the A1 or Ap horizon there is an A2 horizon about 1 to 5 inches thick with color of 10YR 6/1 or 5YR 4/1. The upper B horizon in most places has a color of 7.5YR 4/4 or 10YR 4/4. The lower B horizon generally has a color of 7.5YR 4/4, 10YR 4/4, or 10YR 5/8. The texture of the B horizon is loamy fine sand or fine sand. The C horizon, in most places, has a hue of 2.5Y or 10YR, a value of 5, and a chroma of 4 or 6. The texture is loamy fine sand or fine sand. The IIC horizon, where it occurs, generally has a hue of 2.5Y or 10YR, a value of 3 to 5, and a chroma of 4. The texture is gravelly sand, very coarse sand, sand, or fine sand. In unlimed soils, the reaction of the A horizon ranges from very strongly acid to medium acid. The B and C horizons are strongly acid or medium acid. The IIC horizon, where present, ranges from medium acid to neutral.

The Adams soils occur near the moderately well drained Duane soils, the poorly drained and somewhat poorly drained Walpole soils, and the well drained Berkshire and Marlow soils. The Adams soils are somewhat similar to the Colton and Stetson soils, but they do not have as much gravel in the solum and substratum.

Adams loamy fine sand, 0 to 5 percent slopes (AdA).—This soil is similar to the one described as typical for the series, except where it has been plowed the upper layers have been mixed to form a dark-brown plowed layer 5 to 8 inches thick. Included with this soil in mapping were small areas of the moderately well drained Duane soils and areas along streams that have a surface layer of fine sandy loam.

This soil is easy to work and responds well to fertilizer. It can be worked early in the spring. Erosion is a slight hazard in the gently sloping areas if the soil is plowed and left bare.

This soil is well suited to many uses, including nonfarm uses. Under good management the soil is well suited to alfalfa, red cover, timothy, bromegrass, and corn for silage, all grown in short rotations. This soil is used mainly for corn, hay, or rotation pasture. (Capability unit IIIs–8)

Adams loamy fine sand, 5 to 12 percent slopes (AdB).—This soil is similar to the one described as typical for the series, except where it has been plowed the upper layers have been mixed to form a dark-brown plowed layer 5 to 8 inches thick. Included in mapping were small areas of the moderately well drained Duane soils and a few small areas where the surface layer is fine sandy loam.

This soil is easy to work and responds well to fertilizer. It can be worked early in the spring. Because this soil is moderately sloping, there is a slight to moderate hazard of erosion where it is plowed and left bare.

This soil is suitable for many uses, but the moderate slope may limit some uses. If management is good, the soil is suitable for alfalfa, red clover, timothy, and bromegrass. This soil is used mainly for hay or rotation pasture, but in a few places it is used for corn. On the longer slopes erosion can be controlled by stripcropping. (Capability unit IVs–8)

Adams loamy fine sand, 12 to 30 percent slopes (AdD).—This soil is similar to the one described as typical for the series, except where it has been plowed the upper layers have been mixed to form a dark-brown plowed layer 5 to 8 inches thick. Included with this soil in mapping were small areas of rolling and broken slopes that are not so steep as Adams loamy fine sand, 12 to 30 percent slopes, and some areas that have a few gullies.

Because this soil is steep, farm machinery is difficult to use. The hazard of erosion is moderate where this soil is plowed and left bare. The steep slopes cause severe limitations for most nonfarm uses.

Because of steep slopes, the severe hazard of erosion, and droughtiness, this soil is used mainly as woodland or for unimproved permanent pasture. (Capability unit VIs–8)

Adams loamy fine sand, 30 to 50 percent slopes (AdE).—This soil has the profile described as typical for the series. Included with this soil in mapping were some areas that are gullied.

The extremely steep slopes make the use of modern farm machinery impractical. The hazard of erosion is very severe if the soil is left bare. This soil is not suitable for farm crops or for many other purposes, except woodland. Most of the soil is woodland. (Capability unit VIIs–8)

Amenia Series

The Amenia series consists of deep, moderately well drained, loamy soils. These soils formed on glacial till deposits that contain many fragments of limestone. The substratum is firm. These soils are gently sloping in most places; they are in depressions or in positions where they receive water from higher areas. A seasonal high water table keeps the soils wet from late in fall to early in spring and moist throughout most of the growing season. These soils are in the central Champlain Valley, mainly in a belt from the Green Mountains to U.S. Highway No. 7.

Originally, the Amenia soils were nearly all too stony for the use of farm machinery, but in many places they have been cleared of most stones and can be used for farming. The Amenia soils from which most stones have been removed are used principally for hay or pasture. The soils from which the stones have not been removed are mainly in trees or pasture or are idle.

Profile of an Amenia stony loam in a pasture in the town of Ferrisburg:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam; moderate, very fine, angular blocky structure; friable; many grass roots; medium acid; abrupt, smooth boundary.

B21—5 to 10 inches, dark yellowish-brown (10YR 4/4) loam; moderate, fine, granular structure; friable; many grass roots; medium acid; clear, smooth boundary.

B22—10 to 23 inches, dark-brown (10YR 4/3) loam; few, fine, faint mottles of brown and pale brown; moderate, fine, granular structure; friable; common grass roots; neutral; abrupt, smooth boundary.

C—23 to 30 inches +, light olive-brown (2.5Y 5/4) fine sandy loam; common, medium, distinct mottles of dark brown (10YR 4/3); weak, fine, granular structure; friable; few to no grass roots; calcareous.

Mottles commonly occur at a depth of 10 to 24 inches. Depth to free carbonates ranges from 16 to 30 inches. The content of coarse fragments in the profile ranges from 10 to 35 percent. The A horizon has a hue of 10YR, a value of 2 or 3, and a chroma of 2 or 3. The texture is commonly loam, but in some places it is silt loam. The matrix of the B horizon has a hue of 2.5Y or 10YR, a value of 4 or 5, and a chroma of 3 or 4. Mottles in the B horizon have a chroma of 3 and 4 and range from faint to prominent. The texture of the B horizon is loam, fine sandy loam, or, in a few places, light silt loam. Matrix colors of the C horizon generally have a hue of 2.5Y, a value of 3, 4, or 5, and a chroma of 2 or 4. Mottles are faint to prominent. The texture of the C horizon is loam or fine sandy loam. The reaction of the solum is medium acid to neutral; the C horizon is neutral or calcareous.

The Amenia soils are near the well-drained Nellis soils and the poorly drained and somewhat poorly drained Massena soils. The Amenia soils differ from the similar Peru and Buckland soils in that they do not have a fragipan. The Amenia soils are underlain by calcareous material, but the Peru and Buckland soils are not.

Amenia stony loam, 0 to 8 percent slopes (AmB).—In some places this soil has a thicker surface layer than that described as typical for the series. Included with this soil in mapping were small areas of the poorly drained and somewhat poorly drained Massena soils.

A seasonal high water table delays tillage of this soil in the spring and also interferes with many nonfarm uses. Drainage is necessary for the best growth of most crops and for many other uses of this soil.

Most areas of this soil are used for hay or pasture, but there are some areas used for apple orchards. Crops grown on this soil are corn for silage, alfalfa, Ladino clover, timothy, and bromegrass. Ladino clover generally does well. Drainage by diversion ditches or

by other methods is used in areas of corn and alfalfa. Tile is used to carry water away from seep spots. Practices are needed to control erosion in some of the more sloping areas of this soil. These practices are diversion ditches to intercept surface water and stripcropping on some on the longer smooth slopes. (Capability unit IIw–3)

Amenia stony loam, 8 to 15 percent slopes (AmC).—This soil has the profile described as typical for the series. Included with this soil in mapping were small areas of less steep Amenia soils, a few small areas of the poorly drained and somewhat poorly drained Massena soils, and a few small areas of steeper Amenia soils.

A seasonal high water table delays tillage of this soil in spring and also interferes with many nonfarm uses. Drainage is necessary for the best growth of most crops and for many other uses. The hazard of erosion is moderate to severe where this soil is plowed and left bare or where it is used for row crops.

This soil is used mainly for hay and pasture. Crops grown are corn for silage, alfalfa, Ladino clover, timothy, and bromegrass. Ladino clover generally does well. There are also some apple orchards on the soil. Drainage by diversion ditches or by other means is used in areas of corn and alfalfa. Tile is used to carry water away from seep spots. Practices to control erosion, such as diversion ditches to intercept surface water and stripcropping on some of the longer smooth slopes, are needed in some places. (Capability unit IIIe–3b)

Amenia extremely stony loam, 0 to 15 percent slopes (AsC).—This soil is similar to the one described as typical for the series, but it has not been cleared of stones or plowed. Included with this soil in mapping were a few small areas of the poorly drained and somewhat poorly drained Massena soils.

The many surface stones on this soil make the use of modern farm machinery very difficult or impossible. This soil also has moderate or severe limitations for most nonfarm uses because of stones, seasonal wetness, and moderate slopes.

Most of this soil is wooded; trees grow well on it. In some places it is used for unimproved pasture, which generally produces only a small amount of forage for livestock. (Capability unit VIIs–10)

Amenia extremely stony loam, 15 to 25 percent slopes (AsD).—This soil is similar to the one described as typical for the series, but it has not been cleared of stones or plowed. Included with this soil in mapping were a few small areas of the poorly drained and somewhat poorly drained Massena soils and a few small areas of steeper Amenia soils.

The many surface stones on this soil and the steep slopes make using modern farm machinery very difficult or impossible. The steep slopes, stones, and seasonal high water table limit most nonfarm uses.

Most of this soil is woodland; trees grow well on it. In some places it is used for unimproved pasture, but little forage is produced for livestock. (Capability unit VIIs–10)

Berkshire Series

The Berkshire series consists of deep, well-drained soils that retain moisture well. These soils are loamy and formed in glacial till deposits derived mainly from schistose and quartzitic rocks. They range from nearly level to very steep. The Berkshire soils are mainly in the mountains and hills, although there are some areas in the extreme eastern part of the Champlain Valley.

Originally, these soils were nearly all too stony for the use of farm machinery, but in many places they have been cleared of most stones and can be used for farming. Most of the Berkshire soils that have been cleared of stones are used for hay and pasture. The extremely stony Berkshire soils are used mainly as woodland, but in some places they are in pasture or are idle.

In Addison County, Berkshire soils were not mapped separately, but they were mapped in undifferentiated units with Marlow soils and in complexes with Lyman soils. Marlow soils are described under the Marlow series, and Lyman soils are described under the Lyman series.

In the undifferentiated units of Berkshire and Marlow soils, Berkshire soils are dominant, but an individual area of any unit can consist of Berkshire soils, Marlow soils, or both. The differences in these soils are not important to their use and management for most purposes.

Profile of a Berkshire extremely stony fine sandy loam in woodland in the town of Hancock, north of Middlebury Gap:

O1—2½ inches to 1 inch, litter of sugar maple, beech, yellow birch, and white birch leaves.

O2—1 inch to 0, partly decomposed leaves.

A1—0 to 1 inch, black (N 2/0) fine sandy loam; weak, fine, granular structure; friable; abundant tree roots; 20 percent coarse fragments of gravel size; extremely acid; abrupt, wavy boundary.

A2—1 to 3 inches, gray (5YR 5/1) gravelly fine sandy loam; weak, fine, granular structure; friable; plentiful tree roots; 20 percent coarse fragments of gravel size; extremely acid; abrupt, wavy boundary.

B21h—3 to 5 inches, dark reddish-brown (5YR 2/2) fine sandy loam; moderate, coarse, granular structure; friable; plentiful tree roots; 20 percent coarse fragments of gravel size; extremely acid; clear, wavy boundary.

B22ir—5 to 7 inches, dark reddish-brown (5YR 3/4) gravelly fine sandy loam; moderate, medium, granular structure; friable; plentiful tree roots; 20 percent coarse fragments; extremely acid; clear, wavy boundary.

B23ir—7 to 17 inches, brown to dark-brown (7.5YR 4/4) gravelly fine sandy loam; weak, fine, granular structure; friable; plentiful tree roots; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

B24—17 to 25 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; weak, fine, granular structure; friable; plentiful tree roots; 20 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

C—25 to 30 inches +, grayish-brown (2.5Y 5/2) gravelly sandy loam; weak, thick, platy structure; friable; few tree roots; 30 percent coarse fragments; very strongly acid.

The profile described contains gravel, cobblestone, stones, and channery fragments of quartzose and schistose rocks. The content of coarse fragments in the A1 and A2 horizons ranges from 5 to 30 percent. The B horizon is 10 to 20 percent coarse fragments, and the C horizon, 10 to 40 percent. The A1 horizon, or the Ap horizon in cultivated areas, generally has a hue of 10YR, a value of 2 or 3, and a chroma of 0 to 3. In some places the hue is 5YR. If present, the A2 horizon has a hue of 5YR, a value of 4 to 6, and a chroma of 1. The texture is gravelly loam or gravelly fine sandy loam. A B2h horizon occurs in some places and is 5YR 2/2.

The B2ir horizon has a hue of 5YR or 7.5YR, a value of 3 or 4, and a chroma of 2 to 4. The lower B horizon, in most places, has a hue of 7.5YR or 10YR, a value of 3 or 4, and a chroma of 3 or 4. The texture of the B horizon is fine sandy loam, gravelly loam, gravelly fine sandy loam, or gravelly sandy loam. The C horizon, in most places, has a hue of 2.5Y or 5Y, a value of 3 to 5, and a chroma of 2 to 4. The texture of the C horizon is gravelly loam, gravelly fine sandy loam, or gravelly sandy loam. The A horizon ranges from extremely acid to strongly acid. The B horizon ranges from extremely acid to medium acid. The C horizon is very strongly acid to medium acid.

In the hills the Berkshire soils are near the moderately well drained Peru soils and the poorly drained and somewhat poorly drained Cabot soils. They are also near the Lyman soils, which are shallow to bedrock. In the Champlain Valley the Berkshire soils are near the moderately well drained Amenia soils and the poorly drained and somewhat poorly drained Massena soils. The Berkshire soils are similar to the well-drained Calais, Dutchess, and Nellis soils on glacial till. The Berkshire soils, however, have A2 and B2h horizons, whereas the Calais and Dutchess soils do not. The Berkshire soils have a B2 horizon with a hue of 10YR, 7.5YR, or 5YR, but the B2 horizon in the Calais soils has a hue of 2.5Y or 5Y. The B horizon of the Berkshire soils is very strongly acid or extremely acid, whereas that of the Nellis soils is slightly acid or neutral. The C horizon of the Berkshire soils is very strongly acid, but that of the Nellis soils is neutral to calcareous. The Berkshire soils contain more organic matter in the upper part of the B horizon than do the Dutchess soils, and their B horizon, unlike that of the Dutchess soils, has a hue of 7.5YR that persists after plowing.

Berkshire and Marlow stony loams, 0 to 3 percent slopes (BeA).—These soils are similar to those described as typical for the respective series, except that they have been cleared of surface stones and cultivation has mixed the material in their surface layer to form a dark-brown plowed layer. The Berkshire soil has a gravelly loam surface layer in most areas. Included with these soils in mapping were a few areas that have slightly steeper slopes and a few small areas of the moderately well drained Peru soils.

In the places where the Marlow soils occur, there is a hard layer that is slowly permeable to water. The top of this layer is at a depth of 15 to 30 inches. Water and air move freely above any hard layer. The soils are well suited to most nonfarm uses.

These soils are used for corn for silage, alfalfa, Ladino clover, red clover, timothy, and bromegrass. These soils need no special management; crops grow well on them if management is good. (Capability unit I–3)

Berkshire and Marlow stony loams, 3 to 12 percent slopes (BeB).—These soils are similar to those described as typical for their respective series, but they have been cleared of surface stones and cultivation has formed a dark-brown plowed layer. In most places the profile of the Berkshire soil differs from that described in having a gravelly loam surface layer. Included with these soils in mapping were a few areas that are gently rolling, a few small areas that have steeper slopes, and small areas of the moderately well drained Peru soils. In the places where the Marlow soils occur, there is a hard layer that is slowly permeable to water. The top of this layer is at a depth of 15 to 30 inches.

Water and air move freely through these soils above any hard layer. Erosion is a moderate to severe hazard where the soils are used for row crops or plowed and left bare. The moderate slopes limit some nonfarm uses. These soils warm up quickly in the spring and produce early hay and pasture. They continue to produce good crops of hay throughout most summers because they are deep and have a good capacity for supplying water.

These soils are used mainly for corn for silage and for alfalfa, timothy, and bromegrass. Commonly needed to control erosion are diversion ditches to intercept surface water, stripcropping on some of the longer smooth slopes, and contour cultivation in areas used for row crops. (Capability unit IIIe–3)

Berkshire and Marlow stony loams, 12 to 25 percent slopes (BeC).—These soils are similar to those described as typical for their respective series, except they have been cleared of surface stones and have a dark-brown surface layer. In most places the profile of the Berkshire soil differs from that described in that it has a gravelly loam surface layer. Included with this unit in mapping were areas that are rolling, a few small areas with slopes steeper than 25 percent, and small areas of the moderately well drained Peru soils. In the places where the Marlow soils occur, there is a hard layer that is slowly permeable to water. The top of this layer is at a depth of 15 to 30 inches.

Water and air move freely through these soils above any hard layer. The steep slopes make the use of modern farm machinery somewhat difficult and limit nonfarm uses. Erosion is a very severe hazard where the soils are in row crops or where they are plowed and left bare. These soils warm up quickly in the spring and produce early hay and pasture. They continue to produce good crops of hay throughout most summers because they are deep and have a good water-supplying capacity.

These soils are well suited to hay or pasture under good management. They are used mainly for pasture or as woodland, but in some areas alfalfa, timothy, and bromegrass are grown for hay. Ladino clover and timothy are grown for pasture. Stripcropping is needed to control erosion in some areas where the soils are being reseeded. (Capability unit IVe–3)

Berkshire and Marlow extremely stony loams, 3 to 20 percent slopes (BsC).—In most areas the Berkshire soils in this unit have a gravelly loam surface layer. Included with this unit in mapping in the Green Mountains were a few small areas from which surface stones were removed to permit tillage with horse-drawn equipment. Also included in mapping were small areas of extremely stony Stetson soils and small areas of the moderately well drained Peru soils. In some places there are a few outcrops of bedrock. In

places where the Marlow soils occur, there is a hard layer that is slowly permeable to water. The top of this layer is at a depth of 15 to 30 inches.

Water and air move freely through these soils above any hard layer. The many surface stones, steep slopes, and, in some places, rock outcrops make the use of modern farm machinery difficult or impractical. The stones and moderately steep slopes also limit the use of these soils for many nonfarm purposes.

Most of the acreage is wooded; trees grow well. In some places the soils are used for unimproved pasture, which generally provides only a small amount of forage for livestock. (Capability unit VIIs–10)

Berkshire and Marlow extremely stony loams, 20 to 50 percent slopes (BsE)—Most areas of the Berkshire soil in this unit have a gravelly loam surface layer. Included with this unit in mapping were small areas of extremely stony soils having slopes of 15 to 20 percent, small areas of soils that are bouldery, and a few small areas of the moderately well drained Peru soils. In places where the Marlow soils occur, there is a hard layer that is slowly permeable to water. The top of this layer is at a depth of 15 to 30 inches.

Water and air move freely through these soils above any hard layer. The many surface stones, the very steep slopes, and, in some places, the rock outcrops, make it very difficult or impractical to use modern farm machinery on these soils. Because of surface stones and steep slopes, these soils are not suited to many nonfarm uses.

Generally, these soils are used as woodland; trees grow well on them. In a few places they are used for unimproved pasture, which generally produces little forage. (Capability unit VIIs–10)

Buckland Series

The Buckland series consists of moderately well drained, loamy soils that have a hard layer beginning at a depth of 1 to 2 feet. Water moves moderately slowly through this hard layer but flows readily on top of it. These soils formed in glacial till deposits derived from schistose and limestone rocks. In most places they are on long smooth slopes and range from gently sloping to very steep. They are in depressions or on slopes that receive water from higher areas. A seasonal high water table keeps these soils wet from late in fall to early in spring and commonly moist throughout the growing season. These soils are located in the eastern foothills of the Green Mountains, mainly in the town of Granville.

The Buckland soils are too stony to use for farm crops, except in a very few places where they have been cleared of most stones. They are used mainly as woodland or are idle.

Profile of a Buckland extremely stony loam in a forest in the town of Granville, approximately 3 miles southeast of the village of Granville:

A1—0 to 7 inches, very dark grayish-brown (2.5Y 3/2) loam; moderate, medium, granular structure; friable; abundant tree roots; 15 percent channery fragments of schistose rocks; medium acid; abrupt, smooth boundary.

B21—7 to 13 inches, dark grayish-brown (2.5Y 4/2) loam; weak, very fine, granular structure; friable;plentiful tree roots; 20 percent channery fragments of schistose rocks and quartz gravel; slightly acid; clear, smooth boundary.

B22—13 to 15 inches, olive (5Y 4/3) loam; weak, very fine, granular structure; friable; plentiful tree roots; 20 percent channery fragments of schistose rocks and quartz gravel; slightly acid; abrupt, smooth boundary.

Cx—15 to 24 inches +, mixed olive-gray (5Y 4/2) and dark olive-gray (5Y 3/2) gravelly fine sandy loam; few, fine, distinct mottles of dark brown (10YR 3/3); structureless (massive); firm in place; few tree roots; 30 percent quartz and schistose gravel, and a few channery fragments of schistose rocks; neutral.

The depth to the fragipan ranges from 12 to 24 inches. Depth to mottling ranges from 12 to 18 inches. Content of coarse fragments is 5 to 25 percent in the A horizon and 10 to 20 percent in the B horizon. The C horizon is 20 to 40 percent coarse fragments. The color of the A horizon in most places has a hue of 2.5Y or 10YR, a value of 2 or 3, and a chroma of 2. In some places there is an A1 horizon that has a color of 10YR 2/1. Texture of the A horizon is loam, channery silt loam, or channery loam.

The matrix of the B horizon has a hue of 5Y to 10YR, a value of 3 or 4, and a chroma of 2 to 4. Texture of the B horizon is loam or silt loam. The Cx horizon has a hue of 5Y, a value of 3 to 5, and a chroma of 2 or 3. Mottles in this horizon are faint or distinct. Texture of the Cx horizon is channery fine sandy loam, channery loam, or gravelly fine sandy loam. This horizon is firm or very firm. Reaction of the A horizon is strongly acid or medium acid. The B and Cx horizons vary from medium acid to neutral.

The Buckland soils are near the well-drained Calais soils and the poorly drained and somewhat poorly drained Cabot soils. They also are near the Glover soils, which are shallow to bedrock. The Buckland soils differ from the similar moderately well drained Amenia soils in not having free carbonates at a depth of 30 inches; also, they are underlain by a fragipan. The Buckland soils differ from the similar Peru soils in having a B horizon that is less acid, and they lack A2 and Bir horizons like those in the Peru soils.

Buckland extremely stony loam, 3 to 15 percent slopes (BuC)—This soil has the profile described as typical for the series. Included with this soil in mapping were a few small areas of Buckland soils that have been cleared of most stones, a few small areas having steeper slopes, and small areas of the poorly drained and somewhat poorly drained Cabot soils.

Surface stones make it very difficult or impossible to use modern farm machinery on this soil, and they limit many nonfarm uses.

Most of this soil is woodland; trees grow well on it. In a very few places it is used for unimproved pasture, which provides only a small amount of forage for livestock. (Capability unit VIIs–10).

Buckland extremely stony loam, 15 to 25 percent slopes (BuD)—This soil is similar to the one described as typical for the series. Included with this soil in mapping were a few small areas that have steeper slopes, a few small areas that are not so steep, and a few small areas of the poorly drained and somewhat poorly drained Cabot soils.

The many surface stones and steep slopes make it very difficult or impossible to use modern farm machinery on this soil. If the surface stones are removed, the steep slopes limit use of the soil for farming. The surface stones limit many nonfarm uses.

Most of this soil is woodland; trees grow well on it. In some places it is used for unimproved pasture, which generally provides little forage. (Capability unit VIIs–10)

Cabot Series

The soils of the Cabot series are poorly drained and somewhat poorly drained. They have a hard layer beginning at a depth of 1 to 2 feet. Water moves down moderately slowly through this hard layer but flows readily downhill on top of it. The Cabot soils are wet from late in fall to early in spring and remain moist throughout the growing season. They formed in glacial material derived from schistose and limestone rocks. These nearly level or moderately sloping soils are in the Green Mountains and their foothills.

In most places the Cabot soils are too stony for tillage, but in some places they have been cleared of most stones and can be used for farming. These soils are mainly in trees. Areas cleared of stones are in pasture or hay, or they are idle.

Profile of a Cabot extremely stony loam in wooodland in the town of Hancock, approximately 1/2 mile north of the junction of Vermont Highways No. 125 and 100·

A1—0 to 7 inches, black (5YR 2/1) loam; weak, medium, granular structure; friable; plentiful tree roots; 20 percent coarse fragments of gravel size; neutral; abrupt, smooth boundary.

B2g—7 to 13 inches, dark-gray (5Y 4/1) loam; few, medium, prominent mottles of dark reddish brown (5YR 3/4); structureless (massive); friable; no tree roots; 20 percent coarse fragments of gravel size; neutral; abrupt, smooth boundary.

Cx—13 to 19 inches +, olive-gray (5Y 4/2) loam; common, medium, prominent mottles of strong brown (7.5 YR 5/8); structureless (massive); firm in place; 30 percent coarse fragments of gravel size; slightly acid.

The depth to the fragipan ranges from about 12 to 24 inches. Depth to mottling is 6 to 12 inches. Content of coarse fragments ranges from 5 to 30 percent in the A horizon and from 10 to 35 percent in the B and C horizons. The coarse fragments consist mainly of gravel, cobblestones, and stones of schistose rocks. The color of the A horizon has, in most places, a hue of 5YR or 10YR, a value of 2, and a chroma of 1 or 2. In some places it is 10YR 3/1. The most common texture of the A1 or Ap horizon is loam, but in some places it is silt loam.

The matrix of the B horizon has a hue of 2.5Y, a value of 4 or 5, and a chroma of 1 to 4, or a color of 5Y 4/1. Mottles in the B horizon are faint, distinct, or prominent. Texture of the B horizon is silt loam, loam, or fine sandy loam. The matrix of the Cx horizon has a hue of 5Y, a value of 3 to 5, and a chroma of 1 to 3. Mottles, if present in the Cx horizon, are faint, distinct, or prominent. Texture of the Cx horizon is silt loam, loam, or fine sandy loam. The Cx horizon is firm or extremely firm. The horizon is medium acid, slightly acid, or neutral. The B and Cx horizons are slightly acid or neutral.

In most of the county, the Cabot soils are near the moderately well drained Peru soils and the well drained Berkshire and Marlow soils. They also are near the Lyman soils, which are shallow to bedrock. In the eastern part of the county, the Cabot soils are also associated with the Buckland, Calais, and Glover soils. The Cabot soils differ from the similar Massena soils in that they do not have a C horizon of calcareous materials. Also, unlike the Massena soils, which have a chroma of 3 or higher in the B horizon, the B horizon of the Cabot soils has a chroma of 1.

Cabot stony loam, 0 to 8 percent slopes (CaB).—The profile of this soil is similar to the one described as typical for the series, except that most of the stones have been removed from the surface. In most places the surface layer has been plowed. Included with this soil in mapping were a few small areas of very poorly drained soils, areas of Cabot soils having slightly steeper slopes, and soils that have a profile similar to the one described but are more acid.

The seasonal high water table delays tillage of this soil in the spring and interferes with many nonfarm uses. After draining, the soil is easy to plow. In the nearly level areas there is little or no hazard of erosion, but on the gentle slopes there is a moderate hazard of erosion where the soil is plowed and left bare.

This soil is used mainly for hay or pasture. Crops commonly grown on this soil for hay or pasture are Ladino clover, alsike clover, redtop, timothy, and, in some places, reed canarygrass. Many areas need diversions for intercepting runoff from higher soils, for improving drainage, and for controlling erosion. Open ditches are used in some of the nearly level and gently sloping areas. Drainage is also needed for many nonfarm uses. (Capability unit IIIw–3)

Cabot extremely stony loam, 0 to 15 percent slopes (CbC).—This soil has the profile described as typical for the series. Included in mapping were small areas of wetter soils, of slightly steeper Cabot soils, and of soils that have a similar profile but are more acid.

Because of the many surface stones, this soil is not suited to the use of modern farm machinery. If stones are removed, drainage is necessary for the best growth of most crops and for many other uses. The stones and the seasonal high water table limit many nonfarm uses.

Most of this soil is woodland. In some places the soil is used for unimproved pasture, which furnishes little forage for livestock. (Capability unit VIIs–11)

Calais Series

The soils of the Calais series are deep and well drained, and they retain moisture well. These soils are loamy and formed in glacial till that contains dark-colored schistose and some impure limestone rocks. A firm fragipan lies below the subsoil at a depth of about 18 inches. These soils are gently sloping to very steep. They are in the eastern foothills of the Green Mountains, mainly in the town of Granville.

These soils are nearly all too stony to use for farm crops, but in a very few places they have been cleared of most stones and can be used for farming. The cleared soils are used for hay or are idle. The uncleared Calais soils are used mainly as woodland.

In Addison County the Calais soils were not mapped separately but were mapped in undifferentiated units with Glover soils. An individual area of a unit can consist of Calais soils, Glover soils, or an intermingling of the two. The Glover soils are described under the Glover series.

Profile of a Calais extremely stony loam in woodland in the town of Granville, 1¼ miles southwest of Moss Glen Falls:

O1—1¼ inches to 1 inch, litter of hardwood leaves and of spruce and balsam fir needles.
O2—1 inch to 0, partly decomposed litter containing many tree roots.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; weak, very fine, granular structure; very friable; abundant tree roots; 5 percent channery fragments of schistose rocks; very strongly acid; abrupt, smooth boundary.
B21—2 to 10 inches, olive-brown (2.5Y 4/4) loam; weak, very fine, granular structure; very friable; abundant tree roots; 15 percent channery fragments of schistose rocks; strongly acid; abrupt, wavy boundary.
B22—10 to 18 inches, between olive-brown (2.5Y 4/4) and olive (5Y 4/4) loam; weak, fine and very fine, granular structure; very friable; abundant tree roots; 20 percent channery fragments of schistose rocks; medium acid; abrupt, smooth boundary.
Cx—18 to 25 inches +, olive (5Y 4/3) loam; weak, very fine, granular structure; firm in place, friable when removed; common tree roots; 30 percent channery fragments of schistose rocks and quartzose gravel; medium acid.

Within the profile there are channery fragments, gravel, cobblestones, and stones derived from schistose rock, quartzose rock, limestone, and weathered sandstone. The A horizon is 5 to 30 percent coarse fragments, and the B horizon, 15 to 35 percent. The C horizon is as much as 50 percent coarse fragments in some places. The A horizon generally has a hue of 10YR or 2.5Y, a value of 2 or 3, and a chroma of 2. The texture of the A horizon is loam or silt loam.

The B horizon has a hue that in most places is 2.5Y or 5Y; its value is 3 or 4, and its chroma is 2 to 4. The texture of the B horizon is loam or silt loam. The C horizon, in most places, has a hue of 5Y, a value of 4, and a chroma of 2 to 4. The texture of the C horizon is loam, silt loam, and fine sandy loam. The A horizon ranges from very strongly acid to slightly acid. The B horizon is strongly acid to slightly acid, and the C horizon is medium acid to neutral.

The Calais soils are near the moderately well drained Buckland soils and the poorly drained and somewhat poorly drained Cabot soils. They also are near the Glover soils, which are shallow to bedrock. The Calais soils are similar to the Berkshire and Nellis soils, but the Berkshire soils have a B horizon with a hue of 5YR, 10YR, and 7.5YR. Also, the Calais soils do not have calcareous material within 2 to 3 feet of the surface like the Nellis soils.

Calais and Glover soils, 5 to 20 percent slopes (CIC).—The profile of the Calais soils in this unit is similar to that described as typical for the Calais series. The profile of the Glover soils is similar to that described under the Glover series. Included with these soils in mapping were a few small areas having steeper slopes, a very few areas where the outcrops are more than 100 feet apart, and a very few areas where most of the loose surface stones have been removed. Also included in mapping were a few small areas of the moderately well drained Buckland soils and the poorly drained and somewhat poorly drained Cabot soils. There are many large areas of the Calais soils in which there are no outcrops. In areas where the Calais and Glover soils occur in an intricate pattern, there are outcrops of bedrock about 10 to 30 feet apart in some places, but in other places the outcrops are about 30 to 100 feet apart.

The rock outcrops in areas of Glover soils and the many surface stones on the Calais soils make the use of modern farm machinery very difficult or impossible. They also severely limit many nonfarm uses.

These soils are used mainly as woodland; trees grow well on them. In some places they are used for unimproved pasture, which generally produces little forage for livestock. (Capability unit VIIs–10)

Calais and Glover soils, 20 to 50 percent slopes (CIE).—The Calais soils in this mapping unit have a profile similar to that described as typical for the series. The Glover soils have a profile similar to that described as typical for the Glover series. Included with this unit in mapping were a few small areas of the moderately well drained Buckland soils. There are many large areas of the Calais soils in which there are no outcrops. Where the Calais and Glover soils occur in an intricate pattern, there are outcrops of bedrock about 10 to 30 feet apart in some places, but in other places the outcrops are about 30 to 100 feet apart.

The rock outcrops in areas of Glover soils, the many surface stones on the Calais soils, and the steep slopes make the use of modern farm machinery very difficult or impossible. They also severely limit the use of these soils for most nonfarm uses.

Most areas of these soils are in woodland; trees grow well on them. In a few places the soils are used for unimproved pasture, which generally provides only a small amount of forage. (Capability unit VIIs–10)

Canandaigua Series

The Canandaigua series consists of poorly drained silt loams that formed in deep water-laid deposits of silty material that contains small amounts of lime. These soils are wet from late in fall to early in spring, but in places they become dry during some growing seasons. They are somewhat sticky and plastic when wet but are not difficult to till or to dig. These nearly level or gently sloping soils occur mainly in the Champlain Valley parts of the towns of Bristol and Monkton.

The Canandaigua soils are used mainly for hay and pasture. Some areas are wooded and some are idle.

Profile of Canandaigua silt loam in a pasture in the town of Monkton, approximately 1 mile southeast of Monkton Ridge:

A1—0 to 6 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; abundant grass roots; neutral; abrupt, smooth boundary.
B21g—6 to 10 inches, dark grayish-brown (2.5Y 4/2) silt loam; many, medium, distinct, dark-brown (7.5YR 4/4) mottles; moderate, very fine and fine, angular blocky structure; friable; few grass roots; neutral; abrupt, smooth boundary.
B22g—10 to 18 inches, gray (10YR 5/1) silt loam; many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, very fine, angular blocky structure; firm in place, friable when removed; few grass roots; neutral; abrupt, smooth boundary.
Cg—18 to 22 inches +, gray (10YR 5/1) silt loam, many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; structureless (massive); firm; no roots; neutral.

Mottling occurs at a depth of 4 to 7 inches, or immediately below the A horizon. The A horizon has a hue of 10YR, a value of 2 or 3, and a chroma of 1 or 2. The matrix of the B horizon has a hue of 2.5Y, 10YR, or 5Y; a value of 4 or 5; and a chroma of 1 or 2. Mottles in the B horizon are distinct or prominent. The color of the matrix of the C horizon is neutral or has a hue of 5Y or 10YR; a value of 5 or, in some places, 4; and a chroma of 0 or 1. Mottles in the C

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horizon are distinct or prominent. The texture is silt loam or very fine sandy loam. The reaction of the A horizon ranges from slightly acid to neutral. The B and C horizons are neutral.

The Canandaigua soils are near the somewhat poorly drained or poorly drained Raynham soils and the very poorly drained Livingston soils. The Canandaigua soils are similar to the Covington and Panton soils, but throughout the profile they are silt loam or very fine sandy loam rather than clay.

Canandaigua silt loam (Cn).—This is the only Canandaigua soil mapped in the county. It is nearly level or gently sloping. Included with it in mapping were a few small areas of the very poorly drained Livingston soils, some small areas of somewhat poorly drained to moderately well drained soils, and a few areas where there is a layer of silty clay below the subsoil.

Because of its texture and wetness, this soil is difficult to work. In the gently sloping areas there is a slight hazard of erosion if the soil is plowed and left bare.

This soil is used for hay or pasture. Drainage is needed for successful crop production. Diversion ditches and surface field ditches are used for drainage. Drainage is also necessary for many nonfarm uses of this soil. In the drained areas, birdsfoot trefoil, Ladino and alsike clovers, redtop, and timothy are grown. Reed canarygrass and alsike clover can be grown if drainage is improved only a little. (Capability unit IIIw–4)

Cobbly Alluvial Land

Cobbly alluvial land (Co) consists of recent stream deposits. In most places these deposits are sand, gravel, and cobblestones, but included in mapping were areas that are less coarse in texture. Cobbly alluvial land is well drained in most places, but in some areas it is poorly drained. It occurs on nearly level or gently sloping flood plains of fast-moving streams and is flooded at least once a year. The floodwaters wash away these deposits in some places, or they leave fresh material on the surface. In many places this miscellaneous land type is grown up to alder, red maple, American elm, willow, and hemlock. Cobbly alluvial land is not suited to farming or to most nonfarm uses. It is not productive as woodland. In some places it can be used for wildlife. (Capability unit VIIs–1)

Colton Series

The soils of the Colton series are deep, sandy, and very gravelly. They are excessively drained and do not retain moisture well, or are droughty. They formed in water-deposited sand and gravel derived from schist, granite, and quartzite. These soils are nearly level or moderately sloping in many places, but in other places they are steep or very steep.

The Colton soils occur mainly along the eastern edge of the Champlain Valley. They are also in scattered areas of the Green Mountains and their foothills.

The Colton soils are used mainly for crops, pasture, and woodland. There are many gravel pits in areas of these soils.

Profile of a Colton gravelly sandy loam in an idle field about ½ mile northwest of South Lincoln village:

Ap—0 to 9 inches, very dark brown (10YR 2/2) gravelly sandy loam; weak, very fine, granular structure; friable; abundant grass roots; 20 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

A2—9 to 11 inches, gray (10YR 6/1) gravelly sand; structureless (single grain); loose; plentiful grass roots; 35 percent coarse fragments; strongly acid; abrupt, wavy boundary.

B21h—11 to 13 inches, black (5YR 2/1) very gravelly loamy sand; structureless (single grain); loose; plentiful grass roots; 50 to 60 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

B22ir—13 to 19 inches, yellowish-red (5YR 4/8) very gravelly sand; structureless (single grain); loose; common grass roots; 50 to 60 percent coarse fragments; medium acid; abrupt, wavy boundary.

C—19 to 27 inches +, dark yellowish-brown (10YR 4/4) very gravelly sand; structureless (single grain); loose; few grass roots; 50 percent coarse fragments; medium acid.

The content of gravel in the Ap horizon ranges from 15 to 25 percent, by volume; in the A2 horizon it ranges from 30 to 35 percent. Content of coarse fragments in the B and C horizons varies between 50 and 60 percent. Gravel, cobblestones, and sand are predominantly quartzite. The Ap, or the A1 horizon, has a hue of 10YR, a value of 2 to 4, and a chroma of 2 or 3. The texture is gravelly sandy loam, gravelly loamy sand, or gravelly loamy coarse sand. The A2 horizon has a hue of 10YR, a value of 5 or 6, and generally a chroma of 1 or 2. The texture of the A2 horizon ranges from gravelly sandy loam to gravelly sand.

Where a B2h horizon is present, it may be a 5YR 2/1 or 7.5YR 3/2. The upper B horizon, other than the Bh horizon, normally has a hue of 5YR or 7.5YR, a value of 4 or 5, and a chroma of 6 to 8. The lower B horizon has, in most places, a hue of 5YR, 7.5YR, or 10YR, a value of 4 or 5, and a chroma of 4 to 8. The texture of the B horizon ranges from very gravelly loamy sand to very gravelly coarse sand. In most places the C horizon has a color of 2.5Y or 10YR 4/4, 5/4, or 5/6. The texture of the C horizon is very gravelly fine sand, very gravelly sand, or very gravelly coarse sand. Consistence of all horizons is friable, very friable, or loose. The reaction of the solum ranges from very strongly acid to medium acid. Reaction of the C horizon is strongly acid to medium acid.

The Colton soils are near the moderately well drained Duane soils and the poorly drained and somewhat poorly drained Walpole soils. The Colton soils are similar to the Adams and the Stetson soils, but the Adams soils contain few or no coarse fragments in the profile and the Stetson soils have a B horizon of very gravelly sandy loam, very gravelly fine sandy loam, or very gravelly loam.

Colton gravelly sandy loam, 0 to 5 percent slopes (CtA).—A profile of this soil is described as typical for the series. In some unplowed areas the dark surface layer is thinner than the typical one, and in places it is absent and the gray layer is at the surface. Included with this soil in mapping were small areas of the moderately well drained Duane soils and, in the Champlain Valley, soils that are over a sand and gravel layer that contains lime.

This soil is easy to work and responds well to fertilizer. It can be worked early in the spring. In some places large amounts of gravel or cobblestones in the surface layer interfere with tillage. There is a slight hazard of erosion in the gently sloping areas where the soil is plowed and left bare. This soil is well suited to many nonfarm uses.

Most areas of this soil are used for corn, hay, or rotation pasture. Alfalfa, red clover, timothy, bromegrass and corn for silage are grown in short rotations. (Capability unit IIIs–8)

Colton gravelly sandy loam, 5 to 12 percent slopes (CtB).—This soil is similar to that described as typical of the series, but in some unplowed areas the dark surface layer is thinner and in places it is absent and the gray layer is at the surface. Included with this soil in mapping were a few small areas of the moderately well drained Duane soils and, in the Champlain Valley, soils that are over a sand and gravel layer that contains lime.

This soil is easy to work and responds well to fertilizer. It can be worked early in the spring. In some places large amounts of gravel or cobblestones in the surface layer interfere with tillage. There is a moderate to severe hazard of erosion where the soil is plowed and left bare. This soil is suitable for many nonfarm uses, but the moderate slope limits some uses.

Much of this soil is in hay or rotation pasture. It is used for alfalfa, red clover, timothy, and bromegrass. In a few places corn is grown. (Capability unit IVs–8)

Colton gravelly sandy loam, 12 to 30 percent slopes (CtD).—This soil is similar to the one described as typical for the series, but in many places it has not been plowed and the dark surface layer is thinner or absent and the gray layer is at the surface. Included in mapping were areas that are rolling. Also included, in the Champlain Valley, were small areas of soils that are over a sand and gravel layer that contains lime.

The very steep slopes make the use of modern farm machinery very difficult and severely limit most nonfarm uses. There is a severe hazard of erosion where this soil is plowed and left bare. In some places there are large amounts of gravel or cobblestones in the surface layer that interfere with tillage.

Because of its steep slopes, the severe hazard of erosion, and droughtiness, this soil is used mainly as woodland or for unimproved permanent pasture. (Capability unit VIs–8)

Colton gravelly sandy loam, 30 to 50 percent slopes (CtE).—This soil is similar to the one described as typical for the series, but in most places it has not been plowed and the dark surface layer is thinner or absent and the gray layer is at the surface. Included with this soil in mapping were small areas of soils in the Champlain Valley that are over a sand and gravel layer that contains lime.

The extremely steep slopes make the use of modern farm machinery practically impossible and severely limit most nonfarm uses. There is a very severe hazard of erosion where this soil is plowed and left bare.

Because of its very steep slopes, the very severe hazard of erosion, and its droughtiness, this soil is used mainly as woodland. (Capability unit VIIs–8)

Covington Series

The Covington series consists of poorly and somewhat poorly drained, nearly level or gently sloping silty clays and clays. These soils formed in deep water-laid deposits of clay that contains much lime. Water moves down very slowly through these soils. The Covington soils are wet from late fall to early spring. Their subsoil is moist throughout most of the growing season but becomes dry during some of it. The surface layer dries out almost every growing season. The Covington soils are sticky and plastic when wet, hard when dry, and difficult to till or to dig.

The Covington soils occur through the Champlain Valley. The largest areas are in the towns of Addison, Panton, and Ferrisburg.

The Covington soils are used mainly for hay and pasture. Some areas are wooded, and some are idle. Birdsfoot trefoil grows well on these soils. Some of the birdsfoot trefoil is harvested for seed.

Profile of a Covington silty clay in a cultivated field in the town of Addison, about 2½ miles north of Chimney Point:

Ap—0 to 8 inches, very dark brown (10YR 2/2) silty clay; strong, medium and coarse, granular structure; friable to firm when moist, plastic and sticky when wet; plentiful fibrous roots; medium acid; abrupt, smooth boundary.

B21t—8 to 11 inches, dark grayish-brown (10YR 4/2) clay; many, medium, prominent, brown to dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/8) mottles; strong, coarse, prismatic structure breaking to strong, very fine and fine, angular blocky structure; firm when moist, plastic and sticky when wet; abundant fibrous roots; light brownish-gray (10YR 6/2) silt coatings on peds; medium acid; abrupt, smooth boundary.

B22g—11 to 20 inches, dark-gray (10YR 4/1) clay; many, medium, prominent, dark yellowish-brown (10YR 4/4) mottles with brighter centers and many medium, distinct, gray (10YR 5/1) mottles; strong, coarse, prismatic structure breaking to strong, fine, angular blocky structure and some moderate, fine, subangular blocky structure; very firm when moist; very sticky and very plastic when wet; plentiful fibrous roots; few fine manganese patches; medium acid; clear, wavy boundary.

B23g—20 to 24 inches, very dark gray (10YR 3/1) clay; many, fine, distinct, dark yellowish-brown (10YR 3/4) mottles and few, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, coarse, prismatic structure; extremely firm when moist, very sticky and very plastic when wet; common to few fibrous roots; few fine manganese concretions, common manganese patches; clay films; neutral; clear, smooth boundary.

C1g—24 to 33 inches, dark-gray (N 4/0) clay; many, fine, faint, dark grayish-brown (2.5Y 4/2) mottles; moderate, coarse, prismatic structure breaking to strong, fine and medium, angular blocky structure; very firm when moist, very sticky and very plastic when wet; very few fibrous roots; silt coats; few, medium, light-gray (10YR 7/1) lime concretions; common manganese patches; strong effervescence with cold dilute hydrochloric acid; abrupt, wavy boundary.

C2g—33 to 45 inches +, dark-gray (N 4/0) clay; many, very coarse (2 to 3 inches), prominent, olive-brown (2.5Y 4/4) mottles; the mottles are concentrated in the lower part of the horizon; moderate, medium, prismatic structure breaking to strong, fine, medium and coarse, angular blocky structure; very firm when moist, very sticky and very plastic when wet; very few fibrous roots; clay films; silt coats; some fine manganese patches; some pale-brown (10YR 6/3) concretions that effervesce with cold dilute hydrochloric acid, and some that do not; violent effervescence on ped faces and strong effer-

vescence on interiors with cold dilute hydrochloric acid.

The depth to free carbonates varies between 16 and about 40 inches. The A1, or the Ap, horizon generally has a hue of 10YR, a value of 2 or 3, and a chroma of 2. In some places the A1, or Ap, horizon is 10YR 3/1. The texture of the A horizon is silty clay, silty clay loam, clay loam, or clay. Matrix colors of the B horizon have a hue of 5Y to 10YR, a value of 3 to 5, and a chroma of 1 or 2. The upper B horizon has distinct or prominent mottles. The lower B horizon has faint to prominent mottles. Matrix colors of the C horizon generally are similar to those of the B horizon. In places they are also 2.5Y 3/2 and N 4/0. Mottles range from faint to prominent. In some places there are thin silt layers. The reaction of the solum ranges from very strongly acid to neutral. The C horizon is calcareous or neutral.

The Covington soils are near the moderately well drained Vergennes soils, the very poorly drained Livingston soils, the well drained Nellis and Melrose soils, and the somewhat excessively drained Farmington soils. The Covington soils are similar to the Livingston soils, except that the Livingston soils have a black surface layer. The Covington soils are also similar to the Canandaigua soils, but the Canandaigua soils are silt loam. Covington soils are similar to the Panton soils, except the Panton soils have a lighter colored Ap horizon; or, in places where an A1 horizon occurs, it is as dark as or is darker than that in the Covington soils but is not so thick.

Covington silty clay, flooded (Cv).—This soil is nearly level, and it is covered with floodwater every year, usually in the spring. In some places the depth to free carbonates is greater than that in the profile described as typical for the series. Included with this soil in mapping were small areas of very poorly drained Livingston clay, flooded, and some small areas of moderately well drained soils having a surface layer of clay. This soil is mainly on the flood plain of the Lemon Fair River (fig. 2) but, to a small extent, along other slow-moving streams in the Champlain Valley.

This soil is of limited use for farm and nonfarm purposes. It is difficult to plow and harrow because it is silty clay. It is wet and cold until late in the spring and is wet in the fall. It is very sticky and soft when it is wet and gets hard and cracks when it is dry. It is normally plowed in the fall. The alternate freezing and thawing during the winter make it easier to harrow in the spring. There is very little hazard of erosion in most places.

Figure 2.—**Covington silty clay, flooded, along the Lemon Fair River.**

Wetness and flooding limit the choice of crops. During the growing season, however, crops are not usually damaged. Corn and alfalfa are seldom grown. Birdsfoot trefoil, alsike and Ladino clovers, timothy, and reed canarygrass are the main crops. Ice sheets early in spring may kill the birdsfoot trefoil plants. Drainage has been improved by mains and laterals, surface field ditches, and land smoothing, or by various combinations of these practices. Many areas of this soil are difficult to drain because the soil is at about the same level as the water in nearby streams. (Capability unit IVw–15)

Covington and Panton silty clays (Cw).—This mapping unit consists of Covington and Panton soils that are so intermingled that it is difficult to map them separately. The Covington soil has the profile described as typical for the series. A profile that is typical of the Panton soils is described under the Panton series. Included in mapping were a few small areas of the very poorly drained Livingston soils, some areas of Covington and Panton soils having slightly steeper slopes, and some small areas of the moderately well drained Vergennes soils.

Covington and Panton silty clays are nearly level or gently sloping. They are very wet and sticky in spring and late in fall, and this limits their use for farming and for many nonfarm uses. Because they are silty clays, these soils are difficult to plow and harrow. In addition, they are cold until late in spring, are very sticky and soft when they are wet, and get hard and crack as they dry. They are normally plowed in the fall. The alternate freezing and thawing during the winter make harrowing easier in spring. There is very little hazard of erosion in most places. In the gently sloping areas, however, there is a slight hazard of erosion if the soils are plowed and left bare.

These soils are used mainly for hay or pasture. They are not well suited to corn or alfalfa. Birdsfoot trefoil grown for hay or seed and timothy are common crops. Where these soils are nearly level, ice sheets early in spring may kill the birdsfoot trefoil plants. Reed canarygrass, alsike clover, and Ladino clover are grown in some places. In the nearly level areas, field drainage ditches, land smoothing, or a combination of these is used for drainage (fig. 3). Diversion ditches are built in some places above these soils to intercept surface water. In the gently sloping areas, silage corn is sometimes grown. The nearly level areas are, in general, too wet for the best growth of corn. (Capability unit IVw–5)

Duane Series

The Duane series consists of deep, moderately well drained, sandy soils that formed in water-deposited sand and gravel derived from quartzose and schistose materials. These soils are very gently sloping in most places, but in some places they are sloping. They are slightly wet and occur in depressions or on slopes that receive water from higher areas. A seasonal high water table keeps these soils wet from late in fall to early in spring.

Figure 3.—**Covington silty clay after spring thaw. Ditch drainage or land smoothing is needed.**

The Duane soils occur mainly in the foothills of the Green Mountains and along the eastern edge of the Champlain Valley. They are used mainly for hay, pasture, or woodland.

Profile of a Duane fine sandy loam in a plantation of Norway spruce in the town of Goshen, 5 miles north of the village of Goshen, on the east side of the road from Goshen to Ripton:

Ap—0 to 6 inches, black (5YR 2/1) fine sandy loam; moderate, fine and very fine, granular structure; very friable; abundant tree roots; 10 percent gravel; very strongly acid; abrupt, smooth boundary.

B21ir—6 to 17 inches, brown to dark-brown (7.5YR 4/4) gravelly sandy loam; moderate, fine, granular structure; very friable; abundant tree roots; 40 percent gravel; strongly acid; clear, wavy boundary.

B22ir—17 to 30 inches, dark-brown (7.5YR 3/2) gravelly loamy sand; many, coarse, prominent mottles of olive brown (2.5Y 4/4); structureless (single grain); very friable; few tree roots; 40 percent gravel and cobblestones; strongly acid; clear, smooth boundary.

IIC—30 to 42 inches +, dark grayish-brown (2.5Y 4/2) coarse sand; many, medium, distinct mottles of dark brown (10YR 3/3); structureless (single grain); very friable; no roots; 10 percent gravel; strongly acid.

Mottling occurs at a depth of 10 to 20 inches. Content of gravel in the A horizon ranges from 5 to 20 percent, by volume. The amount of gravel and cobblestones in the B and C horizons ranges from 10 to 40 percent. The A horizon, in most places, has a hue of 10YR or 5YR, a value of 2, and a chroma of 1 or 2. In some places the color is 10YR 3/2. The texture of the A horizon is fine sandy loam or gravelly fine sandy loam.

The B horizon generally has a hue of 7.5YR to 2.5Y, a value of 3 or 4, and a chroma of 2 to 4. Mottles in the B horizon are distinct or prominent. The texture is gravelly sandy loam, gravelly sand, gravelly loamy sand, and cobbly loamy sand.

The C horizon has a hue of 2.5Y or 10YR, a value of 4 in most places, and a chroma of 2 or 4. There are faint to prominent mottles. The texture of the C horizon is loamy fine sand, coarse sand, gravelly loamy sand, gravelly coarse sand, or cobbly sand. The reaction of the solum ranges from very strongly acid to medium acid. The reaction of the C horizon ranges from strongly acid to slightly acid.

The Duane soils are near the excessively drained Colton and Stetson soils and the poorly drained and somewhat poorly drained Walpole soils. The Duane soils are somewhat similar to the Elmwood soils, coarse variant, but the Elmwood soils have a IIC horizon of clay or clay loam at a depth of 18 to 26 inches, and they are not gravelly.

Duane fine sandy loam, 0 to 5 percent slopes (DaA).—This soil has the profile described as typical for the series. Included with this soil in mapping were small areas of the poorly drained and somewhat poorly drained Walpole soils.

This soil is easy to plow, but a high water table delays tillage in the spring. The high water table also limits the use of this soil for many nonfarm purposes. The hazard of erosion is slight if the soil is plowed and left bare.

This soil is used mainly for hay or pasture. Crops grown on it are silage corn, Ladino clover, timothy, and bromegrass. Drainage by open ditches or tile makes this soil more suitable for corn and alfalfa. (Capability unit IIw–67)

Duane fine sandy loam, 5 to 12 percent slopes (DaB).—The profile of this soil is similar to the one described as typical. Included with this soil in mapping were small areas having slopes steeper than 12 percent and a few small areas of the poorly drained and somewhat poorly drained Walpole soils.

This soil is easy to plow, but a high water table delays tillage in the spring. The seasonal high water table also is a limitation to the use of this soil for many nonfarm purposes. The hazard of erosion is moderate where this soil is plowed and left bare or used for row crops.

This soil is used mainly for hay or pasture. Crops grown are silage corn, Ladino clover, timothy, and bromegrass. Drainage by tile makes this soil more suitable for corn and alfalfa. (Capability unit IIIe–67)

Dutchess Series

The Dutchess series consists of deep, well-drained, loamy soils that retain moisture well. These soils formed in glacial till deposits that contain much slate material. They are gently sloping in most places, but there are some steeper areas. The Dutchess soils occur mainly on low hills in the southeastern part of the town of Orwell, which is in the southwestern corner of Addison County.

Originally, these soils were nearly all too stony to use for farm crops, but in many places they have been cleared of most stones and can be used for farming.

The areas from which most stones have been removed are used mainly for hay, silage corn, or pasture. Where the stones have not been removed, these soils are mainly in woodland and pasture or are idle.

Profile of a Dutchess stony loam in an idle field in the town of Orwell, about 1 mile east of the village of Orwell:

Ap—0 to 10 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, granular structure; very friable; abundant grass roots; 5 percent coarse fragments of slate, and pebbles and cobblestones of quartzite; strongly acid; abrupt, smooth boundary.

B21—10 to 16 inches, yellowish-brown (10YR 5/6) loam;

moderate, fine and very fine, granular structure; very friable; abundant grass roots; 5 percent coarse fragments of slate, and pebbles and cobblestones of quartzite; medium acid; abrupt, smooth boundary.

B22—16 to 24 inches, light olive-brown (2.5Y 5/6) loam; moderate, very fine, granular structure; friable; few grass roots; 10 percent coarse fragments of slate, and pebbles and cobblestones of quartzite; medium acid; abrupt, smooth boundary.

C—24 to 28 inches, olive-brown (2.5Y 4/4) loam; structureless (massive); firm in place, friable when removed; no grass roots; 10 percent coarse fragments of slate, and pebbles and cobblestones of quartzite; medium acid.

The content of coarse fragments in the solum ranges from 5 to 15 percent, by volume. In the C horizon it ranges from 10 to 25 percent. The coarse fragments are slate fragments and quartzite gravel and cobblestones. The A1 horizon has a hue of 10YR, a value of 2 or 3, and a chroma of 2. The Ap horizon has a hue of 10YR, a value of 4, and a chroma of 2 to 4. The B horizon has, in most places, a hue of 2.5Y or 10YR, a value of 5, and a chroma of 6. The C horizon has a hue of 2.5Y or 10YR, a value of 4, and a chroma of 4. The texture of the C horizon is loam or fine sandy loam. Reaction of the A horizon ranges from strongly acid to medium acid. The B and C horizons are medium acid.

The Dutchess soils occur near the moderately well drained Amenia soils and also near the Nassau soils, which are shallow to bedrock. The Dutchess soils are similar to the Nellis soils, except that the Nellis soils have a B horizon that is slightly acid or neutral and a C horizon that is neutral or calcareous. The Dutchess soils are also similar to the Berkshire soils, except that the Berkshire soils have a B horizon that has a hue of 7.5YR after plowing, an upper B horizon that contains more organic matter, and an A2 and a B2h horizon.

Dutchess stony loam, 3 to 8 percent slopes (DcB).—The profile of this soil is similar to the one described for the series. Included with this soil in mapping were small areas of the moderately well drained Amenia soils, small areas that are less sloping, and small areas in which bedrock is at a depth of 30 inches.

Except for the slope, this soil has few limitations for most uses. There is a moderate hazard of erosion where the soil is used for row crops or where it is plowed and left bare. This soil warms up quickly in the spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers because it is deep and has a good capacity for supplying water.

This soil is used mainly for hay or corn. Crops grown on it are alfalfa, timothy, bromegrass, and corn for silage. Practices to control erosion are needed in places. These practices are diversion ditches to intercept surface water, stripcropping on some of the longer smooth slopes, and contour cultivation where row crops are grown. (Capability unit IIe–3)

Dutchess stony loam, 8 to 15 percent slopes (DcC).—This soil has the profile described as typical for the series. Included with this soil in mapping were small areas of the moderately well drained Amenia soils, areas of gently rolling Dutchess stony loam, and small areas in which bedrock is at a depth of 30 inches.

Erosion is a moderate to severe hazard where the soil is in row crops or where it is plowed and left bare. The moderate slopes impose some limitations for nonfarm uses. This soil warms up quickly in the spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers because it is deep and has a good water-supplying capacity.

This soil is used mainly for hay or corn. Crops grown are alfalfa, timothy, bromegrass, and corn for silage. Practices that are needed to control erosion in some places are diversion ditches to intercept surface water, stripcropping on some of the longer smooth slopes, and contour cultivation in areas used for row crops. (Capability unit IIIe–3).

Dutchess stony loam, 15 to 25 percent slopes (DcD).—Included with this soil in mapping were small areas that are not so steep, small areas that are steeper, a few small areas of the moderately well drained Amenia soils, and small areas where bedrock is within 30 inches of the surface.

The steep slopes make the use of modern farm machinery somewhat difficult and severely limit most nonfarm uses. There is a very severe hazard of erosion if this soil is in row crops or if it is plowed and left bare. It warms up quickly in the spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers because it is deep and has a good water-supplying capacity.

This soil is used mainly for pasture or woodland. It is well suited to hay or pasture under good management. Alfalfa, timothy, and bromegrass are grown for hay. Ladino clover and timothy are grown for pasture. Stripcropping may be needed to control erosion in areas being reseeded. (Capability unit IVe–3)

Dutchess extremely stony loam, 3 to 15 percent slopes (DsC).—The profile of this soil is similar to the one described, except that there are many stones on the surface. Included with this soil in mapping were small areas that are less sloping and small areas of the moderately well drained Amenia soils. In some places there are a few outcrops of bedrock.

The many surface stones and the rock outcrops in some places make it very difficult or impossible to use modern farm machinery on this soil. Because of the surface stones, this soil is also limited for many nonfarm uses.

Much of this soil is woodland; trees grow well on it. In some places it is used for unimproved pasture, but generally it produces little forage for livestock. (Capability unit VIIs–10)

Dutchess extremely stony loam, 15 to 50 percent slopes (DsE).—The profile of this soil is similar to that described, except there are many stones on the surface. Included with this soil in mapping were a few small areas of the moderately well drained Amenia soils. In some places there are a few outcrops of bedrock.

The many surface stones, the very steep slopes, and rock outcrops in places make it very difficult or impossible to use modern farm machinery on this soil. Because of the surface stones, this soil is not suited to many nonfarm uses. If stones are removed, the steep slopes limit the use for farm crops and for many other uses.

Most of this soil is woodland; trees grow well on

it. In some places the soil is used for unimproved pasture, but little forage is produced for livestock. (Capability unit VIIs–10)

Elmwood Series, Coarse Variant

The Elmwood series, coarse variant, consists of moderately well drained soils that are mainly loamy fine sand to a depth of about 18 to 26 inches. Underlying the loamy fine sand is clay or clay loam. Water moves through the loamy fine sand readily and flows downhill on top of the clay or clay loam. The loamy fine sand, clay, and clay loam were deposited by water. The soils of the Elmwood series, coarse variant, contain more sand and less silt and clay in the upper part of the profile than normal Elmwood soils.

The Elmwood soils, coarse variant, are gently sloping in most places, but there are some moderately steep areas. They are slightly wet and lie mainly in broad areas or in depressions. In some places the soils are on slopes that receive water from higher areas. A seasonal high water table keeps these soils wet from late in fall to early in spring. These soils are mainly in the town of Ferrisburg, but they also occur in scattered areas throughout the Champlain Valley.

The Elmwood soils, coarse variant, are used mainly for hay, pasture, and corn for silage. Some areas are idle.

Profile of an Elmwood fine sandy loam, coarse variant, in an idle field in the town of Ferrisburg, 3 miles north of Ferrisburg village:

Ap—0 to 4 inches, very dark gray (10YR 3/1) fine sandy loam; weak, very fine, granular structure; very friable; abundant grass roots; strongly acid; abrupt, irregular boundary.

B2—4 to 12 inches, yellowish-brown (10YR 5/6) loamy fine sand; few, fine, distinct, yellowish-red (5YR 4/8) mottles in the lower part; structureless (single grain); very friable; plentiful grass roots; strongly acid; clear, wavy boundary.

A'2—12 to 18 inches, olive (5Y 5/3) loamy fine sand; many, coarse, distinct, dark yellowish-brown (10YR 4/4) mottles; structureless (single grain); very friable; few grass roots; medium acid; abrupt, wavy boundary.

IIC—18 to 22 inches, dark-gray (10YR 4/1) and gray (10YR 5/1) clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); structureless (massive); firm in place, firm removed; no grass roots; slightly acid.

The depth to the clay loam or clay material ranges from 18 to 36 inches. Mottling occurs at a depth of 10 to 26 inches. The A horizon has, in most places, a hue of 10YR, a value of 3 or 4, and a chroma of 1 or 2. The B horizon generally has a hue of 10YR or 2.5Y, a value of 4 or 5, and a chroma of 4 or 6. Mottles in the B horizon are distinct. The A'2 horizon is 2.5Y 7/2, 5Y 7/3, 5Y 6/2, or 5Y 5/3. Mottles in the A'2 horizon are distinct or prominent. The IIC horizon has, in most places, a hue of 2.5Y and 10YR, a value of 3, 4, or 5, and a chroma of 1 or 2. There are faint to prominent mottles. The texture of the IIC horizon ranges from clay loam to clay. The reaction of the A1, or Ap, horizon ranges from strongly acid to slightly acid. The B and A'2 horizons are strongly acid to slightly acid. The IIC horizon is medium acid to neutral.

The Elmwood soils, coarse variant, are near the well drained Melrose soils, the poorly drained and somewhat poorly drained Swanton and Covington soils, and the moderately well drained Vergennes soils. The Elmwood soils are similar to the Duane soils, but the Duane soils have a sandy IIC horizon and a high content of coarse fragments in the solum.

Elmwood fine sandy loam, coarse variant, 0 to 8 percent slopes (EIB).—A profile of this soil is described as typical for the Elmwood series, coarse variant. Included with this soil in mapping were small areas of the poorly drained and somewhat poorly drained Swanton soils, a few areas that have a layer of fine sandy loam between the surface layer and the clayey layers, and a few areas that have a layer of silt loam under the sandy material.

This soil is easy to plow, but in places the seasonal high water table delays tillage in spring. The seasonal high water table also interferes with nonfarm uses of this soil. On the gentle slopes there is a slight to moderate hazard of erosion if the soil is plowed and left bare or used for row crops.

This soil is used mainly for hay and for corn for silage. In addition, alfalfa, Ladino clover, birdsfoot trefoil, timothy, and bromegrass are grown. Drainage is necessary for the best growth of some crops and for many other uses of this soil. Drainage by diversion ditches, and by land smoothing in the nearly level areas, make this soil more suitable for corn and alfalfa. In some of the gently sloping areas, especially on long slopes, stripcropping and diversion ditches are needed to control erosion. (Capability unit IIw–9)

Elmwood fine sandy loam, coarse variant, 8 to 15 percent slopes (EIC).—Included with this moderately sloping soil in mapping were small areas that are gently rolling, small areas of the poorly drained and somewhat poorly drained Swanton soils, a few small areas on steeper slopes, a few areas that have a layer of fine sandy loam between the surface and the clayey layers, and a few areas that have a layer of silt loam under the sandy material.

This soil is easy to plow, but in places a seasonal high water table delays tillage in spring. The seasonal high water table and the moderate slopes interfere with nonfarm uses. There is a moderate to severe hazard of erosion if this soil is plowed and left bare or used for row crops.

This soil is used mainly for hay. Crops grown are alfalfa, Ladino clover, birdsfoot trefoil, timothy, bromegrass, and corn for silage. Drainage is necessary for the best growth of some crops and for many other uses of this soil. Drainage by diversion ditches makes this soil more suitable for corn and alfalfa. Stripcropping and diversion ditches are needed in places, especially on long slopes, to control erosion. (Capability unit IIIe–9a)

Farmington Series

The Farmington series consists of gently sloping to very steep silt loams that are underlain by limestone bedrock at a depth of 10 to 20 inches. These soils are somewhat excessively drained and, because they are shallow, do not retain much moisture, or are droughty. They formed in glacial material high in limestone and, to some extent, from the underlying bedrock. Water moves rapidly through the soil material and along the top of the bedrock.

The Farmington soils are mainly in the Champlain Valley. There are a few acres in the extreme western part of the foothills of the Green Mountains.

Most of these soils have too many rock outcrops to be used for farm crops.

Profile of a Farmington extremely rocky silt loam in woodland in the town of Weybridge, about 2½ miles northwest of Middlebury village:

O1—2 inches to ½ inch, litter of red oak and sugar maple leaves, with some basswood and elm leaves.
O2—½ inch to 0, litter of partly decomposed leaves and twigs.
A1—0 to 3 inches, dark-brown (7.5YR 3/2) silt loam; moderate, fine, granular structure; friable; abundant tree roots; 5 percent gravel and cobblestones; slightly acid; abrupt, smooth boundary.
B21—3 to 11 inches, yellowish-red (5YR 4/6) silt loam; weak, fine and very fine, subangular blocky structure; friable; abundant tree roots; 5 percent gravel and cobblestones; slightly acid; abrupt, smooth boundary.
B22—11 to 13 inches, brown (7.5YR 5/4) silt loam; weak, very fine, subangular blocky structure; friable; abundant roots; 5 percent gravel and cobblestones; slightly acid; abrupt, wavy boundary.
R—13 inches +, light-gray limestone, which effervesces violently with cold dilute hydrochloric acid.

Depth to bedrock varies between 10 and 20 inches. The thickness of the solum ranges from 9 to about 20 inches. In many places the B horizon is directly on the underlying rock. Coarse fragments in the soil are principally limestone, shale, slate, and quartzite. Content of coarse fragments in the surface layer is from 5 to 50 percent. In most places the A1, or Ap, horizon has a hue of 10YR or 7.5YR, a value of 3, and a chroma of 2 or 3. Texture of the A horizon is silt loam or loam.

The B horizon generally has a hue of 5YR to 10YR, a value of 4 or 5, and a chroma of 4 to 6. The B horizon is silt loam or loam. Where there is a C horizon, it has a hue of 2.5Y or 10YR, a value of 4, and a chroma of 2. The texture is, in most places, loam. The underlying bedrock is hard massive limestone or a softer shaly limestone. The reaction of the A horizon ranges from medium acid to neutral. The B horizon is slightly acid to neutral, and the C horizon is medium acid to neutral.

The Farmington soils are near the moderately well drained Vergennes soils, the poorly drained and somewhat poorly drained Covington soils, and the well drained Nellis soils. The Farmington soils differ from the similar Nassau and Lyman soils in having a B horizon that is slightly acid or neutral rather than very strongly acid to medium acid. They differ from the similar but shallow Glover soils in that their B horizon has a value higher than 3 in a hue of 10YR or has a hue of 7.5YR or 5YR.

Farmington extremely rocky silt loam, 5 to 20 percent slopes (FaC).—A profile of this soil is described as typical for the series. Included with this soil in mapping were a few pockets of deep soils, a few small areas having steeper slopes, and a few areas where the bedrock is quartzite and the soils are more acid than the one described. In many places there are outcrops of limestone bedrock about 10 to 30 feet apart; in other places the outcrops are about 30 to 100 feet apart.

The outcrops of bedrock, the shallowness of the soil to bedrock in most places, the many loose stones on the surface in some places, and the rough broken topography make it very difficult or impossible to use modern farm machinery on this soil. The same adverse features also severely limit nonfarm uses.

Most of this soil is woodland. In some places the soil is used for unimproved pasture, though it produces little forage for livestock. (Capability unit VIIs–9)

Farmington extremely rocky silt loam, 20 to 50 percent slopes (FaE).—Included with this soil in mapping were a few pockets of deep soils and a few areas where the bedrock is quartzite and the soils are more acid than the one described. In many places there are outcrops of limestone bedrock about 10 to 30 feet apart; in other places the outcrops of limestone bedrock are about 30 to 100 feet apart.

The outcrops of bedrock, the shallowness of the soil to bedrock, the many loose stones on the surface in some places, the rough broken topography, and the very steep slopes make it very difficult or impossible to use modern farm machinery on this soil. For the same reasons, there are limitations on nonfarm uses.

Most of this soil is woodland. In some places the soil is used for unimproved pasture, but it provides little forage for livestock. (Capability unit VIIs–9)

Farmington Series, Moderately Deep Variant

The Farmington series, moderately deep variant, consists of gently sloping to very steep, loamy soils that are underlain by limestone or shale at a depth of 20 to 40 inches. These soils are well drained. They formed in glacial material high in limestone. Water movement through the soil is moderate. The Farmington soils, moderately deep variant, occur in the Champlain Valley.

Profile of a Farmington stony silt loam, moderately deep variant, in pasture in the town of Orwell, approximately 2.5 miles south of junction of Vermont Route No. 73A and Old Stage Road, then approximately 0.2 miles west, then approximately 200 feet north of road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, subangular blocky structure; friable; plentiful grass roots; medium acid; abrupt, smooth boundary.
B21—8 to 18 inches, reddish-brown (5YR 4/4) silt loam; moderate, fine, angular blocky structure; firm; few grass roots; slightly acid; abrupt, smooth boundary.
B22—18 to 27 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, very fine to fine, subangular blocky structure; firm, friable in hand; no roots; neutral; abrupt, smooth boundary.
R—27 inches +, calcareous shale.

Depth to bedrock ranges from 20 to 40 inches. The thickness of the solum ranges from 20 to 32 inches. In many places the B horizon lies directly on the underlying rock. Coarse fragments in the soil are principally shale and slate. The content of coarse fragments in the upper half of the soil profile is generally less than 20 percent. It is 15 to 35 percent in the lower part of the soil profile. In most places the A1, or Ap, horizon has a hue of 10YR, a value of 3 or 4, and a chroma of 2 or 3. Texture of the A horizon is silt loam or loam.

The color of the B horizon is dark brown (7.5YR 4/4), brown (7.5YR 5/4), dark yellowish brown (10YR 4/4), and reddish brown (5YR 4/4). The texture of the B horizon is silt loam or loam. Where a C horizon occurs, it has a hue of 10YR or 2.5Y, a value of 4, and a chroma of 2 or 3. The texture of the C horizon is silt loam or loam. The underlying bedrock is generally shattered, calcareous or noncalcareous shale and slate. The reaction of the A

horizon ranges from medium acid to neutral. The B and C horizons are medium acid to neutral.

The Farmington soils, moderately deep variant, are near the moderately well drained Vergennes soils, the poorly drained and somewhat poorly drained Covington and Panton soils, and the well drained Nellis soils. The Farmington soils, moderately deep variant, differ from the similar Nassau, Lyman, and Farmington soils in that they are underlain by bedrock at a depth of more than 20 inches. In contrast to the Dutchess and Nellis soils, they are underlain by bedrock at a depth of less than 40 inches.

Farmington stony silt loam, moderately deep variant, 3 to 8 percent slopes (FdB).—This soil has the profile described as typical for the series. There are very few rock outcrops. In some areas the lower part of the soil is calcareous. Included with this soil in mapping were a few small areas that are more gently sloping, a few small areas having steeper slopes, a few places where bedrock is less than 20 inches from the surface, and a few areas where bedrock is noncalcareous shale or slate and the soil is more acid than the one described.

Except for limitations because of slope, this soil is suitable for many farm and nonfarm uses. Erosion is a moderate hazard if the soil is in row crops or is plowed and left bare. The shallow depth to bedrock in some places and occasional rock outcrops interfere with tillage and engineering practices. Because this soil is only moderately deep, it warms up quickly in spring and produces early hay and pasture. For this same reason it may dry out in summer.

This soil is used mainly for hay or pasture. Crops grown are alfalfa, Ladino clover, birdsfoot trefoil, timothy, bromegrass, and corn for silage. In places diversions are needed to intercept surface runoff from areas above, because this runoff can cause erosion. (Capability unit IIe–2)

Farmington stony silt loam, moderately deep variant, 8 to 15 percent slopes (FdC).—There are very few rock outcrops in areas of this soil. In some places, the lower part of the soil is calcareous. Included in mapping were a few small areas having less steep slopes, a few small areas having steeper slopes, a few places where bedrock is less than 20 inches from the surface, and a few areas where the bedrock is noncalcareous shale or slate and the soils are more acid than the one described.

Except for the moderate slopes, which limit some nonfarm uses, this soil is suitable for farming and other purposes. Because the soil is only moderately deep, it warms up quickly in the spring and produces early hay and pasture. For this same reason, it may dry out in the summer. There is a moderate to severe hazard of erosion where the soil is in row crops or plowed and left bare. The shallow depth to bedrock in some places and occasional rock outcrops interfere with tillage and engineering practices.

Most of this soil is used for hay or pasture. Crops grown are alfalfa, Ladino clover, birdsfoot trefoil, timothy, and bromegrass. Diversions may be needed to intercept surface runoff that comes from areas above and may cause erosion. (Capability unit IIIe–2)

Farmington stony silt loam, moderately deep variant, 15 to 25 percent slopes (FdD).—There are very few rock outcrops in areas of this soil. In some places the lower part of the soil is calcareous. Included in mapping were a few small areas that have less steep slopes, a few small areas having steeper slopes, a few places where bedrock is less than 20 inches from the surface, and a few areas where the bedrock is noncalcareous shale or slate and where the soils are more acid than the one described.

The shallow depth to bedrock in some places, occasional rock outcrops, and steep slopes make the use of modern farm machinery and the installation of engineering practices difficult. The steep slopes limit many nonfarm uses. Erosion is a severe to very severe hazard where this soil is in row crops or is plowed and left bare. Because the soil is only moderately deep, it warms up quickly in the spring and produces early hay and pasture. For this same reason it may dry out in the summer.

Most of the acreage is woodland or in pasture. The soil is also used for hay. Crops grown are alfalfa, Ladino clover, timothy, birdsfoot trefoil, and bromegrass. Reseeding in narrow strips running across the slope helps to control erosion. (Capability unit IVe–2)

Farmington stony silt loam, moderately deep variant, 25 to 50 percent slopes (FdE).—There are very few rock outcrops in areas of this soil. In some places the lower part of the soil is calcareous. Included with this soil in mapping were a few small areas where the bedrock is noncalcareous shale or slate and where the soils are more acid than the one described.

The very steep slopes make the use of modern farm machinery very difficult, and they severely limit nonfarm uses. Erosion is a severe hazard if the soil is plowed and left bare. This soil has a moderate moisture-holding capacity, but because of the moderate depth to bedrock, the moisture available to plants is limited during the summer months.

Most of this soil is woodland. (Capability unit VIIe–2)

Farmington-Nellis rocky complex, 5 to 12 percent slopes (FnB).—This complex consists of Farmington and Nellis soils that occur in such an intricate pattern that it was difficult to map them separately. The Farmington and Nellis soils in this unit are much like those described for the respective series, except that the Farmington soils have fewer bedrock outcrops. The Nellis soils are described under the Nellis series. Included in mapping were a few small nearly level areas, a few small areas having steeper slopes, and a few areas where the bedrock is quartzite and the soils with rock outcrops are more acid than the Farmington soil described.

Where this complex was mapped, there are outcrops of bedrock about 100 to 300 feet apart that interfere with farming and other uses of the soils. The depth to bedrock in some places and the rock outcrops interfere with tillage and engineering practices. Between the outcrops of bedrock, however, these soils are easy to till and can be used for many nonfarm purposes. Erosion is a moderate to severe hazard if the soils are in row crops or are plowed and left bare.

Most areas of these soils are used for hay or pasture. Crops grown are alfalfa, Ladino clover, birdsfoot

trefoil, timothy, and bromegrass. Diversions are needed in places to intercept surface water that runs off areas above and causes erosion. (Capability unit IIIe–2)

Farmington-Nellis rocky complex, 12 to 20 percent slopes (FnC).—Where the Farmington and Nellis soils occur in such an intricate pattern that they are difficult to separate in mapping, this unit was mapped. These soils are similar to those described for the respective series, but the Farmington soils have fewer bedrock outcrops. The Nellis soils are described under the Nellis series. Included in mapping are a few small areas that are not so steep, a few small areas of steeper slopes, and a few areas where the bedrock is quartzite and the Farmington soils between the rock outcrops are more acid than the one described for the Farmington series.

In areas of this complex, there are outcrops of bedrock about 100 to 300 feet apart that interfere with farming and other uses of the soils. The shallow depth to bedrock in some places, the rock outcrops, and the steep slopes make the use of modern farm machinery and the installation of engineering practices difficult. The outcrops and the steep slopes also severely limit many nonfarm uses. Erosion is a severe to very severe hazard if these soils are in row crops or are plowed and left bare.

Most of the acreage of these soils is wooded or in pasture. The soils are also used for hay. Crops that are grown are alfalfa, Ladino clover, timothy, birdsfoot trefoil, and bromegrass. Reseeding in narrow strips that run across the slope controls most erosion. (Capability unit IVe–2)

Farmington-Nellis rocky complex, 20 to 30 percent slopes (FnD).—Areas of Farmington and Nellis soils in an intricate pattern make up this complex. These soils are similar to those described for the two series, but the Farmington soils have fewer bedrock outcrops. The Nellis soils are described under the Nellis series. Included in mapping were areas that are rolling and a few areas where the bedrock is quartzite and the soil between the rock outcrops is more acid than the Farmington soil described.

Where this complex was mapped, there are outcrops of bedrock about 100 to 300 feet apart. Outcrops of bedrock interfere with farming and other uses of these soils. The very steep slopes and the outcrops of bedrock make it extremely difficult to use farm machinery and impose severe or very severe limitations on nonfarm uses. The hazard of erosion is very severe if the soils are plowed for reseeding and left bare. These soils have a moderate capacity to supply moisture to plants, but because they are shallow to bedrock in places and are very steep, they dry out quickly and are somewhat droughty.

Most of the acreage is woodland or in pasture. Birdsfoot trefoil and timothy are grown in some pastures. (Capability unit VIe–2)

Fresh Water Marsh

Fresh water marsh (Fw) consists of flat areas that are covered by shallow water most of the year. When the water is low in the summer and fall, some areas of Fresh water marsh are not under water for a few weeks, but in these places the water table is at or near the surface. In most places there is clay or silt under the shallow water. In a few places there are deposits of sandy material or of peat.

Areas of Fresh water marsh are mainly in the Champlain Valley, on the flood plains of slow-moving streams, such as the Lemon Fair River, Dead Creek, East Creek, and the lower reaches of Otter Creek. There are large areas of this land type along the shore of Lake Champlain. The few areas in the hill section of the county are on the shores of ponds.

Fresh water marsh supports a growth of water-tolerant plants, such as sedges, reeds, and marsh grasses. Trees have become established in only a very few places.

Fresh water marsh is not suited to farm crops or trees. It is a very good habitat for waterfowl and muskrats. Where woody plants are available for food and material to build lodges, it is a good habitat for beaver. Large areas of Fresh water marsh along Dead Creek are intensively managed for waterfowl by the Vermont Department of Fish and Game. (Capability unit VIIIw–0)

Glover Series

The Glover series consists of gently sloping to very steep, loamy soils that are underlain by schistose or limestone bedrock at a depth of 10 to 20 inches. In most places the bedrock is schistose rock. These soils are somewhat excessively drained to excessively drained, and because they are shallow, they do not retain as much moisture as deeper soils. They formed in glacial material derived from schistose rocks and some limestone. Water moves readily through the soil and along the top of the bedrock. The Glover soils are in the hills to the east of the main range of the Green Mountains, in the towns of Granville and Hancock.

Most areas of the Glover soils have too many rock outcrops or loose surface stones to be used for farm crops. They are used mainly as woodland. A few open areas are in pasture or are idle.

In Addison County, Glover soils were mapped only in undifferentiated units with Calais soils. The Calais soils and these undifferentiated units are described under the Calais series.

Profile of a Glover extremely rocky loam in woodland in the town of Granville, approximately 1 mile southwest of Moss Glen Falls:

O1—1 to ½ inch, a litter of hardwood leaves and twigs.
O2—½ inch to 0, partly decomposed litter containing many tree roots.
A1—0 to 4 inches, very dark grayish-brown (2.5Y 3/2) loam; weak, very fine, granular structure; very friable; very many tree roots; 5 percent channery fragments and pebbles of schistose and quartzose rocks; medium acid; abrupt, smooth boundary.
B21—4 to 8 inches, olive-brown (2.5Y 4/4) loam; weak, fine and very fine, granular structure; very friable; many tree roots; 20 percent channery fragments and pebbles of schistose and quartzose

rocks and a few pebbles of rotten limestone; medium acid; abrupt, wavy boundary.

B22—8 to 13 inches, dark grayish-brown (2.5Y 4/2) loam; weak, fine and very fine, granular structure; very friable; many tree roots; 20 percent channery fragments and pebbles of schistose and quartzose rocks and a few pebbles of rotten limestone; slightly acid; abrupt, wavy boundary.

C—13 to 15 inches, olive-gray (5Y 4/2) loam; weak, thin, platy structure; friable; common tree roots; 30 percent channery fragments and pebbles of schistose and quartzose rocks and a few pebbles of rotten limestone; slightly acid; abrupt, irregular boundary.

R—15 inches +, schistose bedrock.

Depth to bedrock ranges from 10 to 20 inches. The thickness of the solum ranges from 10 to 20 inches. In places there is a C horizon; in other places the B horizon lies directly on the bedrock. The content of channery fragments, pebbles, and stones ranges from 5 to 35 percent in the A horizon, from 15 to 35 percent in the B horizon, and from 30 to 35 percent in the C horizon. The color of the A horizon, in most places, is 10YR 2/2, 10YR 3/2, or 2.5Y 3/2. The texture is loam or silt loam.

The B horizon generally has a hue of 2.5Y, a value of 3 or 4, and a chroma of 2 to 4. The texture of the B horizon is loam or silt loam. The C horizon has a hue of 5Y, a value of 3 or 4, and a chroma of 2. Its texture is loam or silt loam. Reaction in the A horizon ranges from very strongly acid to medium acid; in the B horizon, from medium acid to slightly acid; and in the C horizon, from medium acid to slightly acid.

The Glover soils are next to the well drained Calais soils, the moderately well drained Buckland soils, and the poorly drained Cabot soils. The Glover soils are similar to the Nassau soils, but in the Nassau soils the B horizon has a hue of 10YR or 7.5YR and the bedrock is slate rather than schist. The Glover soils are also similar to the Lyman soils, but the Lyman soils have a B2ir horizon with a color of 5YR or 7.5YR 4/4.

Hadley Series

The soils of the Hadley series are deep and well drained and retain moisture well. They are nearly level or very gently sloping, loamy soils on the flood plains of streams. They are high enough above the streams so that they are under floodwater for only a few days at a time. Flooding usually occurs in the spring, but in some years there is no flooding. Some areas of the Hadley soils are above normal overflow and are very seldom flooded. The Hadley soils are mainly along Otter Creek, the Middlebury River, the New Haven River, the White River, and the tributaries to these rivers.

The Hadley soils are used mainly for hay, corn for silage, and pasture.

Profile of Hadley very fine sandy loam, frequently flooded, in a cultivated field about 3 miles south of Vergennes:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) very fine sandy loam; weak, fine, granular structure; friable; plentiful grass roots; neutral; abrupt, smooth boundary.

C1—10 to 23 inches, dark-brown (10YR 4/3) very fine sandy loam; structureless (massive); friable; abundant grass roots; neutral; clear, smooth boundary.

C2—23 to 36 inches +, dark yellowish-brown (10YR 4/4) very fine sandy loam; structureless (massive); friable; few grass roots; neutral.

The A1, or Ap horizon in cultivated areas, has a hue of 10YR, a value of 3, and a chroma of 2 or 3. The texture is very fine sandy loam or silt loam. The C horizon is 2.5Y or 10YR 4/4 or 4/3. Its texture is fine sandy loam or silt loam. In some areas mottles are 5Y 5/3, are irregular in shape, and apparently are not related to impeded drainage.

The Hadley soils are near the moderately well drained Winooski soils and the poorly drained Limerick soils. No other well-drained soils developed on alluvium have been recognized in Addison County.

Hadley very fine sandy loam (Hf).—This nearly level or very gently sloping soil is seldom flooded. Included in mapping were a few small areas of the moderately well drained Winooski soils.

This soil is easy to till. The hazard of erosion is slight. The capacity to supply moisture to plants is high.

This soil is suitable for all farm crops, but corn for silage is the crop commonly grown. Timothy, bromegrass, and red clover are also grown, in a short rotation with corn. The soil is very responsive to good management. It is also well suited to many nonfarm uses. (Capability unit I–1)

Hadley very fine sandy loam, frequently flooded (Hh).—This nearly level or very gently sloping soil has the profile described as typical for the series. Included in mapping were small areas of the moderately well drained Winooski soils, of soils that are more sandy than this one, of Hadley soils that have been covered with 5 to 10 inches of sandy material during floods, and of Hadley very fine sandy loam. Also included in mapping, especially along the smaller, more rapidly flowing streams, were small areas of soils that are similar to the one described, except that they have a layer of sand or gravel below a depth of 1½ to 3 feet. In a few places these included areas are gravelly to the surface.

A very thin layer, seldom over ½ inch thick, of very fine sand and silt is deposited when this soil is flooded. Frequency of flooding varies from place to place. Some places are flooded every year, usually in the spring. In other places, flooding occurs only every 2 to 4 years. Flooding generally does not damage crops during the growing season. The hazard of flooding limits many nonfarm uses.

This soil is easy to till. If the soil is plowed in the fall there is commonly a hazard of erosion from fast-moving floodwater. In some areas streambanks are eroded. The capacity to supply moisture available to plants is high.

This soil is suitable for most farm crops. Corn for silage, Ladino clover, timothy, and bromegrass are grown. Alfalfa is also grown, but in some years it is killed by floodwater standing in the fields for a long time. Although this soil is subject to flooding it is one of the better soils in the county if it is managed well. It is very responsive to good management. Most of the large areas are used for corn for silage in a rotation with hay. In some places corn is grown every year. (Capability unit IIw–1)

Limerick Series

The Limerick series consists of deep, poorly drained, loamy soils that are nearly level or are in

broad depressions on the flood plains. They formed on silty and very fine sandy deposits on the flood plains of streams. Most areas of the Limerick soils are low enough in relation to the level of the water in the streams that they are under water for periods of 1 to 2 weeks in the spring and in the fall. Other areas are flooded only for a period of a few days. In addition to being subject to flooding, these soils have a high water table that keeps them wet from the middle of the fall until late in spring. These soils lie along Otter Creek, the Middlebury River, the New Haven River, the White River, and along the tributaries to these streams.

The Limerick soils are used mainly for hay and pasture. The wetter areas are idle or wooded.

Profile of a Limerick silt loam in a hayfield in the town of Leicester, about ½ mile south of Leicester Junction and about 100 yards west of Otter Creek:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; coarse, very fine and fine, granular structure; friable; abundant grass roots; neutral; abrupt, smooth boundary.

C1g—5 to 20 inches, dark-gray (5Y 4/1) silt loam; common, fine and medium, prominent, dark reddish-brown (5YR 3/4) mottles; structureless (massive); friable; abundant grass roots; neutral; clear, smooth boundary.

C2g—20 to 36 inches +, dark-gray (5Y 4/1) silt loam; few, fine, faint, brown (10YR 5/3) mottles; structureless (massive); friable to firm; few grass roots; neutral; abrupt, smooth boundary.

The Limerick soils are mottled just below the A horizon and, in some places, in the A horizon. The A horizon has a hue of 10YR, a value of 2 or 3, and a chroma of 2. In places the texture is silt loam, but in some places it is very fine sandy loam. The C horizon has a hue of 2.5Y or 5Y, a value of 3 to 5, and a chroma of 1 or 2. The texture is silt loam or very fine sandy loam. The reaction of the profile ranges from medium acid to neutral.

The Limerick soils are near the well drained Hadley soils, the moderately well drained Winooski soils, and the very wet Muck and Peat. There are no other somewhat poorly drained or poorly drained soils on alluvium in Addison County.

Limerick silt loam (Le).—This soil is level or nearly level and, in places, is in slight depressions. Its profile is described as typical for the series. Included in mapping were small areas of the moderately well drained Winooski soils, small areas of Limerick silt loam, very wet, and small areas of soils that are more sandy. Along the Otter Creek are similar soils having a layer of disintegrated peat below a depth of 1½ to 2½ feet. Also included in mapping, especially along the smaller, more rapidly flowing streams, are small areas of soils that are similar to the one described but have a layer of sand or gravel below a depth of 1½ to 3 feet. In a few places these included areas are gravelly or sandy to the surface.

In most places spring floods delay tillage of this soil until late in the spring and also limit nonfarm uses. Drainage is necessary for the best use of this soil for most purposes. Erosion from fast-moving floodwater is a hazard, especially along the smaller, faster moving streams, if this soil is plowed and left bare over winter. The available moisture capacity is high. The soil has good natural fertility but tends to stay wet late in the spring.

Most of this soil is in hay or pasture, to which it is well suited. Corn is not generally grown unless the soil has been drained. In drained areas, Ladino clover, birdsfoot trefoil, and timothy are grown. Surface drainage by ditches and land smoothing both are beneficial. Reed canarygrass and Ladino clover grow well without extensive drainage. (Capability unit IIIw–1)

Limerick silt loam, very wet (Lf).—This nearly level soil is similar to the one described for the series, but the water table is seldom below a depth of 2 feet during the year, the soil is wet during most of the growing season, and it is covered with floodwater more often and for longer periods. Included with this soil in mapping were small areas of soils that have an organic surface layer, and some areas along the Otter Creek where a layer of disintegrated peat is below a depth of 1 to 4 feet. Also included in mapping, especially along the smaller, more rapidly flowing streams, are small areas of soils that are similar to the one described but have a layer of sand or gravel below a depth of 1½ to 3 feet. In a few places these included areas are gravelly or sandy at the surface.

This soil is flooded every year in nearly every area. It is flooded usually in the spring and fall and often during the growing season. Wetness limits the use of this soil for many purposes. This soil is very difficult to drain because it is at about the same level as the water in nearby streams. There is no hazard of erosion, but a very thin layer of very fine sand and silt is deposited where the soil is flooded.

This soil is used mainly as woodland. Because it is so wet and under water for long periods, it is not used for hay or pasture except along the Otter Creek, where some areas are in reed canarygrass. In some places the soil is used for unmanaged pasture of native grass, but it is best used for wildlife or as woodland. (Capability unit VIIw–1)

Livingston Series

The Livingston series consists of very poorly drained, very wet clays that formed in deep water-laid deposits of clay that contains much lime. These soils are nearly level in most places, but a few areas are very gently sloping. Water moves down very slowly through these soils. The Livingston soils are wet from late in summer or early in fall to late in spring, and they seldom become dry during the growing season. The Livingston soils are located throughout the Champlain Valley part of Addison County. They are very sticky and plastic when wet and are very difficult to till or to dig.

These soils are used mainly as woodland. Some areas are in pasture, and some are idle. In a very few places the soils have been drained and hay is grown.

Profile of a Livingston clay in an idle field in the town of Addison:

A1—0 to 7 inches, black (10YR 2/1) clay high in organic-matter content; strong, fine, granular structure and strong, very fine, subangular blocky structure; friable, sticky, plastic; abundant fibrous roots; strongly acid; abrupt, wavy boundary.

B21g—7 to 20 inches, dark-gray (N 4/0) clay; many,

coarse, prominent, olive-brown (2.5Y 4/4) mottles with brownish-yellow (10YR 6/8) centers; strong, coarse, prismatic structure breaking to moderate, very fine to medium, angular blocky structure; firm in place, plastic, sticky; plentiful grass roots; slickensides; some very dark-gray (N 3/0) and dark-gray (N 4/0) clay films on the faces of the coarse prisms; strongly acid; clear, wavy boundary.

B22g—20 to 28 inches, dark-gray (5Y 4/1) clay; many, fine, distinct, olive-brown (2.5Y 4/4) mottles with brown to dark-brown (7.5YR 4/4) and dark yellowish-brown (10YR 4/4) centers; moderate, coarse, prismatic structure breaking to weak, very fine to medium, angular blocky structure; firm in place and in hand, plastic, sticky; few grass roots; pronounced slickensides coated with dark gray (N 4/0); clay films along root channels; some white (10YR 8/1), noncalcareous, irregular streaks; slightly acid; clear, smooth boundary.

B23g—28 to 36 inches, dark-gray (5Y 4/1) clay; coarse, distinct olive-brown (2.5Y 4/4) mottles; very weak, very fine, subangular blocky structure; firm in place and in hand, plastic, sticky; few grass roots; few slickensides; neutral; clear, smooth boundary.

C1g—36 to 46 inches, dark grayish-brown (2.5Y 4/2) clay; many coarse, faint, olive-brown (2.5Y 4/4) mottles; weak to moderate, very fine, subangular blocky structure; friable to firm, very plastic; very few grass roots; few manganese patches; mildly alkaline; abrupt, wavy boundary.

C2g—46 to 62 inches, dark-gray (10YR 4/1) clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate to strong, fine, angular blocky structure and some subangular blocky structure; soil mass friable, peds firm, very plastic, very sticky; no roots; manganese patches; light-gray to gray (10YR 6/1) lime nodules (5 to 15 millimeters in diameter) and streaks; slight effervescence with cold dilute hydrochloric acid.

C3g—62 to 78 inches, dark grayish-brown (2.5Y 4/2) clay; few, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; structure not determined; firm in place, friable in hand when moist, very plastic and very sticky when wet; no roots; light brownish-gray (10YR 6/3) lime seams and concretions; few, fine manganese patches; slight effervescence with cold dilute hydrochloric acid along seams and concretions, mildly alkaline; arbitrary boundary; bucket auger boring.

C4g—78 to 86 inches, dark grayish-brown (2.5Y 4/2) clay; few, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; structure not determined; firm in place, friable in hand when moist, very plastic and very sticky when wet; no roots; dark-gray (N 4/0) ped coatings; few, fine manganese patches; slight effervescence with cold dilute hydrochloric acid along seams and concretions; mildly alkaline; arbitrary boundary; bucket auger boring.

C5g—86 to 94 inches, dark grayish-brown (10YR 4/2) clay; structure not determined; firm when moist, very plastic and very sticky when wet; no roots; peds coated with dark gray (N 4/0) and gray (N 5/0); few white streaks, both calcareous and noncalcareous; strong effervescence with cold dilute hydrochloric acid, only along lime streaks; mildly alkaline; bucket auger boring.

The depth to calcareous material ranges from about 30 to 48 inches. The color of the A horizon is black; it has a hue of 5YR, 10YR, and 5Y, a value of 2, and a chroma of 1. In most places the texture is clay or clay loam. The matrix colors of the B horizon, in most places, are neutral or have a hue of 10YR or 5Y, a value of 3 or 4, and a chroma of 0 or 1. The B horizon has distinct or prominent mottles having a chroma of 4 or higher. The C horizon generally is dark gray with a hue of 10YR to 5Y, a value of 4, and a chroma of 0 or 1. Mottles are faint to prominent. Reaction of the A and B horizons ranges from strongly acid to neutral. The C horizon is neutral to moderately alkaline.

The Livingston soils are near the moderately well drained Vergennes soils, the poorly drained and somewhat poorly drained Covington and Panton soils, and the very wet organic soils of the swamps. The Livingston soils are similar to the Covington and Panton soils, but the Covington and Panton soils do not have a black surface horizon. They are also similar to the Canandaigua soils, but the Canandaigua soils have a solum of silt loam.

Livingston clay (Lh).—This nearly level soil has the profile described as typical for the series. Included in mapping were a few small areas of very poorly drained soils that are silty rather than clayey, a few small areas having very gentle slopes, and a few areas where this soil has a mucky surface layer.

Drainage is necessary for the best use of this soil for farming and for nonfarming purposes. Drainage is improved by diversion ditches that intercept water from areas above, by mains and laterals, by surface field ditches, or by a combination of these practices. In some places this soil is very difficult to drain because suitable outlets are lacking. Even if it is drained, the soil is wet and hard to till. The hazard of erosion is slight where the soil is plowed and left bare.

Most of this soil is in pasture or trees. Until the soil is drained, it is too wet for most farm crops, but reed canarygrass can be grown with little or no drainage. After drainage, reed canarygrass is grown, and birdsfoot trefoil with timothy is grown in some places. Ice sheets in the early spring may kill the birdsfoot trefoil plants. (Capability unit IVw–5a)

Livingston clay, flooded (Lk).—This nearly level soil is covered with floodwater every year, usually in the spring and fall. Included with this soil in mapping were small areas of soils that are not so wet.

This soil is too wet for most crops and for most nonfarm uses. It is very difficult to drain because it is at about the same level as the water in nearby streams.

Most of this soil is in trees. It is not used for hay because it is so wet. In some places it is used for unmanaged pasture of native grass, but it is best used for wildlife or as woodland. (Capability unit VIIw–1)

Lyman Series

The Lyman series consists of gently sloping to very steep, loamy soils that are underlain by schist or phyllite bedrock at a depth of 10 to 20 inches. These soils are somewhat excessively drained and excessively drained, and because they are shallow to bedrock, they do not retain as much moisture as soils deeper to bedrock. Lyman soils formed from glacial material high in schist or phyllite. Water moves readily through the soil and along the top of the bedrock. The Lyman soils are located in the Green Mountains and foothills to the east of the Champlain Valley.

Most of the acreage has too many rock outcrops to be used for farm crops or for nonfarm purposes. The Lyman soils are used mainly as woodland. A few open areas are in hay or pasture or are idle.

In Addison County, the Lyman soils were not mapped separately but were mapped only in complexes with the Berkshire soils. Soils of the two series are in-

termingled in such an intricate pattern that they could not be mapped separately at the scale used in mapping. The Lyman soils are dominant in most of these areas. The Berkshire soils are described under the Berkshire series.

Profile of a Lyman extremely rocky loam in woodland in the town of Goshen:

O1—1½ inches to ½ inch, undecomposed litter of sugar maple, birch, and aspen leaves.
O2—½ inch to 0, partly decomposed leaves.
A1—0 to 5 inches, black (5YR 2/1) loam; moderate, medium, granular structure; friable; abundant tree roots; 10 percent channery fragments and flagstones; strongly acid; abrupt, smooth boundary.
A2—5 to 6 inches, a discontinuous horizon of dark reddish-gray (5YR 4/2) loam; moderate, medium, granular structure; friable; abundant tree roots; 15 percent channery fragments and flagstones; very strongly acid; abrupt, broken boundary.
B21ir—6 to 9 inches, reddish-brown (5YR 4/4) loam; moderate, medium, granular structure; friable; plentiful tree roots; 25 percent channery fragments and flagstones; very strongly acid; clear, wavy boundary.
B22—9 to 12 inches, brown to dark-brown (7.5YR 4/4) loam; moderate, medium, granular structure; very friable; plentiful tree roots; 25 percent channery fragments and flagstones; very strongly acid; abrupt, smooth boundary.
R—12 inches +, gray schistose bedrock.

The depth to schist or phyllite bedrock ranges from 10 to 20 inches. Content of coarse fragments, which are mainly schistose channery fragments and flagstones, ranges from 5 to 35 percent. Surface stoniness ranges from areas essentially cleared of all stones to areas where stones cover 10 to 15 percent of the surface. The color of the A1 horizon generally is 5YR or 10YR 2/1. The Ap horizon in cultivated areas normally is 10YR 3/2 or 3/3. The color of the A2 horizon is 5YR 4/2 or N 4/0. The texture of the A horizon is generally loam, but there are areas of fine sandy loam.

The color of the upper B horizon in most places has a hue of 5YR or 7.5YR, a value of 4, and a chroma of 4. Generally, the lower B horizon has a hue of 10YR or 7.5YR, a value of 3 or 4, and a chroma of 4. The texture of the B horizon is loam or fine sandy loam. The C horizon, which occurs in a few places, has a color of 2.5Y 5/4 or 5Y 4/3, and its texture is loam or fine sandy loam. The reaction of the solum is very strongly acid or strongly acid. Where there is a C horizon, its reaction is strongly acid or medium acid.

The Lyman soils are near the well drained Berkshire and Marlow soils, the moderately well drained Peru soils, and the poorly drained and somewhat poorly drained Cabot soils. The Lyman soils are somewhat similar to the Nassau soils, but the Nassau soils are underlain by slate rather than schist bedrock and lack the distinct A2 and B2ir horizons of the Lyman soils. The Lyman soils are also similar to the Glover soils, but the Glover soils do not have a B2ir horizon and lack a distinct A2 horizon. The somewhat similar Farmington soils have a B horizon that is slightly acid or neutral over limestone bedrock.

Lyman-Berkshire rocky complex, 5 to 12 percent slopes (LmB).—The Lyman soils of this complex have a profile similar to that described as typical of the Lyman series, except that the surface layer has been mixed to form a dark-brown plowed layer 5 to 8 inches thick. Also, there are fewer rock outcrops. The Berkshire soils have a profile similar to the profile described as typical for the Berkshire series, except that the plowed surface layer is similar to the one in the Lyman soils and has been cleared of most surface stones. Included in mapping were a few small nearly level areas and a few small areas having steeper slopes.

Where this complex was mapped, there are outcrops of bedrock about 100 to 300 feet apart that interfere with farming and other uses of the soils. The shallow depth to bedrock in some places and the rock outcrops interfere with tillage and engineering practices. Between the outcrops these soils are easy to till and can be used for many nonfarm purposes. There is a moderate to severe hazard of erosion where the soils are in row crops or are plowed and left bare.

Most of the acreage of this complex is used for hay or pasture. Crops grown on the soils are Ladino clover, timothy, and bromegrass. Diversion terraces are needed in some places to intercept surface runoff from areas above, for this runoff can cause erosion. (Capability unit IIIe–2)

Lyman-Berkshire rocky complex, 12 to 20 percent slopes (LmC).—The Lyman soils of this complex have a profile similar to the profile described as typical for the Lyman series, but their surface layer has been mixed to form a dark-brown plowed layer 5 to 8 inches thick and there are fewer rock outcrops. The Berkshire soils have a profile similar to that described as typical for the Berkshire series, except that their plowed layer is similar to the one in the Lyman soils and has been cleared of most stones. Included in mapping were a few small areas that are less steep than this complex and a few small areas of steeper slopes.

Where this complex was mapped, there are outcrops of bedrock about 100 to 300 feet apart that interfere with farming and other uses of the soils. The shallow depth to bedrock in some places, the rock outcrops, and the steep slopes make the use of the modern farm machinery and the installation of engineering practices difficult. The outcrops and steep slopes also limit nonfarm uses. Erosion is a severe hazard if the soils are in row crops or are plowed and left bare.

Most of the acreage of these soils is in trees or pasture, or is used for hay. Crops that are grown are Ladino clover, timothy, and bromegrass. Reseeding in narrow strips that run across the slope controls erosion in most places. (Capability unit IVe–2)

Lyman-Berkshire very rocky complex, 5 to 20 percent slopes (LxC).—The Lyman soils of this complex have a profile similar to the one described as typical for the Lyman series. The Berkshire soils have a profile similar to that described as typical for the Berkshire series. Included in mapping were a few small areas having steeper slopes.

Where this complex was mapped, there are outcrops of bedrock about 10 to 30 feet apart in some places; in other places the outcrops are about 30 to 100 feet apart. The outcrops of bedrock, the shallowness of the soils to bedrock in many places, the many loose stones on the surface, and the rough broken topography make it very difficult or impossible to use modern farm machinery on these soils and severely limit most nonfarm uses.

Most areas of this complex are used as woodland. In some places the soils are used for unimproved pasture,

but little forage is produced for livestock. (Capability unit VIIs–9)

Lyman-Berkshire very rocky complex, 20 to 50 percent slopes (LxE).—The Lyman soil of this complex has the profile described as typical for the series. The Berkshire soils have a profile similar to that described as typical for the Berkshire series.

Where this complex was mapped, there are outcrops of bedrock about 10 to about 30 feet apart in some places; in other places the outcrops are about 30 to about 100 feet apart. The outcrops of bedrock, the shallowness of the soils to bedrock in many places, the many loose stones on the surface, the rough broken topography, and the very steep slopes make it very difficult or impossible to use modern farm machinery and severely limit most nonfarm uses.

Most of this complex is in trees. In some places the soils are used for unimproved pasture, but this provides little forage for livestock. (Capability unit VIIs–9)

Marlow Series

The Marlow series consists of well-drained, loamy soils that retain moisture well. In most places these soils are on smooth ridges that range from gently sloping to very steep. The soils have a hard layer that occurs at a depth of 15 to 30 inches. Water moves slowly through this hard layer but flows readily on top of it. These soils formed in glacial till deposits derived from schistose rocks. These soils are located in the Green Mountains and in the foothills.

Originally, these soils were nearly all too stony to use for farm crops, but in some places they have been cleared of most stones and can be used for farming. The Marlow soils from which most stones have been removed are used principally for hay or pasture. Where the stones have not been removed, these soils are used mainly as woodland and pasture or are idle.

In Addison County, Marlow soils were mapped only in undifferentiated units with Berkshire soils. These undifferentiated units and the Berkshire soils are described under the Berkshire series.

Profile of a Marlow extremely stony loam in a plantation of Norway spruce in South Lincoln:

A1—0 to 5 inches, dark-brown (7.5YR 3/2) loam; weak, fine, granular structure; friable; abundant very fine tree roots; 5 percent channery fragments and gravel; very strongly acid; abrupt, smooth boundary.

B21ir—5 to 10 inches, yellowish-red (5YR 4/6) loam containing pockets, ½ inch to 4 inches wide, of a gray A2 horizon; structureless (massive); friable; few very fine tree roots; 25 percent channery fragments and gravel; very strongly acid; abrupt, smooth boundary.

B22—10 to 22 inches, yellowish-brown (10YR 5/6) loam; structureless (massive); friable; few very fine tree roots; 25 percent channery fragments and gravel; strongly acid; abrupt, smooth boundary.

Cx—22 to 36 inches +, olive-brown (2.5Y 4/4) loam; weak, thick, platy structure; very firm in place; no roots; 30 percent channery fragments and gravel; medium acid.

The depth to the fragipan ranges from 15 to 30 inches. Coarse fragments, consisting mainly of schistose and quartzose gravel, cobblestones, and stones, are common in all horizons. The content of coarse fragments in the A1, A2, and Ap horizons ranges from 5 to 15 percent. In the B21ir horizon the content of coarse fragments ranges from 5 to 25 percent; in the lower B horizon it ranges from 10 to 50 percent. In the Cx horizon the content of coarse fragments ranges from 20 to 50 percent.

In most places the A1 horizon has a hue of 5YR, 7.5YR, or 10YR, a value of 3, and a chroma of 2 or 3. In most places, the A2 horizon has a hue of 10YR, a value of 5, 6, or 7, and a chroma of 1 or 2. The Ap horizon in cultivated areas has a hue of 10YR, a value of 3 or 4, and and a chroma of 2 or 3. The texture of the A horizon is loam in most places, but in some places it is fine sandy loam. In places there is a B2h horizon, which has a color of 2.5YR 3/2 or 7.5YR 4/2. The B2ir horizon is 2.5YR 4/8, 5YR 4/6, or 10YR 5/6. The lower B horizon, in most places, has a color of 2.5YR, 7.5YR, or 10YR 5/6.

The texture of the B horizon is loam, fine sandy loam, or sandy loam. Generally, the Cx horizon has a hue of 2.5Y, a value of 4 or 5, and a chroma of 4 or 6. The texture of the Cx horizon is loam, fine sandy loam, or sandy loam. The Cx horizon is firm or very firm. Reaction of the A horizon ranges from extremely acid to very strongly acid; that of the B and Cx horizons ranges from very strongly acid to medium acid.

The Marlow soils are near the well drained Berkshire soils, the moderately well drained Peru soils, and the poorly drained and somewhat poorly drained Cabot soils. They are also near the Lyman soils, which are shallow to bedrock. The Marlow soils are somewhat similar to the Peru soils, but the Peru soils are moderately well drained and have distinct or prominent mottles in the lower B horizon or in the fragipan.

Massena Series

The Massena series consists of nearly level or gently sloping, poorly drained and somewhat poorly drained soils that formed in glacial material derived mainly depth of 1 to 2 feet. Water moves very slowly through from limestone. These soils have a hard layer at a the hard layer, but flows readily downhill on top of it. The Massena soils are wet from late in fall to early in spring, and they remain moist throughout the growing season. They occur mainly along the eastern edge of the Champlain Valley.

Most areas of these soils are too stony to use for farm crops, but in some places the soils have been cleared of stones and can be used for farming. The Massena soils are mainly used for pasture or as woodland, but some areas are in hay or are idle.

Profile of a Massena extremely stony silt loam in woodland in the town of Leicester:

A1—0 to 7 inches, very dark gray (10YR 3/1) silt loam; strong, medium and coarse, granular structure; friable; abundant grass roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

B2—7 to 12 inches, dark yellowish-brown (10YR 4/4) loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); structureless (massive); friable; plentiful grass roots; 5 to 10 percent coarse fragments of quartzite and limestone; neutral; abrupt, smooth boundary.

C—12 to 40 inches +, olive-gray (5Y 5/2) fine sandy loam; many, coarse, distinct mottles of light olive brown (2.5Y 5/4) and common, coarse, prominent mottles of yellowish brown (10YR 5/8); structureless (massive); very firm in place, firm when removed; no roots; 5 to 10 percent coarse fragments of quartzite and limestone; neutral to depth of 28 inches, calcareous below.

The thickness of the solum ranges from 12 to 24 inches. Content of coarse fragments in the Ap horizon ranges from 5 to 15 percent. In the A1, B, and C horizon it ranges between 5 and 30 percent. Depth to free carbonates is 16 to about 30 inches. Mottles occur directly under the A1, or the Ap horizon in cultivated areas, and continue down through the profile. The color of the A horizon has a hue of 10YR, a value of 2 or 3, and a chroma of 1, 2 or 3. The texture of the A horizon is silt loam or loam.

Matrix colors of the B horizon are 10YR 4/4, 2.5Y 5/4, or 5Y 5/3. Mottles are faint to prominent. The texture of the B horizon is loam or fine sandy loam. Matrix colors of the C horizon have a hue of 2.5Y or 5Y, a value of 5, and a chroma of 1 to 4. Mottles are faint to prominent. The texture of the C horizon is loam or fine sandy loam. The C horizon is firm or very firm. Reaction of the A horizon is slightly acid or neutral. The B and C horizons are neutral or calcareous.

The Massena soils are near the moderately well drained Amenia soils and the well drained Nellis soils. The Massena soils are similar to the Cabot soils, but the Cabot soils have a well-developed fragipan and did not develop in calcareous glacial till.

Massena stony silt loam, 0 to 3 percent slopes (MaA).—The profile of this soil is similar to that described as typical for the series, except that most stones have been removed from the surface and in most places the surface layer has been plowed. Included with this soil in mapping were a few small areas of very poorly drained soils, areas of Massena soils that are slightly more sloping, and areas of soils having a substratum that is not hard.

The seasonal high water table delays tillage and interferes with most nonfarm uses. If the soil is drained, it is easy to plow. Drainage is also needed for many nonfarm uses. There is little or no hazard of erosion.

Most areas of this soil are used for hay and pasture. Crops commonly grown for hay or pasture are Ladino clover, alsike clover, birdsfoot trefoil, redtop, timothy, and, in some places, reed canarygrass. Many areas need diversions to intercept runoff from areas above. Open ditches and tile drainage are used in some areas. (Capability unit IIIw–3)

Massena extremely stony silt loam, 0 to 8 percent slopes (MnB).—This soil has the profile described as typical for the series. Included in mapping were small areas of wetter soils, areas of Massena soils that are slightly steeper, and areas of soils that have a substratum that is not hard.

Because of the many surface stones, this soil is not suited to the use of modern farm machinery. The stones and the seasonal high water table also limit many nonfarm uses. If stones are removed, drainage is necessary for the best growth of most crops and for many other uses.

Most of this soil is used for unimproved pasture, though only a little forage is produced for livestock. (Capability unit VIIs–11)

Melrose Series

The soils of the Melrose series are well drained and retain moisture well. They are fine sandy loam to a depth of 18 to 30 inches. Under the loamy material there is clay or silty clay. The sandy and clayey material was deposited by water. These soils are nearly level or gently sloping in most places, but there are some steeper areas. The Melrose soils are mainly in the town of Ferrisburg but are scattered throughout the Champlain Valley.

Most areas of the Melrose soils are used for crops and pasture. Some areas are wooded.

Profile of a Melrose fine sandy loam in a cultivated field in the town of Ferrisburg, about 2 miles southwest of North Ferrisburg:

Ap—0 to 8 inches, dark-brown (10YR 3/3) fine sandy loam; structureless (single grain); very friable; abundant grass roots; medium acid; abrupt, smooth boundary.

B2—8 to 24 inches, yellowish-brown (10YR 5/8) fine sandy loam; structureless (single grain); very friable; abundant grass roots; medium acid; clear, smooth boundary.

C1—24 to 30 inches, light olive-brown (2.5Y 5/4) loamy fine sand; structureless (single grain); very friable; plentiful grass roots; neutral; abrupt, smooth boundary.

IIC2—30 to 40 inches +, dark grayish-brown (10YR 4/2) clay; structureless (massive); firm; no roots; slightly acid.

The depth to fine-textured material ranges from 18 to 30 inches. The color of the A horizon is 10YR 2/2 or 10YR 3/3. The B horizon, in most places, has a hue of 10YR, a value of 4 or 5, and a chroma of 4, 6, or 8. Where the C horizon occurs, its color is 2.5Y 5/4. The texture is loamy fine sand or fine sandy loam. In most places the contrasting IIC horizon has a hue of 10YR, a value of 4, and a chroma of 2 or 3. The texture of the IIC horizon is clay, silty clay, or clay loam. In some places there is a thin layer of sand in the fine-textured material. The IIC horizon is firm or very firm. The reaction of the sandy upper solum ranges from very strongly acid to medium acid. The reaction of the sandy C horizon varies from medium acid to neutral. The clayey IIC horizon ranges from medium acid to neutral.

The Melrose soils are near the moderately well drained Elmwood and Vergennes soils. They are somewhat similar to the Adams soils, but the Adams soils lack the fine-textured substratum and are coarser textured in the solum.

Melrose fine sandy loam, 0 to 3 percent slopes (MrA).—Included with this soil in mapping were small areas of the moderately well drained Elmwood soils and areas where a layer of loamy sand or sand overlies the clayey material.

This soil is easy to plow and can be worked early in the spring. There is little or no hazard of erosion where the soil is plowed and left bare or used for row crops.

This soil is used mainly for corn for silage or grain, oats harvested for grain, alfalfa, Ladino clover, timothy, and bromegrass. It requires no special management practices because it is easy to work, is well drained, and retains moisture well. This soil is also suitable for many nonfarm uses. (Capability unit I–9).

Melrose fine sandy loam, 3 to 8 percent slopes (MrB).—This soil has the profile described as typical for the series. Included with this soil in mapping were small areas of the moderately well drained Elmwood soils and areas in which there is a layer of loamy sand or sand over the clayey material.

This soil is easy to plow and can be worked early in spring. Erosion is a slight to moderate hazard where the soil is plowed and left bare or used for row crops. There are a few limitations for nonfarm uses.

This soil is used mainly for corn and hay. Crops grown on it are corn for silage or grain, oats har-

vested for grain, alfalfa, Ladino clover, timothy, and bromegrass. Diversion ditches are needed in some places to intercept surface water. Stripcropping or contour cultivation is needed in some places, particularly on the longer slopes, to control erosion. (Capability unit IIe–9)

Melrose fine sandy loam, 8 to 15 percent slopes (MrC).—Included with this soil in mapping were areas that are gently rolling, small areas of the moderately well drained Elmwood soils, and areas where a layer of loamy sand or sand overlies the clayey material.

This soil is easy to plow and can be worked early in spring. Erosion is a moderate to severe hazard where the soil is plowed and left bare or used for row crops. The slope limits some nonfarm uses.

This soil is used mainly for hay or corn. Crops grown, in addition to corn for silage, are alfalfa, Ladino clover, timothy, and bromegrass. In some places diversion ditches are needed to intercept surface water. Stripcropping or contour cultivation is needed in some places, particularly on the longer slopes, to control erosion. (Capability unit IIIe–9)

Melrose fine sandy loam, 15 to 25 percent slopes (MrD).—Included with this soil in mapping were small areas that are rolling, small areas having slopes that are steeper than 25 percent, a few areas of the moderately well drained Elmwood soils, and areas in which there is a layer of loamy sand or sand over the clayey material.

The steep slopes make the use of modern farm machinery difficult and severely limit many nonfarm uses. Erosion is a severe to very severe hazard where the soil is plowed and left bare or used for row crops.

Most of this soil is used for pasture or as woodland. In some places Ladino clover and timothy are grown for pasture. (Capability unit IVe–9)

Melrose fine sandy loam, 25 to 50 percent slopes (MrE).—Included with this soil in mapping were a few small areas of the moderately well drained Elmwood soils and areas where there is a layer of loamy sand or sand over the clayey material.

Because of the extremely steep slopes, which make the use of modern farm machinery practically impossible, and the very severe hazard of erosion if the soil is plowed and left bare, this soil is not suitable for the production of farm crops. The steep slopes also severely limit many nonfarm uses. Most of this soil is woodland. (Capability unit VIIe–9)

Muck and Peat

Muck and Peat (Mv) consists of flat deposits of organic material that range in depth from 18 inches to 14 feet or more. These black or very dark brown organic deposits formed in what were once shallow ponds. The organic material consists of well-decomposed remains of reeds, sedges, and woody plants. In places it contains undecomposed pieces of wood. This land type is extremely wet. Water stands on the surface early in spring and late in fall. At other times the water table is at the surface or only a few inches below it. In the Champlain Valley this organic soil material is over clay in most places. In the hills it is over loamy material.

In its present condition, this land type is too wet for farm crops or for most nonfarm uses. Although water moves readily through the soil material, to a depth of several feet, it is difficult to drain because of a lack of suitable outlets for drainage ditches. On the flood plain of Otter Creek, this land type is at approximately the same level as the water in the stream during much of the growing season. In other places constructing outlets for drainage ditches is costly and difficult. In very few places, where the areas have been partially drained, reed canarygrass is grown. (Capability unit VIIw–0)

Nassau Series

The Nassau series consists of gently sloping to steep, loamy soils that are underlain by slate or phyllite bedrock at a depth of 10 to 20 inches. These soils are somewhat excessively drained and excessively drained, and because they are shallow, they do not retain as much moisture as deeper soils. They formed in glacial materials high in slate or phyllite. Water moves readily through the soil material and along the top of the bedrock. The Nassau soils occur mainly in the town of Orwell in the southwestern corner of the county.

Most areas of these soils are in trees, pasture, or hay. Row crops are seldom grown because of rockiness or steep slopes.

Profile of a Nassau extremely rocky silt loam in woodland in the town of Orwell:

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam; strong, fine, granular structure; friable; abundant tree roots; 25 percent slate fragments and flagstones; medium acid; abrupt, smooth boundary.

B2—4 to 19 inches, brown to dark-brown (7.5YR 4/4) silt loam; weak, fine, granular structure; friable; abundant tree roots; 50 percent slate fragments and flagstones; medium acid; abrupt, wavy boundary.

R—19 inches +, gray slate bedrock.

The depth to bedrock, or thickness of the solum, ranges from 10 to 20 inches. Coarse fragments in the profile are mainly slate fragments, but in some places there are numerous quartzite pebbles and cobblestones. The range in content of coarse fragments in the A horizon is from 10 to 30 percent, and in the B and C horizons the range is from 40 to 60 percent. In most places the color of the A horizon has a hue of 10YR, a value of 3 or 4, and chroma of 2 or 3. The texture is mainly silt loam, but loam occurs in some places.

In most places the B horizon has a hue of 10YR or 7.5YR 4/4. In some unplowed areas, the upper B horizon has a color of 7.5YR 5/6. Texture of the B horizon is silt loam or loam. Where a C horizon occurs, its color is 10YR 4/2. Its texture is silt loam or loam. The reaction of the A horizon ranges from very strongly acid to medium acid; that of the B horizon is strongly acid or medium acid.

The Nassau soils are near the well drained Dutchess soils and the moderately well drained Amenia soils. The Nassau soils differ from the similar Farmington soils in that they have a B horizon that is strongly acid or medium acid rather than slightly acid or neutral. The Nassau soils contain slate rather than limestone fragments. The Nassau soils are similar to the Lyman soils, but the Lyman soils have distinct A2 and B2ir horizons. The Nassau soils are also similar to the Glover soils, which are shallow to rock; but the Glover soils have a B horizon that has a

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hue of 2.5Y, or that has a color value and chroma of less than 4 in the hue of 10YR.

Nassau extremely rocky silt loam, 3 to 25 percent slopes (NdC).—This soil has the profile described as typical of the series. Included with this soil in mapping were pockets of deep soils and a few small areas having steeper slopes.

In many places there are outcrops of bedrock about 10 to about 30 feet apart, but in some places the outcrops are about 30 to 100 feet apart. The outcrops of bedrock, the shallowness of the soil to bedrock in many places, the many loose stones on the surface, and the rough broken topography make it very difficult or impossible to use modern farm machinery on this soil. The rock outcrops and loose surface stones in many places impose severe limitations for nonfarm uses.

Most of this soil is woodland. In some places it is used for unimproved pasture, though it supplies little forage for livestock. (Capability unit VIIs–9)

Nassau-Dutchess rocky complex, 3 to 8 percent slopes (NaB).—This complex consists of Nassau and Dutchess soils that occur in such an intricate pattern that they would have been difficult to map separately. The Nassau soils of this unit have a profile similar to the profile described as typical for the Nassau series, except that the surface layer and material from the subsoil have been mixed together to form a dark-brown plowed layer 5 to 8 inches thick and there are fewer rock outcrops. The Dutchess soils have a profile similar to the profile described as typical for the Dutchess series. Included with this unit in mapping were a few small, nearly level areas and a few small areas having slopes steeper than 8 percent.

In this complex there are outcrops of bedrock about 100 to 300 feet apart that interfere with tillage and engineering practices. The shallowness of the soils also limits these uses. Between the outcrops, however, these soils are easy to till and can be used for many nonfarm purposes. Erosion is a moderate hazard where these soils are in row crops or are plowed and left bare.

These soils are used mainly for hay or pasture. Crops grown are alfalfa, Ladino clover, timothy, and bromegrass. Diversions are needed in some places where surface runoff from areas above causes erosion. (Capability unit IIe–2)

Nassau-Dutchess rocky complex, 8 to 15 percent slopes (NaC).—This mapping unit is similar to Nassau-Dutchess rocky complex, 3 to 8 percent slopes, but it is more sloping. Included in mapping were some areas that are gently rolling and a few small areas that are steeper than these soils.

In this unit there are outcrops of bedrock about 100 to 300 feet apart. These outcrops and the shallowness to bedrock in some places interfere with tillage and engineering practices. Between the outcrops, however, the soils are easy to till and can be used for many nonfarm purposes. Erosion is a moderate to severe hazard where these soils are in row crops or are plowed and left bare.

These soils are used mainly for hay or pasture. Crops grown are alfalfa, Ladino clover, timothy, and bromegrass. Diversions are needed in places to intercept surface runoff from areas above. (Capability unit IIIe–2)

Nassau-Dutchess rocky complex, 15 to 25 percent slopes (NaD).—The Nassau and Dutchess soils in this complex occur in such an intricate pattern that they would have been difficult to map separately. The Nassau soils have a profile similar to that described as typical for the Nassau series, except that the surface layer and upper few inches of the subsoil have been mixed together to form a dark-brown plowed layer 5 to 8 inches thick and there are fewer rock outcrops. The Dutchess soils have a profile similar to that described as typical for the Dutchess series. Included with this unit in mapping were a few small areas that are rolling and a few small areas having steeper slopes.

In this unit there are outcrops of bedrock about 100 to 300 feet apart. These outcrops, the shallowness to bedrock in some places, and steep slopes make the use of modern farm machinery and the installation of engineering practices difficult. The outcrops of bedrock and the steep slopes also severely limit many nonfarm uses. Erosion is a severe to very severe hazard if the soils are in row crops or are plowed and left bare.

These soils are mainly in trees or pasture. They are also used for hay. Crops that are grown are alfalfa, Ladino clover, timothy, and bromegrass. (Capability unit IVe–2)

Nellis Series

The soils of the Nellis series are deep, are well drained, and retain moisture well. They are loamy and formed in glacial till that contains much limestone material. These soils are gently sloping or moderately sloping in most places, but there are some steep areas. The Nellis soils occur on low hills in the central part of the Champlain Valley.

The Nellis soils were nearly all too stony to use for farm crops, but in many places they have been cleared of most stones and can now be used for farming. The Nellis soils from which most stones have been removed are used mainly for hay and silage corn, or pasture. Where the stones have not been removed, these soils are mainly in trees or pasture or are idle.

Profile of a Nellis stony loam in a cultivated field in the town of Bridport:

Ap—0 to 10 inches, dark-brown (10YR 3/3) loam; moderate, fine and medium, granular structure; friable; abundant grass roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

B2—10 to 35 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, subangular blocky structure; friable; plentiful grass roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

C—35 to 38 inches +, olive (5Y 4/3) loam; structureless (massive); friable; very few grass roots; 5 percent coarse fragments; strong effervescence with cold dilute hydrochloric acid.

The content of coarse fragments in the Ap horizon ranges from 5 to 15 percent, and in the A1 horizon it ranges from 5 to about 25 percent. Content of gravel and cobblestones in the B horizon ranges from 5 to 20 percent, and in the C

horizon it ranges from 5 to about 50 percent. Depth to free carbonates ranges from 24 to 36 inches.

The A horizon, in most places, has a hue of 10YR, a value of 2, 3, or 4, and a chroma of 2 or 3. In most places the color of the B horizon is 10YR 4/4. The texture of the B horizon is loam or fine sandy loam. In most places the color of the C horizon is 2.5Y 5/4, but in some places it is 5Y 4/3. Texture of the C horizon is loam or fine sandy loam. Reaction of the A horizon ranges from medium acid to neutral. Reaction of the B horizon ranges from slightly acid to neutral. The C horizon is neutral to calcareous and moderately alkaline.

The Nellis soils are near the moderately well drained Amenia and Vergennes soils. They also are near the Farmington soils, which are shallow to bedrock.

The Nellis soils are somewhat similar to the Berkshire and Dutchess soils, but the Berkshire and Dutchess soils ar strongly acid or medium acid in the B and C horizons.

Nellis stony loam, 3 to 8 percent slopes (NeB).—This soil has the profile described as typical for the series. Included with this soil in mapping were small areas of the moderately well drained Amenia soils and some small areas having lesser slopes.

Except for the slopes, this soil has few limitations for most uses. The soil warms up quickly in the spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers, because it is deep and has good water-supplying capacity. Erosion is a moderate hazard if the soil is in row crops or is plowed and left bare.

This soil is used mainly for hay or corn. In addition to corn for silage, crops grown are alfalfa, timothy, and bromegrass. There are also some apple orchards on this soil. In some places practices are needed to control erosion. These practices include diversion ditches to intercept surface runoff, stripcropping on some of the longer smooth slopes, and contour cultivation in areas used for row crops. (Capability unit IIe–3)

Nellis stony loam, 8 to 15 percent slopes (NeC).—Included with this soil in mapping were small areas of the moderately well drained Amenia soils and small areas of Nellis stony loam that are less sloping.

The moderate slopes limit some nonfarm uses. This soil warms up quickly in the spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers, because it is deep and has good water-supplying capacity. Erosion is a moderate to severe hazard if the soil is in row crops or is plowed and left bare.

This soil is used mainly for hay or corn. In addition to corn for silage, crops grown are alfalfa, timothy, and bromegrass. There are also some apple orchards on this soil. Practices needed in some areas to control erosion are diversion ditches that intercept surface water, stripcropping on some of the longer smooth slopes, and contour cultivation in areas used for row crops. (Capability unit IIIe–3)

Nellis stony loam, 15 to 25 percent slopes (NeD).—Included with this soil in mapping were small areas that are rolling, small areas having slopes that are steeper than 25 percent, and a few small areas of the moderately well drained Amenia soils.

The steep slopes make it somewhat difficult to use modern farm machinery on this soil and severely limit many nonfarm uses. Erosion is a very severe hazard if the soil is in row crops or if it is plowed and left bare. The soil warms up quickly in spring and produces early hay and pasture. It continues to produce good crops of hay throughout most summers, because it is deep and has good water-supplying capacity.

This soil is well suited to hay or pasture under good management. It is used mainly for pasture or as woodland. Alfalfa, timothy, and bromegrass are grown for hay. Ladino clover, birdsfoot trefoil, and timothy are grown for pasture. Stripcropping is needed to control erosion in areas being reseeded. (Capability unit IVe–3)

Nellis extremely stony loam, 3 to 15 percent slopes (NsC).—This soil has a profile similar to the one described as typical for the series, but there are many stones on the surface. Included with this soil in mapping were a few small areas that are less sloping and some areas of the moderately well drained Amenia soils. In some places there are a few outcrops of bedrock.

The many surface stones and, in some places, the rock outcrops make it very difficult or impossible to use modern farm machinery on this soil. Because of the surface stones, this soil is not suited to most nonfarm uses.

Most of this soil is woodland; trees grow well on it. In some places it is used for unimproved pasture, though generally only a small amount of forage is produced for livestock. (Capability unit VIIs–10)

Nellis extremely stony loam, 15 to 50 percent slopes (NsD).—This soil has a profile similar to the one described as typical for the series, except that there are many stones on the surface. Included with this soil in mapping were a few small areas of the moderately well drained Amenia soils. In some places there are a few outcrops of bedrock.

The many surface stones, the very steep slopes, and, in some places, the rock outcrops make it very difficult or impossible to use modern farm machinery on this soil. If stones are removed, the steep slopes limit the use for farm crops and many other types of land use. Because of the surface stones and steep slopes, this soil is not suited to many nonfarm uses.

Most areas of this soil are wooded; trees grow well. In some places the soil is used for unimproved pasture, which generally produces little forage for livestock. (Capability unit VIIs–10)

Panton Series

The Panton series consists of nearly level or gently sloping, poorly drained and somewhat poorly drained silty clays and clays that formed in deep water-laid deposits of clay that contain much lime. Water moves down very slowly through these soils. The Panton soils are wet from late in fall to early in spring. Their subsoil is moist throughout most growing seasons, but it becomes dry during some of them. The surface layer dries out almost every growing season. The Panton soils are sticky and plastic when wet, hard when dry, and difficult to till or to dig.

The Panton soils occur throughout the Champlain

Valley of Addison County. The largest areas are in the towns of Addison, Panton, and Ferrisburg.

The Panton soils are used mainly for hay and pasture. There are some areas in trees, and some areas are idle. Birdsfoot trefoil is well suited to these soils. Some of the birdsfoot trefoil is harvested for seed.

In Addison County, Panton soils were mapped only in an undifferentiated unit with Covington soils. This mapping unit is described under the Covington series.

Profile of a Panton silty clay in a meadow in the town of Addison, about one-fourth mile west of the Vermont Department of Fish and Game Refuge Headquarters on Vermont Highway No. 17, on the north side of road:

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) silty clay; moderate, fine and medium, angular blocky structure; firm; abundant fibrous roots; slightly acid; abrupt, smooth boundary.

A2g—4 to 8 inches, dark-gray (10YR 4/1) silty clay; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; strong, medium, angular blocky structure breaking to moderate, medium, subangular blocky structure and some moderate, medium, granular structure; very firm when moist, very sticky and very plastic when wet; abundant fibrous roots; peds coated with light gray to gray (10YR 6/1); slightly acid; clear, wavy boundary.

B21tg—8 to 15 inches, dark-gray (10YR 4/1) clay; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; strong, coarse, prismatic structure breaking to moderate, medium, angular blocky structure; very firm when moist, very sticky and very plastic when wet; plentiful fibrous roots; clay films; slickensides in lower part of horizon; neutral; clear, smooth boundary.

B22tg—15 to 20 inches, very dark grayish-brown (10YR 3/2) clay; some streaks of dark gray (N 4/0); few, fine, distinct, olive-brown (2.5Y 4/4) mottles; moderate, coarse, prismatic structure breaking to weak, fine, angular blocky structure; very firm when moist, very sticky and very plastic when wet; plentiful fibrous roots; clay films; manganese patches; neutral; clear, smooth boundary.

B23tg—20 to 25 inches, dark-gray (N 4/0) and gray (5Y 5/1) clay; few, medium, distinct, olive (5Y 4/4) and very dark grayish-brown (10YR 3/2) mottles; structureless (massive) in place breaking to weak, medium, platy structure and moderate, very fine, subangular blocky structure; very firm when moist, very sticky and very plastic when wet; plentiful fibrous roots; clay films; many light brownish-gray (2.5Y 6/2) lime seams ½ inch wide; few manganese patches; moderately alkaline; slight effervescence with cold dilute hydrochloric acid; clear, wavy boundary.

B31tg—25 to 38 inches, dark-gray (5Y 4/1) clay; many, medium, distinct, olive-brown (2.5Y 4/4) mottles; structureless (massive) in place breaking to weak, medium, platy structure; very firm when moist, very sticky and very plastic when wet; plentiful fibrous roots; clay films along root channels and some dark-gray (N 4/0) clay films on ped faces; few, fine, light brownish-gray (2.5Y 6/2) lime seams; few manganese patches; moderately alkaline; strong effervescence along ped faces with cold hydrochloric acid; arbitrary boundary; from depth of 31 to 38 inches, used a bucket auger.

B32tg—38 to 46 inches, dark-gray (5Y 4/1) clay; common, fine and medium, distinct, olive-brown (2.5Y 4/4) mottles with brighter centers; moderate, medium, angular blocky structure; very firm when moist; very few fibrous roots; clay films; gray (10YR 5/1) lime seams; manganese patches; moderately alkaline; slight effervescence with cold dilute hydrochloric acid; arbitrary boundary; bucket auger boring.

C1—46 to 58 inches, dark-gray (5Y 4/1) clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive clods breaking to moderate, medium, angular blocky structure; firm when moist; very few fibrous roots; manganese patches; moderately alkaline; strong effervescence with cold dilute hydrochloric acid; arbitrary boundary; bucket auger boring.

C2—58 to 70 inches, dark-gray (5Y 4/1) clay; common, fine, distinct, olive-brown (2.5Y 4/4) mottles with light-gray to gray (10YR 6/1) centers; structureless (massive in place, clods breaking to moderate, medium, angular blocky structure;) firm when moist; very few fibrous roots; manganese patches on ped faces; moderately alkaline; strong effervescence with cold dilute hydrochloric acid; arbitrary boundary; bucket auger boring.

C3—70 to 80 inches +, dark grayish-brown (10YR 4/2) and dark-gray (2.5Y 4/1) clay; common, medium, prominent, dark yellowish-brown (10YR 4/4) mottles with light-gray to gray (10YR 6/1) centers; structureless (massive) or weak, medium, angular blocky structure; firm when moist; very few fibrous roots; manganese patches on ped faces; mildly alkaline; slight effervescence with cold dilute hydrochloric acid; bucket auger boring.

Depth to free carbonates ranges from 16 to 40 inches. The Ap horizon has a hue of 10YR, a moist value of 4 or more, a dry value of 6 or more (crushed and smooth), and a chroma of 3 or less. The A1 horizon is less than 6 inches thick if its moist value is lower than 3.5. The A2 horizon has a hue of 10YR, a value of 4 and 5, and a chroma of 1 or 2. The texture of the A horizon is silty clay, silty clay loam, clay loam, or clay. Matrix colors of the B horizon are neutral or have a hue of 5Y to 10YR, a value of 3, 4, or 5, and a chroma of 0, 1, or 2. Color of the C horizon is similar to that of the B horizon. Mottles vary from faint to prominent. The reaction of the solum ranges from very strongly acid to calcareous and moderately alkaline.

The Panton soils are near the moderately well drained Vergennes soils, the very poorly drained Livingston soils, the well drained Nellis and Melrose soils, and the somewhat excessively drained Farmington soils. The Panton soils are similar to the Livingston and Covington soils, but the Livingston and Covington soils have a surface layer that is brown or black and more than 6 inches thick. The Panton soils are also similar to the Canandaigua soils, but the Canandaigua soils have a solum of silt loam.

Peru Series

The Peru series consists of moderately well drained, loamy soils that formed in glacial till deposits derived from schistose rocks. These soils have a hard layer beginning at a depth of 1 to 2 1/2 feet. Water moves slowly through this hard layer but flows readily on top of it. In most places these soils are on long smooth slopes that range from gently sloping to very steep. They are slightly wet and occur in depressions or on slopes that receive water from higher areas. A seasonal high water table keeps these soils wet from late in fall to early in spring, and they are moist throughout much of the growing season. The soils are located in the Green Mountains and their foothills.

Originally, the Peru soils were nearly all too stony to use for farm crops, but in some places they have been cleared of most stones and can now be used for farming. The Peru soils from which most stones have been removed are used principally for hay or pasture.

Where the stones have not been removed, these soils are mainly in trees and pasture or are idle.

Profile of a Peru extremely stony loam in a plantation of Norway spruce in the town of Goshen, about one-half mile north of Goshen Four Corners:

A1—0 to 6 inches, dark reddish-brown (5YR 3/2) loam; weak, fine, granular structure; friable; plentiful tree roots; 5 percent gravel; very strongly acid; abrupt, smooth boundary.

A2—6 to 7 inches, weak-red (2.5YR 5/2) loam; structureless (massive); friable; few tree roots; 5 percent gravel; extremely acid; abrupt, broken boundary.

B21h—7 to 8 inches, very dark gray (5YR 3/1) loam; weak, fine, granular structure; friable; few tree roots; 15 percent gravel; very strongly acid; abrupt, broken boundary.

B22ir—8 to 13 inches, dark reddish-brown (5YR 3/4) loam; weak, medium, subangular blocky structure; friable; few tree roots; 25 percent gravel; very strongly acid; abrupt, smooth boundary.

Bx—13 to 18 inches, strong-brown (7.5YR 5/6) fine sandy loam; common, medium, distinct, red (2.5YR 4/6) mottles; weak, medium, platy structure; very firm in place; very few roots; 20 percent gravel and cobblestones; strongly acid; abrupt, smooth boundary.

C1x—18 to 20 inches, pale-brown (10YR 6/3) sandy loam; common, fine and medium, prominent, yellowish-red (5YR 5/8) and dark reddish-brown (5YR 3/4) mottles; weak, medium, platy structure; very firm in place; no roots; 20 percent gravel and cobblestones; strongly acid; abrupt, smooth boundary.

C2x—20 to 28 inches +, light brownish-gray (2.5Y 6/2) sandy loam; common, medium, prominent, red (2.5YR 4/6) mottles; weak, medium, platy structure; very firm in place; no roots; 20 percent gravel and cobblestones; medium acid.

Depth to the fragipan ranges from 12 to 30 inches. Depth to mottling ranges from 12 to 18 inches. Content of gravel and cobblestones ranges from about 5 to about 30 percent in the surface layer and in the horizons below. The A1 horizon, or Ap horizon in cultivated areas, is generally dark reddish brown (5YR 3/2) and dark grayish brown (10YR 3/2). The texture is loam or fine sandy loam. The A2, B2h, and B2ir horizons described are not present in some areas that have been plowed, but they are common in undisturbed areas.

The lower B horizon has a hue of 7.5YR to 5Y, a value of 4 or 5, and a chroma of 4 to 6. The texture of the B horizon is loam, fine sandy loam, or sandy loam. The Cx horizon has a hue of 10YR to 5Y, a value of 4 to 6, and a chroma of 2 or 3. Its texture is loam, fine sandy loam, or sandy loam. The Cx horizon is firm or very firm. Reaction of the unlimed surface layer ranges from extremely acid to strongly acid. The B horizon is very strongly acid or strongly acid. The Cx horizon is strongly acid or medium acid.

The Peru soils are near the well-drained Berkshire and Marlow soils, and the poorly drained and somewhat poorly drained Cabot soils. They also are near the Lyman soils, which are shallow to bedrock. The Peru soils differ from the similar moderately well drained Buckland soils in that their B horizon is strongly acid or very strongly acid, rather than medium acid to neutral, as is the B horizon in the Buckland soils. In contrast to the somewhat similar well-drained Marlow soils, the Peru soils have distinct or prominent mottles in the fragipan or in the lower B horizon. The Peru soils are somewhat similar to the moderately well drained Amenia soils, but the Amenia soils have a medium acid to neutral solum and are underlain by calcareous material rather than acid material.

Peru stony loam, 0 to 5 percent slopes (PeA).—The profile of this soil is similar to the one described as typical for the series, except that most stones have been removed from the surface so the soil can be used for farming, and in most places the soil has a dark-brown plowed layer 5 to 8 inches thick. Included in mapping were small areas having slightly steeper slopes and small areas of the poorly drained and somewhat poorly drained Cabot soils.

The seasonal high water table delays tillage of this soil in the spring and interferes with other uses. Drainage is needed for the best growth of most crops and for many other uses of this soil. Because this soil is moderately well drained, there are some limitations that affect the growing of alfalfa.

This soil is used mainly for pasture or hay. Crops grown on this soil are Ladino clover, timothy, and bromegrass. Ladino clover generally does well. Drainage by diversion ditches or by other methods can be used. Tile can be used to carry water away from seep spots. Practices that are needed in some of the more sloping areas to control erosion are diversion ditches to intercept surface water and stripcropping on some of the longer smooth slopes. (Capability unit IIw–3)

Peru stony loam, 5 to 12 percent slopes (PeB).—The profile of this soil is similar to the one described as typical for the series, but most of the stones have been removed from the surface so the soil can be used for farming, and in most places the present surface layer is a dark-brown plowed layer 5 to 8 inches thick. Included with this soil in mapping were small areas that are less sloping, a few small areas that are steeper, and a few small areas of the poorly drained and somewhat poorly drained Cabot soils.

A seasonal high water table delays tillage of this soil in the spring and interferes with many nonfarm uses. The moderate slopes also limit some nonfarm uses. Drainage is necessary for the best growth of most crops and for many other uses of this soil. Because the soil is moderately well drained, there are some limitations for growing alfalfa. The hazard of erosion is moderate to severe where the soil is plowed and left bare or where it is used for row crops.

This soil is used mainly for pasture and hay. Crops grown on this soil include timothy and bromegrass. Also, Ladino clover generally does well. Diversion ditches can be used for drainage, and tile can be used to carry water away from seep spots. Practices that are needed in places to control erosion are diversion ditches to intercept surface water and stripcropping on some of the longer smooth slopes. (Capability unit IIIe–3b)

Peru stony loam, 12 to 20 percent slopes (PeC).—Most of the stones have been removed from the surface so this soil can be used for farming, and in most places the present surface layer is a dark-brown plowed layer 5 to 8 inches thick. Included with this soil in mapping were small areas that are gently rolling, a few small areas having steeper slopes, and a few small areas of the poorly drained and somewhat poorly drained Cabot soils.

A seasonal high water table delays tillage of this soil in the spring and interferes with other uses. The moderately steep slopes make it somewhat difficult to

use modern farm machinery and limit many nonfarm uses. Drainage is necessary for the best growth of most crops and is necessary in some areas for other uses. Because this soil is moderately well drained, there are some limitations for growing alfalfa. Erosion is a severe or very severe hazard where the soil is plowed and left bare.

This soil is used mainly for pasture or as woodland. Ladino clover and timothy are grown for pasture and, in some places, for hay. Tile is needed to carry water away from seep spots in some areas. Plowing in narrow strips for reseeding helps control erosion on long smooth slopes. (Capability unit IVe–3b)

Peru extremely stony loam, 0 to 20 percent slopes (PsC).—Included with this soil in mapping were a few small areas that are steeper, a few small areas of soils that have many large boulders on the surface, and small areas of the poorly drained and somewhat poorly drained Cabot soils. Also included in mapping, in the large forested areas in the foothills of the Green Mountains, are a few areas from which enough surface stones were removed, many years ago, to permit tillage with horse-drawn farm machinery. These areas are now grown up to trees.

The surface stones make the use of modern farm machinery very difficult or impossible and limit many nonfarm uses.

This soil is mainly wooded; trees grow well on it. In some places it is used for unimproved pasture, which generally provides little forage for livestock. (Capability unit VIIs–10)

Peru extremely stony loam, 20 to 50 percent slopes (PsD).—Included with this soil in mapping were a few small areas that are not so steep and a few small areas of the poorly drained and somewhat poorly drained Cabot soils.

Because of the surface stones and steep slopes, it is very difficult or impossible to use modern farm machinery, and the soil is not suitable for many nonfarm uses.

This soil is used mainly as woodland; trees grow well on it. In some places it is used for unimproved pasture, which generally supplies only a small amount of forage. (Capability unit VIIs–10)

Quarry

Quarry (Qu) consists of areas where limestone, quartzite, shale, or kaolin is relatively near the surface. After the overlying soil material has been removed, the rock is taken for many farm and nonfarm purposes.

Limestone, including marble, is quarried throughout the Champlain Valley. It is used for road construction, ground lime, buildings, and other industrial and farm uses. Quartzite quarries occur in the northeastern part of the county. Quartzite is used for road surfacing, road construction, and buildings. Shale is quarried within a few miles of Lake Champlain and is used for road surfacing. A kaolin quarry is in the south-central part of Monkton town. Kaolin is used in the manufacture of paper.

These quarries range from less than 2 acres to about 15 acres in size. The ones no longer used for mining can be planted to trees or other vegetation. The plants selected should be those that will grow in shallow, rocky, acid or limy soil material that is in poor tilth. Many areas can be developed and used for recreation and wildlife. (Capability unit not assigned)

Raynham Series

The Raynham series consists of somewhat poorly drained or poorly drained, level to moderately steep soils that are somewhat sticky and plastic when wet. These soils have a texture of silt loam in the surface layer and silt loam or silt in the layers below it. They formed on deep water-laid deposits that contain small amounts of lime. These soils are generally not difficult to till or to dig. Water moves readily through them. A seasonal high water table keeps the soils wet from late in fall to early in spring and moist throughout much of the growing season. The Raynham soils occur mainly in the Champlain Valley parts of the towns of Bristol and Monkton.

The Raynham soils are used mainly for forage crops, pasture, and woodland. Some areas are idle.

Profile of a Raynham silt loam in a pasture in the town of Monkton:

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine, granular structure; friable; abundant roots; medium acid; clear, smooth boundary.

B2g—4 to 20 inches, olive-gray (5Y 5/2) silt loam; many, medium, distinct, olive-brown (2.5Y 4/4) mottles; weak, very fine and fine, subangular blocky structure; friable; plentiful roots; neutral; gradual, wavy boundary.

Cg—20 to 42 inches +, olive-gray (5Y 5/2) silt loam; many, medium, distinct, olive-brown (2.5Y 4/4) mottles; massive; firm in place, friable when removed; no roots; neutral.

Mottling occurs at a depth of 4 to 10 inches. The color of the A horizon is 10YR 4/3 or 10YR 4/2. The B horizon, in most places, has a hue of 2.5Y or 5Y, a value of 5, and a chroma of 2, 3, or 4. Mottles are distinct. The texture of the B horizon is silt or silt loam. The C horizon has a hue of 2.5Y or 5Y, a value of 4 or 5, and a chroma of 2. Mottles are distinct or prominent. The texture of the C horizon is silt loam or silt. The reaction of the profile ranges from medium acid to neutral.

The Raynham soils are near the poorly drained Canandaigua soils and the very poorly drained Livingston soils. The Raynham soils are somewhat similar to the Vergennes, Covington, and Panton soils, but they have a silty rather than a clayey solum.

Raynham silt loam, 0 to 6 percent slopes (RaB).—Included with this soil in mapping were small nearly level areas of the poorly drained Canandaigua soils or the very poorly drained Livingston soils.

A seasonal high water table delays tillage of this soil in the spring and interferes with nonfarm uses. Drainage is necessary for the best growth of some crops and for many other uses. Erosion is a moderate hazard in the gently sloping areas if the soil is plowed and left bare or used for row crops.

This soil is used mainly for hay or pasture. Corn for silage, alfalfa, Ladino clover, timothy, and bromegrass

are grown. Drainage by diversion ditches improves growth, especially of corn and alfalfa. (Capability unit IIIw–4)

Raynham silt loam, 6 to 12 percent slopes (RaC).—This soil has the profile described as typical for the series. Included in mapping were areas that are gently rolling, a few small areas that are steeper, and small areas of the poorly drained Canandaigua soils that have very gentle slopes.

A seasonal high water table delays tillage of this soil in the spring and interferes with nonfarm uses. The moderate slopes also limit some nonfarm uses. Drainage is necessary for the best growth of some crops and for many other uses of this soil. Erosion is a moderate to severe hazard if the soil is plowed and left bare or used for row crops.

This soil is used mainly for hay or pasture. Corn for silage, alfalfa, Ladino clover, timothy, and bromegrass are grown. Drainage by diversion ditches improves growth, especially of corn and alfalfa. Erosion control measures, such as stripcropping, may be needed, particularly on long slopes. (Capability unit IIIe–4a)

Raynham silt loam, 12 to 25 percent slopes (RaD).—Included with this soil in mapping were small areas that are rolling, small areas having slopes that exceed 25 percent, and a few small areas of the poorly drained Canandaigua soils.

A seasonal high water table delays tillage in the spring and interferes with nonfarm uses. The steep slopes make the use of modern farm machinery difficult and impose limitations for most nonfarm uses. Erosion is a severe hazard if this soil is plowed and left bare or used for row crops.

This soil is used mainly for pasture and hay. It is not well suited to corn, because of the steep slopes, but it is well suited to hay without drainage. Alfalfa, Ladino clover, timothy, and bromegrass are grown. Plowing steep areas in narrow strips across the slope helps control erosion. (Capability unit IVe–4a)

Rock Land

Rock land (Rk) consists of areas that are 50 to 90 percent bare bedrock or have less than 10 inches of soil over the bedrock. The bedrock is quartzite, slate, limestone, schist, or granite. Included in mapping were a few areas that are more than 90 percent bare bedrock. Rock land occurs on mountaintops, hilltops, and the sides of steep cliffs in many parts of the county. Slopes range from gently rolling to extremely steep. Vegetation is sparse and consists of moss, lichens, and small scrubby trees.

Rock land has no value for farm crops and very little value for pasture. It is a poor site for forest trees. In a few places it provides some food and cover for wildlife. In many places it has scenic value. (Capability unit VIIIs–2)

Salmon Series

The soils of the Salmon series are deep and well drained and retain moisture well. They are loamy and are on water-laid or wind-laid deposits of very fine sandy loam. These soils range from nearly level to very steep.

The Salmon soils occur along the eastern edge of the Champlain Valley. They are also in small scattered areas in the foothills of the Green Mountains.

The Salmon soils are used mainly for hay, pasture, corn for silage, and woodland.

Profile of a Salmon very fine sandy loam in an idle field in the town of Ripton:

Ap—0 to 7 inches, dark-brown (10YR 3/3) very fine sandy loam; structureless (single grain); very friable; abundant grass roots; medium acid; abrupt, smooth boundary.

B2—7 to 12 inches, dark yellowish-brown (10YR 4/4) very fine sandy loam; structureless (single grain); very friable; plentiful grass roots; medium acid; abrupt, smooth boundary.

C–12 to 30 inches +, olive (5Y 5/3) very fine sandy loam; structureless (single grain); firm in place, very friable when disturbed; few grass roots; medium acid.

In some places there are a few schistose stones on the surface and few quartzose and schistose pebbles throughout the profile. The texture of the Salmon soils in Addison County is very fine sandy loam throughout the profile. Color of the A horizon is 10YR 3/3 or 4/4. The upper B horizon is 10YR 4/4 or 5/8. The lower B horizon is 2.5Y 5/6. The C horizon has a color of 5Y 5/3 or 2.5Y 5/4. In reaction the profile ranges from strongly acid to medium acid.

The Salmon soils are near the well-drained Berkshire and Marlow soils and the excessively drained Adams soils. The Salmon soils are similar to the Adams soils, but the Adams soils have B and C horizons of loamy fine sand or fine sand.

Salmon very fine sandy loam, 2 to 6 percent slopes (SaB).—Included with this soil in mapping were small areas of slightly wetter soils, some areas that are nearly level, and some small areas having slopes of slightly more than 6 percent.

This soil is very easy to till and, except for gentle slopes, there are few limitations for nonfarm uses. Erosion is a moderate hazard in areas of this soil that are plowed and left bare or used for row crops.

This soil is used mainly for hay. Corn for silage, alfalfa, Ladino clover, bromegrass, and timothy are grown. Diversion terraces that intercept surface water from areas above are needed in places. (Capability unit IIe–4)

Salmon very fine sandy loam, 6 to 12 percent slopes (SaC).—This soil has the profile described as typical for the series. Included in mapping were small areas of slightly wetter soils and small areas of Salmon very fine sandy loam that are gently rolling.

Salmon very fine sandy loam, 6 to 12 percent slopes, is easy to till, but the moderate slopes limit some nonfarm uses. Erosion is a moderate to severe hazard where the soil is plowed and left bare or used for row crops.

This soil is used mainly for hay. Corn for silage, alfalfa, Ladino clover, bromegrass, and timothy are grown. Diversions are needed to intercept surface water from the areas above. (Capability unit IIIe–4)

Salmon very fine sandy loam, 12 to 50 percent slopes (SaE).—Included with this soil in mapping were small

areas that have slopes of less than 12 percent, a few small areas of slightly wetter soils, and areas where the surface layer and subsoil are silt loam.

The steep slopes make the use of modern farm machinery difficult and severely limit many nonfarm uses. Erosion is a severe or very severe hazard where this soil is plowed and left bare.

This soil is used mainly for pasture or as woodland. In the less steeply sloping areas, Ladino clover, bromegrass, and timothy can be seeded. To control erosion, only narrow strips across the slope should be plowed at one time. (Capability unit VIIe–4)

Stetson Series

The Stetson series consists of deep, somewhat excessively drained, very gravelly soils that do not retain moisture so well as less gravelly soils. Stetson soils formed in water-deposited sand and gravel derived from schist and quartzite material. These soils are nearly level or moderately sloping in most places, but in some places they are very steep. They occur on the eastern edge of the Champlain Valley and in the foothills of the Green Mountains.

The Stetson soils are used mainly for crops, pasture, and woodland, but some areas are idle. There are many gravel pits in areas of these soils.

Profile of a Stetson gravelly fine sandy loam in a pasture in the town of Starksboro, 1 mile north of the village of Starksboro on Vermont Route No. 116:

Ap—0 to 10 inches, dark-brown (10YR 3/3) gravelly fine sandy loam; weak, fine, granular structure; loose; abundant grass roots; 15 percent quartzite gravel; medium acid; abrupt, smooth boundary.

B21ir—10 to 16 inches, dark reddish-brown (5YR 3/4) very gravelly fine sandy loam; weak, fine, granular structure; loose; plentiful grass roots; 50 to 60 percent quartzite gravel and cobblestones; strongly acid; clear, smooth boundary.

B22—16 to 25 inches, dark-brown (7.5YR 4/4) very gravelly sandy loam; structureless (single grain); loose; plentiful grass roots; 50 to 60 percent quartzite gravel and cobblestones; medium acid; clear, smooth boundary.

IIC1—25 to 38 inches, dark yellowish-brown (10YR 4/4) very gravelly loamy sand; structureless (single grain); loose; few grass roots; 50 to 60 percent quartzite gravel and cobblestones; medium acid; abrupt, smooth boundary.

IIIC2—38 to 45 inches +, dark yellowish-brown (10YR 3/4) very gravelly coarse sand; structureless (single grain); loose; few grass roots; 50 to 70 percent quartzite gravel; medium acid.

Coarse fragments in the profile consist mainly of water-rounded pebbles and cobblestones of quartzose and schistose material. In a few places there are stones larger than 10 inches in diameter. The content of coarse fragments in the A horizon ranges from 15 to 20 percent. In the B horizon the content of coarse fragments ranges from 40 to 95 percent. The content of cobblestones and gravel in the C horizon is 10 to 80 percent. The A1 horizon in uncultivated areas, or the Ap horizon in cultivated areas, generally has a hue of 10YR, a value of 3, and a chroma of 2, 3, or 4. In some areas that have never been plowed, there is an A2 horizon 1 to 3 inches thick having a color of 5YR 6/1. The texture of the A horizon is gravelly fine sandy loam or gravelly sandy loam.

The upper B horizon, in most places, has a hue of 2.5YR to 7.5YR, a value of 3 or 5, and a chroma of 4 to 6. The lower B horizon is, in most places, 7.5YR or 10YR 4/4. The texture of the B horizon is very gravelly loam, very gravelly fine sandy loam, or very gravelly sandy loam.

In most places the C horizon has a hue of 10YR, a value of 3 or 4, and a chroma of 4. In some places its color is 2.5Y or 5Y 5/4. The texture of the C horizon is very gravelly coarse sand, very gravelly loamy sand, gravelly sand, and sand. The reaction of the solum ranges from very strongly acid to slightly acid. The reaction of the C horizon ranges from strongly acid to slightly acid.

The Stetson soils are near the moderately well drained Duane soils and the poorly drained and somewhat poorly drained Walpole soils. The Stetson soils are similar to the Colton soils in that they both contain many coarse fragments, but in the Colton soils the texture of the B horizon is loamy sand or sand. The Stetson soils are also similar to the Adams soils, but the Adams soils contain few or no coarse fragments in their profile.

Stetson gravelly fine sandy loam, 0 to 5 percent slopes (StA).—Included with this soil in mapping were small areas of the moderately well drained Duane soils. Also included were small areas of gravelly soils in the Champlain Valley that overlie a sand and gravel layer that is high in lime.

In most places this soil is easy to till and has few limitations for many nonfarm uses. In some places gravel and cobblestones in the surface layer interfere with tillage. The hazard of erosion is slight in the gently sloping areas if this soil is plowed and left bare or is used for row crops.

This soil is used mainly for corn for silage and hay. In addition to corn for silage, crops grown are alfalfa, Ladino clover, timothy, and bromegrass. (Capability unit IIs–7)

Stetson gravelly fine sandy loam, 5 to 12 percent slopes (StB).—Included with this soil in mapping were small areas of the moderately well drained Duane soils, and small areas of gravelly soils in the Champlain Valley that are underlain by a sand and gravel layer that is high in lime.

This soil is generally easy to till, but in some places gravel and cobblestones in the surface layer interfere with tillage. The slopes limit some nonfarm uses. Erosion is a moderate to severe hazard in fields that are plowed and left bare or are used for row crops.

This soil is used mainly for hay or for corn for silage. In addition to corn for silage, crops grown are alfalfa, Ladino clover, timothy, and bromegrass. On some of the longer slopes, stripcropping is needed to control erosion. (Capability unit IIIe–7)

Stetson gravelly fine sandy loam, 12 to 30 percent slopes (StD).—This soil has the profile described as typical for the series. Included in mapping were areas that are gently rolling and small areas of gravelly soils in the Champlain Valley that overlie a sand and gravel layer that contains lime.

The steep slopes make it difficult to use modern farm machinery and impose moderate to severe limitations for many nonfarm uses. In some places gravel and cobblestones in the surface layer interfere with tillage.

Because of the steep slopes, most areas of this soil are used as woodland or for pasture of native grass. On the less steep slopes, there are some areas in hay. Wherever possible, these areas should be plowed in narrow strips across the slope when they are reseeded,

because erosion is a severe hazard if the soil is plowed and left bare or is used for row crops. (Capability unit VIe–7)

Stetson gravelly fine sandy loam, 30 to 50 percent slopes (StE).—Included with this soil in mapping were a few small areas of gravelly soils in the Champlain Valley that overlie a sand and gravel layer, which is high in content of lime.

Because of the extremely steep slopes, which make the use of modern farm machinery practically impossible, and the very severe hazard of erosion in fields left bare, this soil is not suited to farm crops. The steep slopes impose severe limitations for most nonfarm uses. Most areas of this soil are used as woodland. (Capability unit VIIe–67)

Swanton Series

The Swanton series consists of nearly level or gently sloping, poorly drained and somewhat poorly drained soils that are fine sandy loam to a depth of 20 to 30 inches. Under the fine sandy loam is clay or silty clay. Water moves through the sandy layer readily but may flow downhill on top of the clayey layer. Water moves slowly through the clayey layer. The Swanton soils are wet from late in fall to early in spring and remain moist throughout most of the growing season.

The Swanton soils occur mainly in the towns of Panton and Ferrisburg. They also occur, however, in small areas scattered throughout the Champlain Valley.

The Swanton soils are used mainly for pasture and hay. Some areas are idle or are wooded.

Profile of Swanton fine sandy loam in a pasture in the town of Leicester:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, granular structure; friable; few plant roots; medium acid; abrupt, smooth boundary.

B2—9 to 22 inches, olive (5Y 5/3) fine sandy loam; common, medium, prominent, yellowish-red (5YR 5/8) and gray (10YR 5/1 and 6/1) mottles; structureless (single grain); friable; few plant roots; medium acid; abrupt, smooth boundary.

IIC—22 to 32 inches +, grayish-brown (10YR 5/2) clay; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, very fine or fine, angular blocky structure; firm; very few or no plant roots; neutral.

The depth to clay generally ranges from 20 to 30 inches. Mottling occurs at a depth of 7 to 10 inches. The color of the A horizon is mainly 10YR 3/2 or 10YR 2/2. The texture of the A horizon is very fine sandy loam or fine sandy loam. Where an A2 horizon occurs, it is 2.5Y 7/2. The matrix of the B horizon has a hue of 5Y to 10YR, a value of 4 or 5, and a chroma of 2 or 3. This horizon contains distinct or prominent mottles. The texture of the B horizon is fine sandy loam or sandy loam.

The IIC horizon has a hue of 5Y to 10YR, a value of 4 or 5, and a chroma of 1 or 2. In some places the color of the IIC is N 5/0. The IIC horizon contains faint to prominent mottles. The texture of the IIC horizon is clay, silty clay, or silty clay loam. The reaction of the sandy material ranges from strongly acid to slightly acid. The fine-textured substratum ranges from medium acid to neutral.

The Swanton soils are near the moderately well drained Elmwood soils and the poorly drained and somewhat poorly drained Covington and Panton soils.

Swanton fine sandy loam (Sw).—This is the only Swanton soil mapped in the county. It is nearly level and gently sloping. Included with this soil in mapping were small areas of wetter, very poorly drained soils that stay wet or moist throughout most of the growing season and small areas of slightly more sloping Swanton soils.

This soil is easy to plow, but a seasonal high water table delays tillage until late in the spring. Drainage is necessary for the best use of the soil for farming and for some nonfarm uses. Where slopes are gentle, the hazard of erosion is slight to moderate if the soil is plowed and left bare or used for row crops.

This soil is used mainly for hay or pasture. Crops grown are Ladino and alsike clovers, birdsfoot trefoil, and timothy. Diversion ditches, open field ditches in nearly level areas, land smoothing, and bedding are practices used for drainage. Drainage is needed to make this soil suitable for corn. In the gently sloping areas, especially on the long slopes, diversion ditches help to control erosion. (Capability unit IIIw–9)

Vergennes Series

The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain lime. These soils are gently sloping to very steep. They are sticky and plastic when wet, hard when dry, and are difficult to till or to dig. Water moves very slowly through these soils.

Vergennes soils are widely distributed throughout the Champlain Valley. They occupy nearly the entire area between the foothills of the Green Mountains and Lake Champlain.

The Vergennes soils are used mainly for forage crops, pasture, apple orchards, and woodland. Some areas are idle.

Profile of a Vergennes clay in a hayfield in the town of Weybridge, 2 miles west of the village of Middlebury:

Ap—0 to 6 inches, dark grayish-brown (2.5Y 4/2 to 10YR 4/2) clay; strong, fine and medium, angular blocky structure in soil mass and strong, fine, granular structure along roots; very firm when moist, plastic and sticky when wet; abundant fibrous roots; medium acid; smooth boundary.

B21t—6 to 16 inches, dark grayish-brown (2.5Y 4/2 to 10YR 4/2) clay; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure breaking to strong, medium, angular blocky structure; very firm when moist, plastic and sticky when wet; abundant fibrous roots; medium acid; clear, wavy boundary.

B22t—16 to 25 inches, very dark grayish-brown (2.5Y 3/2) clay; weak, coarse, prismatic structure breaking to strong, thick, platy and then to strong, thin, platy structure; very firm when moist, plastic and sticky when wet; plentiful fibrous roots along ped faces; clay films; few fine manganese patches; neutral; abrupt, wavy boundary.

B23t—25 to 29 inches, dark grayish-brown (2.5Y 4/2) clay; moderate, coarse, prismatic structure breaking to weak, thin to thick, platy structure; very firm when moist, plastic and sticky when wet; plentiful roots along ped faces; clay films; many. fine, black patches; grayish-brown (2.5Y 5/2) and pale-brown (10YR 6/3) lime seams; slight effer-

vescence on ped faces with cold dilute hydrochloric acid; abrupt, smooth boundary.

C1—29 to 35 inches, dark-gray (10YR 4/1) clay varves interbedded with some thin, olive-brown (2.5Y 4/3) and grayish-brown (2.5Y 5/2) varves of silt; strong, very thick, platy structure; very firm; plentiful roots along ped faces; many, fine, black patches in the silt and clay varves; clay varves show slight effervescence with cold, dilute hydrochloric acid, silt varves show strong effervescence; abrupt, smooth boundary.

C2—35 to 47 inches +, dark-gray (10YR 4/1) and olive-brown (2.5Y 4/4) clay varves 9 to 12 millimeters thick interbedded with olive-brown (2.5Y 4/4) and grayish-brown (2.5Y 5/2) varves of silt 1 to 2 millimeters thick; strong, very thick, platy structure breaking to weak, thin and very thin, platy structure; very firm; plentiful fibrous roots; clay varves show slight effervescence with cold, dilute hydrochloric acid, silt varves show strong effervescence.

Depth to carbonate ranges from 10 inches to 35 inches. Depth to bedrock is more than 4 feet. The A horizon, in most places, has a hue of 10YR and 2.5Y, a value of 2 to 5, and a chroma of 1 or 2. In most places the texture is clay, but in some places it is silty clay, silty clay loam, or silt loam. The B horizon has a hue of 2.5Y to 7.5YR, a value of 3 or 4, and a chroma of 1 or 2. In some places faint mottles are present in the B horizon.

The C horizon has a hue of 2.5Y to 10YR, a value of 3 or 4, and a chroma of 1 or 2. The C horizon may or may not be mottled. If mottles are present they are faint or distinct. The entire profile is plastic or sticky when wet. The reaction of the A horizon ranges from strongly acid to neutral; that of the B horizon, from strongly acid to neutral in the upper part and medium acid to calcareous and moderately alkaline in the lower part.

The Vergennes soils are near the poorly drained and somewhat poorly drained Covington and Panton soils, the very poorly drained Livingston soils, and the well-drained Farmington, Nellis, and Melrose soils. The Vergennes soils differ from the Raynham soils in that they have a solum of clay rather than silt loam and they formed in calcareous parent material. The Vergennes soils contain faint or no mottles in the B horizon, whereas the Covington and Panton soils contain distinct or prominent mottles in the B horizon.

Vergennes clay, 2 to 6 percent slopes (VgB).—A profile of this soil is described as typical for the series. Included in mapping were small, nearly level areas of the poorly drained and somewhat poorly drained Covington and Panton soils and small areas of the very poorly drained Livingston soils. Also included were areas where sand and gravel occur below a depth of 4 feet or where bedrock occurs at a depth of 3 feet.

A seasonal high water table delays tillage of this soil in the spring and interferes with nonfarm uses. Drainage is necessary for the best growth of most crops and for many other uses of this soil. Because it is clay, the soil is difficult to plow and harrow. It is normally plowed in the fall. The alternate freezing and thawing during winter make harrowing easier in spring. This soil is cold and warms slowly in spring. Erosion is a slight to moderate hazard if the soil is plowed and left bare or used for row crops. Where the soil occurs along the shore of Lake Champlain, there is generally a steep bank dropping down to the water. In many places this bank is being severely eroded by wave action (fig. 4).

This soil is used mainly for hay, corn, and pasture. Crops grown are corn for silage and for grain, oats harvested for grain, birdsfoot trefoil for hay or seed (fig. 5, top), alfalfa, timothy, and bromegrass. There are some apple orchards on this soil. Diversion ditches are used to intercept surface water and, together with stripcropping, to control erosion. In some places land smoothing facilitates the removal of excess water (fig. 5, bottom). (Capability unit IIe–5)

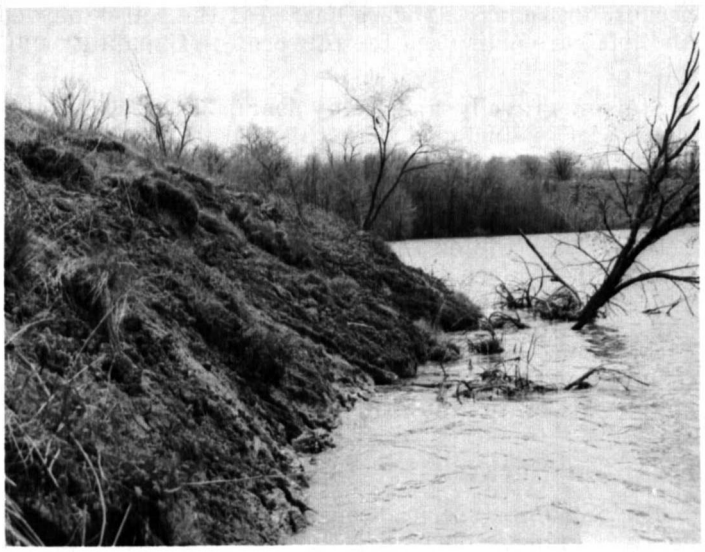

Figure 4.—**Lakeshore erosion. Slumping of banks along Lake Champlain. This soil is heavy Vergennes clay.**

Vergennes clay, 6 to 12 percent slopes (VgC).—Included with this soil in mapping were areas that are gently rolling, a few small areas having steeper slopes, and small areas of very gently sloping, poorly drained and somewhat poorly drained Covington and Panton soils. Also included were areas where sand and gravel occur below a depth of 4 feet or where bedrock occurs at a depth of 3 feet.

A seasonal high water table delays tillage of this soil in the spring and interferes with nonfarm uses. Drainage is necessary for the best growth of most crops and for many other uses of this soil. Because it is clay, this soil is difficult to plow and harrow. It is normally plowed in the fall. The alternate freezing and thawing in winter make harrowing easier in spring. This soil is cold in spring and warms late. The hazard of erosion is moderate to severe if the soil is plowed and left bare or used for row crops. Where this soil occurs along the shore of Lake Champlain there is, in most places, a steep bank that adjoins the water. In many places this steep bank is being severely eroded by wave action.

This soil is used mainly for hay or pasture. Crops grown are corn for silage, birdsfoot trefoil for hay, alfalfa, timothy, and bromegrass. There are also some apple orchards on this soil. Diversion ditches are used to intercept surface water and, along with stripcropping, to control erosion. (Capability unit IIIe–5)

Vergennes clay, 12 to 25 percent slopes (VgD).—Included with this soil in mapping were small areas having less steep slopes, small areas having slopes steeper

Figure 5.—Top, **Birdsfoot trefoil on Vergennes clay, 2 to 6 percent slopes. A Farmington rocky silt loam is in background.** *Bottom,* **Waterway on Covington soil in an area of Vergennes clay, 2 to 6 percent slopes.**

than 25 percent, and a very few small areas of the poorly drained and somewhat poorly drained Covington and Panton soils. Also included were areas where sand and gravel occur below a depth of 4 feet or where bedrock occurs at a depth of 3 feet. There are some gullied areas.

A seasonal high water table delays tillage and other uses of this soil in the spring. The steep slopes make the use of farm machinery difficult and limit the use of this soil for many nonfarm purposes. Because it is clay and is steep, this soil is difficult to plow and harrow. The soil is cold in spring and late to warm up. Erosion is a severe hazard where the soil is plowed and left bare or used for row crops.

This soil is used mainly for pasture or as woodland. It is seldom used for corn or hay because of the difficulty of using farm machinery on the steep slopes and because of the hazard of erosion. Birdsfoot trefoil and timothy are grown. Diversion ditches need to be built above the less sloping areas to intercept and remove excess water. (Capability unit IVe–5)

Vergennes clay, 25 to 50 percent slopes (VgE).—In most places this soil is on the walls of narrow valleys that have been cut by small streams in deep deposits of clay. Included in mapping were areas where the upper 1 to 3 feet of soil has been removed by landslides. These landslides range from about 1 /10 of an acre to about 2 acres in size. They occur in a very irregular pattern. In some places they are in isolated small areas, and in other places they cover one quarter of an individual valley wall. Also included in mapping were steep banks along the shore of Lake Champlain that have been severely eroded by wave action and a few small areas having slopes of less than 25 percent. There are a few areas where sand and gravel occur below a depth of 4 feet or where bedrock occurs at a depth of 3 feet.

The extremely steep slopes make this soil very difficult to plow and harrow and impose severe limitations on most nonfarm uses. The use of modern farm machinery is practically impossible. This soil is cold in spring and warms late. Erosion is a very severe hazard if the soil is plowed and left bare. Overstocking with cattle causes well-defined cattle paths that will erode. When the soil is saturated by water, it has a tendency to slide on the very steep slopes, especially where it is used for pasture rather than as woodland.

Because of the very steep slopes and very severe hazard of erosion, most of this soil is used for unimproved pasture or as woodland. (Capability unit VIIe–5)

Vergennes Series, Moderately Shallow Variant

The soils of the Vergennes series, moderately shallow variant, are clay and are underlain by limestone at a depth of 20 to 40 inches. They are moderately well drained and gently sloping to steep. They formed in calcareous estuarine and glacial lacustrine material. Water moves through the soils very slowly. The Vergennes soils, moderately shallow variant, occur in the Champlain Valley.

The Vergennes soils, moderately shallow variant, are used mainly for forage crops, pasture, and woodland. Some areas are idle.

Profile of a Vergennes clay, moderately shallow variant, in woodland in the town of Middlebury, about 1.1 mile southwest of the junction of Vermont Route No. 125 and U.S. Route No 7, or 0.5 mile north of the Middlebury-Salisbury town line, then 400 feet west of the Middlebury River:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) clay; moderate, medium, granular structure; friable; abundant roots; medium acid; abrupt, wavy boundary.

A2—3 to 5 inches, brown (10YR 5/3) clay; weak, fine, subangular blocky structure; friable; abundant roots; slightly acid; clear, smooth boundary.

B21t—5 to 13 inches, dark grayish-brown (10YR 4/2) clay; moderate, medium, subangular blocky structure; firm; abundant roots; clay films; slightly acid; abrupt, wavy boundary.

B22t—13 to 26 inches, dark grayish-brown (10YR 4/2) clay; common, fine, faint, brown (10YR 4/3) mottles; moderate, medium, subangular blocky structure; plentiful roots; neutral; abrupt, wavy boundary.

R—26 inches +, bedrock.

Depth to bedrock ranges from 20 to 40 inches, and outcrops of bedrock range from 100 to 300 feet apart. The A1 horizon, or Ap horizon in cultivated areas, has a hue of 10YR, a value of 2 to 4, and a chroma of 1 or 2. In some areas never plowed, there is an A2 horizon having a hue of 10YR, a value of 4 or 5, and a chroma of 2 or 3. The B horizon has a hue of 2.5Y to 7.5YR, a value of 3 or 4, and a chroma of 1 or 2. In some places faint mottles are present.

In some places a C horizon underlies the B horizon. Where a C horizon does occur, it has a hue of 2.5Y to 10YR, a value of 3 or 4, and a chroma of 1 or 2. Mottling in the C horizon is present in some places and not in others. The bedrock is quartzite or limestone. The reaction of the A horizon ranges from strongly acid to neutral. The B horizon is strongly acid to neutral in the upper part and medium acid to calcareous and moderately alkaline in the lower part. The C horizon is calcareous and moderately alkaline.

The Vergennes soils, moderately shallow variant, are near the moderately well drained Vergennes soils, the poorly drained and somewhat poorly drained Covington and Panton soils, and the well drained Nellis soils. They are also near the well drained Farmington soils, which are moderately deep. The Vergennes soils, moderately shallow variant, have more clay in their profile than the Glover, Lyman, and Nassau soils. The Vergennes soils, moderately deep variant, differ from the Covington and Panton soils in that they are underlain by bedrock at a depth of less than 40 inches.

Vergennes rocky clay, moderately shallow variant, 2 to 6 percent slopes (VrB).—Included with this soil in mapping were small nearly level areas, or pockets, of the poorly drained and somewhat poorly drained Covington and Panton soils and small areas of the deeper Vergennes clay, 2 to 6 percent slopes.

The rock outcrops interfere with tillage for farm crops. The outcrops and the shallowness to bedrock limit nonfarm uses. Because Vergennes rocky clay, moderately shallow variant, 2 to 6 percent slopes, is shallow to bedrock, it tends to dry out in summer, and consequently crops are affected by drought. The hazard of erosion is moderate where the soil is in row crops or is plowed and left bare.

This soil is used mainly for hay or pasture. Crops grown are alfalfa, birdsfoot trefoil, timothy, and bromegrass. Diversions are needed to intercept surface runoff from areas above and thereby to help control erosion. (Capability unit IIIe–2)

Vergennes rocky clay, moderately shallow variant, 6 to 12 percent slopes (VrC).—Included with this soil in mapping were areas that are gently rolling, a few small areas having steeper slopes, and small areas of the deeper Vergennes clay, 6 to 12 percent slopes.

The rock outcrops interfere with tillage for farm crops. The shallowness to bedrock and the outcrops limit nonfarm uses. Because Vergennes rocky clay, moderately shallow variant, 6 to 12 percent slopes, is shallow to bedrock, it tends to dry out in the summer, and crops are affected by drought. Erosion is a moderate to severe hazard where this soil is in row crops or is plowed and left bare.

This soil is used mainly for hay or pasture. Crops that are grown are alfalfa, birdsfoot trefoil, timothy, and bromegrass. (Capability unit IIIe–2)

Vergennes rocky clay, moderately shallow variant, 12 to 25 percent slopes (VrD).—A profile of this soil is described as typical for the series. Included in mapping were small areas having less steep slopes, small areas where slopes are steeper than 25 percent, and small areas of the deeper Vergennes clay, 12 to 25 percent slopes.

The rock outcrops interfere with tillage for farm crops, and the steep slopes make it difficult to use farm machinery. The shallow depth to bedrock, the rock outcrops, and the moderately steep slopes limit nonfarm uses. Because this soil is shallow to bedrock, it tends to dry out in the summer, and consequently crops are affected by drought. Erosion is a severe to very severe hazard where this soil is in row crops or is plowed and left bare.

This soil is mainly wooded or in pasture. Crops grown are alfalfa, timothy, birdsfoot trefoil, and bromegrass. Reseeding in narrow strips across the slope helps to control erosion. (Capability unit IVe–2)

Walpole Series

The Walpole series consists of poorly drained and somewhat poorly drained soils that are loamy to a depth of 15 or 20 inches and are sandy below that depth. Water moves easily through these soils. The Walpole soils are wet from late in fall to early in spring and remain moist throughout the growing season. They formed on water-deposited sand and gravel derived from schistose rocks and some limestone. These soils are nearly level or gently sloping and are mainly in depressions or areas near streams. They occur in small areas in the Green Mountains, in their foothills, and along the eastern edge of the Champlain Valley.

The Walpole soils are mainly in trees or pasture, but some areas are in hay or are idle.

Profile of Walpole silt loam in a plantation of Norway spruce in the town of Goshen:

A1—0 to 5 inches, black (5YR 2/1) silt loam; moderate, fine and medium, granular structure; friable; abundant tree roots; very strongly acid; abrupt, wavy boundary.

B21—5 to 10 inches, grayish-brown (10YR 5/2) gravelly fine sandy loam; many, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, fine, granular structure; friable; plentiful tree roots; 20 percent gravel; very strongly acid; abrupt, wavy boundary.

B22—10 to 20 inches, grayish-brown (2.5Y 5/2) gravelly fine sandy loam; many, medium and fine, distinct, dark-brown (7.5YR 4/4) mottles; structureless (single grain); friable; plentiful tree roots; 30 percent gravel and cobblestones; strongly acid; clear, smooth boundary.

IIC1—20 to 35 inches, dark grayish-brown (2.5Y 4/2) gravelly sand; many, coarse, prominent, dark reddish-brown (5YR 3/4) mottles; structureless (single grain); loose; very few tree roots; 30 percent gravel and cobblestones; medium acid; clear, wavy boundary.

IIC2—35 inches +, very dark grayish-brown (2.5Y 3/2) gravelly sand; structureless (single grain); loose; no roots; 30 percent gravel and cobblestones; medium acid.

Depth to mottling ranges from 5 to 10 inches. The content of coarse fragments, which are pebbles and cobblestones, ranges from very few throughout the profile to about 35 percent in the lower B and C horizons. The color of the A horizon is 5YR or 10YR 2/1, or 10YR 3/1. The texture is silt loam or fine sandy loam. In most places the B horizon has a hue of 5Y or 10YR, a value of 4 or 5, and a chroma of 1 or 2. Mottles in the B horizon are distinct or prominent. The texture of the B horizon is gravelly fine sandy loam or gravelly sandy loam.

The C horizon has, in most places, a hue of 2.5Y or 5Y, a value of 3, 4, or 5, and a chroma of 2. Mottles are distinct or prominent. The texture of the C horizon is loamy fine sand, coarse sand, or gravelly sand. Reaction of the A horizon ranges from very strongly acid to slightly acid. Reaction of the B horizon ranges from very strongly acid to neutral. The C horizon is strongly acid to neutral.

The Walpole soils are near the moderately well drained Duane soils and the excessively drained Colton and Stetson soils. Walpole soils are the only poorly drained or somewhat poorly drained soils on glaciofluvial deposits recognized in Addison County. The Walpole soils are somewhat similar to the Swanton soils, but the Swanton soils have a IIC horizon of clay material at a depth of 20 to 30 inches and lack the coarse fragments in the solum.

Walpole silt loam (Wa).—This is the only Walpole soil mapped in the county. It is nearly level. In many places the surface layer has been plowed and is 7 or 8 inches thick. Included with this soil in mapping were small areas of very poorly drained soils that have a higher water table than the Walpole soils.

Because this soil is wet, a seasonal high water table delays tillage until quite late in the spring. The soil is easy to plow. Drainage is necessary for the best use of this soil for most nonfarm uses.

This soil is mainly in trees or pasture. Ladino clover, alsike clover and timothy are grown. Drainage by surface ditches or other methods is needed for good growth of crops. (Capability unit IIIw–67)

Winooski Series

The Winooski series consists of deep, moderately well drained, loamy soils that formed in silt loam and very fine sandy loam deposits on the flood plains of streams. The Winooski soils are nearly level or are in depressions on the flood plains. Some areas of the Winooski soils are low enough in relation to the level of the water in the streams that they may be under water for periods of 1 to 2 weeks, usually in the spring and fall. Other areas are flooded for periods of only a few days. In some places there may be years when no flooding occurs. A seasonal high water table keeps these soils wet from late in fall to early in spring and moist throughout much of the growing season.

These soils occur along the Otter Creek, the Middlebury River, the New Haven River, and the White River. They are also along the tributaries that flow into these larger rivers.

The Winooski soils are used mainly for forage crops and pasture.

Profile of Winooski very fine sandy loam in a pasture in the town of Weybridge, near the junction of Otter Creek and the Lemon Fair River:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; structureless (massive); friable; abundant grass roots; neutral; abrupt, smooth boundary.

C1—9 to 20 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; few, fine, faint, grayish-brown (2.5Y 5/2) mottles below a depth of 12 inches; structureless (massive); friable; few grass roots; neutral; abrupt, smooth boundary.

IIC2—20 to 42 inches +, brown to dark-brown (10YR 4/3) silt loam; many, coarse, prominent, olive-gray (5Y 5/2) mottles; structureless (massive); firm in place, friable when removed; no roots; medium acid.

Mottling generally occurs at a depth of 10 to 20 inches. The A horizon has a hue of 2.5Y or 10YR, a value of 2, 3, or 4, and a chroma of 2. The texture is very fine sandy loam in most places, but in some places it is silt loam. The C horizon has a hue of 2.5Y or 10YR, a value of 3 or 4, and a chroma of 2 or 3. Mottles are faint to prominent. The texture of the C horizon is very fine sandy loam or silt loam.

The Winooski soils are near the well-drained Hadley soils and the poorly drained Limerick soils. They are the only moderately well drained soils developed on alluvium recognized in Addison County.

Winooski very fine sandy loam (Wo).—This is the only Winooski soil mapped in the county. It is nearly level. Included with it in mapping were small areas of the poorly drained Limerick soils, small areas of the well-drained Hadley soils, soils that are more sandy, and Winooski soils that have had a few inches of sandy material deposited on the surface during floods. Also included in mapping, especially along the smaller, more rapidly flowing streams, are soils that are similar to this one in most respects, but they have a layer of sand or gravel below a depth of 1 1/2 to 3 feet. In a few places these included areas are gravelly to the surface.

Frequency of flooding varies from one place to another. Some places are flooded every year, usually in the spring and fall. In other places flooding occurs every 3 to 4 years. A few areas are very seldom flooded. Spring floods in some places and the seasonal high water table delay tillage of this soil in the spring and impose limitations for nonfarm uses. Drainage is necessary for the best use of this soil for most purposes. In some areas there is a hazard of erosion from fast-moving floodwaters if the soil is plowed in the fall and left bare. Streambanks erode in some places. A very thin layer, seldom over 1/2 inch thick, of very fine sand and silt is deposited where this soil is flooded.

Most of the larger areas of this soil in the Champlain Valley are used for silage corn in a rotation with hay. In addition to corn for silage, Ladino clover, timothy, and bromegrass are grown. Alfalfa also is grown, but there is danger that it will be killed because of flooding and the high water table. Surface drainage by ditches and land smoothing permits tillage earlier in the spring. (Capability unit IIw–1a)

Use and Management of the Soils

In this section the soils are discussed in relation to their use and suitability for crops and pasture, as

woodland, for wildlife habitat, in engineering, and for recreational development.

Use of the Soils for Crops and Pasture

The soils in the county range from moderate to very low in natural fertility, and many of them are naturally acid. The need for lime and plant nutrients depends on past management and cropping practices. Consequently, lime and fertilizer should be applied in amounts determined by soil tests.

In this section the system of capability grouping is explained and the capability classes, subclasses, and units are described. Suggestions for use and management of each soil in the county are given in the section "Descriptions of the Soils." The capability unit designation is given at the end of each mapping unit description. Also in this section, predicted yields are given for arable soils under two levels of management.

Capability grouping

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

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

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs. The placement of any mapping unit in the grouping can be learned by turning to the "Guide to Mapping Units" at the back of this survey, or by referring to the notation that ends the description of each mapping unit in the section that describes the soils of the county.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. There are no class V soils in Addison County.

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

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

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

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

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

CAPABILITY UNITS are soil groups within the subclass. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–3 or IIIe–2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

Predicted yields

Table 2 gives the predicted crop yield per acre for the soils under two levels of management. Only arable soils are listed in the table. The information is based on estimates obtained from soil scientists and soil conservationists of the Soil Conservation Service, from county agents, and from experimental plots.

Yields indicated in columns A are average yields obtained during a period of 5 years or more under ordinary management. At this level of management, insufficient amounts of lime and fertilizer are applied, drainage is inadequate or incomplete, improved varieties of crops are not grown, or seedbeds are poorly prepared. In addition, there may be poor timing of harvest and no control of plant diseases and insects.

TABLE 2.—*Predicted average acre yields of principal crops under two levels of management*

[Yields in columns A are those expected under ordinary management; those in columns B, under improved management. Absence of figure indicates the crop is not commonly grown on the soil or that yields were not predicted. Soils not listed are generally not used for the stated crops]

Soil	Alfalfa hay		Clover hay		Birdsfoot trefoil hay		Oat hay		Corn for silage		Corn for grain	
	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*
Adams loamy fine sand, 0 to 5 percent slopes	2.0	3.5	1.5	2.5	---	---	1.5	2.5	12	20	--	50
Adams loamy fine sand, 5 to 12 percent slopes	2.0	2.5	1.5	2.5	---	---	1.5	2.5	10	12	--	40
Amenia stony loam, 0 to 8 percent slopes	3.0	4.5	2.5	4.5	---	---	2.5	3.5	12	18	--	70
Amenia stony loam, 8 to 15 percent slopes	3.0	4.0	2.5	3.5	---	---	2.5	3.5	12	18	--	70
Berkshire and Marlow stony loams, 0 to 3 percent slopes	3.0	5.0	2.0	4.0	---	---	2.0	3.0	15	20	--	60
Berkshire and Marlow stony loams, 3 to 12 percent slopes	3.0	5.0	2.0	4.0	---	---	2.0	3.0	15	20	--	60
Berkshire and Marlow stony loams, 12 to 25 percent slopes	2.0	3.0	2.0	3.0	---	---	2.0	2.5	--	--	--	--
Cabot stony loam, 0 to 8 percent slopes	---	4.0	1.5	3.0	---	---	1.0	3.0	--	15	--	--
Canandaigua silt loam	---	2.5	2.0	3.0	2.0	3.0	2.0	2.5	--	18	--	60
Colton gravelly sandy loam, 0 to 5 percent slopes	2.0	3.0	2.0	2.5	---	---	1.5	2.5	10	14	--	30
Colton gravelly sandy loam, 5 to 12 percent slopes	2.0	3.0	1.5	2.5	---	---	1.5	2.5	8	10	--	30
Covington silty clay, flooded	---	3.0	2.0	3.0	2.5	3.5	1.0	2.0	8	12	--	60
Covington and Panton silty clays	---	---	1.5	3.0	2.0	3.0	---	---	--	--	--	--
Duane fine sandy loam, 0 to 5 percent slopes	2.5	4.5	2.5	4.0	---	---	1.5	2.5	12	18	--	60
Duane fine sandy loam, 5 to 12 percent slopes	2.5	4.5	2.5	4.0	---	---	1.5	2.5	12	18	--	60
Dutchess stony loam, 3 to 8 percent slopes	3.0	5.0	2.0	3.0	---	---	1.5	3.0	15	20	--	--
Dutchess stony loam, 8 to 15 percent slopes	3.0	5.0	2.0	3.0	---	---	1.5	3.0	15	20	--	--
Dutchess stony loam, 15 to 25 percent slopes	2.0	4.0	1.5	3.0	---	---	1.0	2.0	--	--	--	--
Elmwood fine sandy loam, coarse variant, 0 to 8 percent slopes	3.0	4.5	2.5	3.5	---	---	1.5	2.5	12	20	--	--
Elmwood fine sandy loam, coarse variant, 8 to 15 percent slopes	3.0	4.5	2.5	3.5	---	---	1.5	2.5	12	20	--	--
Farmington stony silt loam, moderately deep variant, 3 to 8 percent slopes	3.5	5.5	3.0	4.5	---	---	1.5	2.5	10	16	--	--
Farmington stony silt loam, moderately deep variant, 8 to 15 percent slopes	3.5	5.5	3.0	4.5	---	---	1.5	2.5	10	16	--	--
Farmington stony silt loam, moderately deep variant, 15 to 25 percent slopes	2.0	3.0	2.0	3.0	---	---	1.0	2.0	8	12	--	--
Farmington-Nellis rocky complex, 5 to 12 percent slopes	2.5	4.0	2.0	3.0	---	---	2.0	2.5	10	15	--	--
Farmington-Nellis rocky complex, 12 to 20 percent slopes	2.0	3.0	1.5	2.5	---	---	1.0	2.0	10	14	--	--
Hadley very fine sandy loam	3.0	5.0	3.0	4.0	---	---	2.0	3.0	15	25	--	80
Hadley very fine sandy loam, frequently flooded	3.0	4.5	3.0	4.0	---	---	2.0	3.0	15	25	--	80
Limerick silt loam	---	3.0	2.5	3.5	---	2.5	---	---	--	12	--	50
Livingston clay	---	---	1.0	3.0	---	2.5	---	---	--	12	--	50
Lyman-Berkshire rocky complex, 5 to 12 percent slopes	2.0	4.0	2.0	3.0	---	---	1.0	2.5	10	15	--	--
Lyman-Berkshire rocky complex, 12 to 20 percent slopes	2.0	3.0	1.5	2.5	---	---	1.0	2.0	--	--	--	--
Massena stony silt loam, 0 to 3 percent slopes	---	4.0	2.0	3.0	---	---	1.5	2.5	6	15	--	--
Melrose fine sandy loam, 0 to 3 percent slopes	3.5	5.0	3.0	4.0	---	---	1.5	3.0	15	25	--	--
Melrose fine sandy loam, 3 to 8 percent slopes	3.5	5.0	3.0	4.0	---	---	1.5	3.0	15	25	--	--
Melrose fine sandy loam, 8 to 15 percent slopes	2.5	4.0	1.5	3.0	---	---	1.5	2.5	12	18	--	--
Melrose fine sandy loam, 15 to 25 percent slopes	2.0	3.0	1.5	2.5	---	---	1.0	1.5	--	--	--	--
Nassau-Dutchess rocky complex, 3 to 8 percent slopes	3.0	4.5	2.0	3.0	---	---	1.5	2.0	12	18	--	--

TABLE 2.—*Predicted average acre yields of principal crops under two levels of management*—Continued

Soil	Alfalfa hay		Clover hay		Birdsfoot trefoil hay		Oat hay		Corn for silage		Corn for grain	
	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*
Nassau-Dutchess rocky complex, 8 to 15 percent slopes	3.0	4.5	2.0	3.0	---	---	1.5	2.0	12	18	--	--
Nassau-Dutchess rocky complex, 15 to 25 percent slopes	2.0	3.0	1.5	2.5	---	---	1.0	2.0	--	--	--	--
Nellis stony loam, 3 to 8 percent slopes	4.0	6.0	3.0	4.5	---	---	2.0	3.0	14	25	--	--
Nellis stony loam, 8 to 15 percent slopes	4.0	6.0	3.0	4.5	---	---	2.0	3.0	14	25	--	--
Nellis stony loam, 15 to 25 percent slopes	3.0	5.0	2.5	3.5	---	---	1.5	2.5	12	20	--	--
Peru stony loam, 0 to 5 percent slopes	2.5	4.0	2.5	4.0	---	---	1.5	3.0	10	15	--	50
Peru stony loam, 5 to 12 percent slopes	2.0	4.0	2.0	4.0	---	---	1.0	2.5	--	--	--	60
Peru stony loam, 12 to 20 percent slopes	2.0	4.0	2.0	4.0	---	---	1.0	2.5	--	--	--	60
Raynham silt loam, 0 to 6 percent slopes	3.0	3.5	2.5	3.5	---	---	2.0	3.0	12	18	--	55
Raynham silt loam, 6 to 12 percent slopes	3.0	3.5	2.5	3.5	---	---	2.0	3.0	12	18	--	55
Raynham silt loam, 12 to 25 percent slopes	2.5	4.0	2.0	4.0	---	---	2.0	3.0	--	--	--	55
Salmon very fine sandy loam, 2 to 6 percent slopes	3.0	5.5	2.5	4.5	---	---	2.0	3.5	15	25	--	--
Salmon very fine sandy loam, 6 to 12 percent slopes	3.0	5.5	2.5	4.5	---	---	2.0	3.5	15	25	--	--
Salmon very fine sandy loam, 12 to 50 percent slopes (Yields given for slopes up to 25 percent.)	2.5	4.0	2.0	3.0	---	---	1.5	2.5	12	16	--	--
Stetson gravelly fine sandy loam, 0 to 5 percent slopes	3.0	5.0	2.0	3.5	---	---	2.0	3.0	15	20	--	--
Stetson gravelly fine sandy loam, 5 to 12 percent slopes	3.0	5.0	2.0	3.5	---	---	2.0	3.0	15	20	--	--
Stetson gravelly fine sandy loam, 12 to 30 percent slopes (Yields given for slopes up to 20 percent.)	2.0	4.0	2.0	2.5	---	---	1.0	2.0	--	--	--	--
Swanton fine sandy loam	2.0	4.0	2.0	3.0	---	---	1.5	2.5	12	18	--	--
Vergennes clay, 2 to 6 percent slopes	3.5	5.0	2.0	3.5	3.5	4.5	2.0	2.5	12	18	--	--
Vergennes clay, 6 to 12 percent slopes	3.5	5.0	2.0	3.5	3.5	4.5	2.0	2.5	12	18	--	--
Vergennes clay, 12 to 25 percent slopes	3.0	4.0	1.5	2.5	2.0	3.0	---	---	--	--	--	--
Vergennes rocky clay, moderately shallow variant, 2 to 6 percent slopes	2.0	3.0	1.5	2.5	2.0	3.0	1.0	2.0	10	12	--	--
Vergennes rocky clay, moderately shallow variant, 6 to 12 percent slopes	2.0	3.0	1.5	2.5	2.0	3.0	1.0	2.0	10	12	--	--
Vergennes rocky clay, moderately shallow variant, 12 to 25 percent slopes	1.5	2.5	1.0	2.0	1.5	3.0	1.0	2.0	8	10	--	--
Walpole silt loam	---	2.5	2.0	3.5	---	---	1.0	2.0	--	16	--	50
Winooski very fine sandy loam	2.5	4.5	3.0	4.0	---	---	1.5	3.0	15	22	--	70

Yields indicated under columns B represent the predicted average yields for a period of 5 years or more under improved management. Under improved management, enough lime, fertilizer, and manure is applied; suitable cropping systems are used; drainage systems are constructed if needed; runoff, erosion, weeds, brush, insects, and plant diseases are controlled; seedbeds are prepared properly; and suitable crops and varieties are selected. The yields in columns B are not the maximum that can be obtained. They are an indication of what most farmers can reach in yields if they use improved management. The yields on the same soil may vary from year to year because of differences in weather, number and kinds of insects and diseases, kind of management, and the varieties of crops grown.

Use of the Soils as Woodland [1]

This section relates briefly some general information about the woodland in Addison County and describes each of three major areas of woodland in the county. It also rates the soils according to their suitability for trees and gives estimated yields of specified trees according to site class.

The 1965 Forest Survey made by the U.S. Forest Service reports the commercial woodland acreage of Addison County as approximately 271,000 acres, or 54 percent of the total county area. About 10 percent of the county is unsuitable for the production of commercial timber. Soils unsuitable for commercial timber production are very poor for the growth of trees. In 1965 a little more than 15 million board feet of timber, consisting of 20 percent softwoods and 80 percent hardwoods, were cut within the county; and 17 million board feet were utilized in the 24 wood processing mills in the county. The general condition of the woodland indicates that this cut can be maintained and even increased if the woodlands are given good management.

The woodlands in the county have been grouped into three major areas, each made up of two or more soil

[1] ROBERT A. FARRINGTON, senior forester, Vermont Department of Forests and Parks, assisted in the preparation of this section.

associations. The three areas broadly coincide with the distribution of major trees. Within each area the productivity of these trees, the land uses, and the general management of woodland are roughly the same. The major areas are described as follows:

Champlain Valley (soil associations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11).—The Champlain Valley comprises 60 percent of the acreage in the county. Here, the major trees are hickory, oak, basswood, ash, soft maple, sugar maple, white pine, hemlock, and cedar. This area contains most of the operating farms, and the woodland is characteristically in small woodlots. Farming is important, and woodlots receive extremely good or extremely poor management.

Foothills (soil associations 13, 15, 16, 17).—In the foothills, which occur mainly between the main range of the Green Mountains and the Champlain Valley, the major trees are soft maple, sugar maple, white birch, yellow birch, beech, black birch, ash, basswood, elm, white pine, red spruce, and hemlock. This is a transitional area between the farm woodlots of the Champlain Valley and the larger tracts in the Green Mountains. There are many abandoned farms in this area, and these farms are now in private ownership of various kinds. The caliber of management is generally better than that in the Champlain Valley. Much of this area is within the boundaries of the Green Mountain National Forest.

Green Mountains (soil associations 12 and 14).—The main mountains of the Green Mountain Range occur in the eastern part of the county. Here, the major trees are yellow birch, beech, sugar maple, ash, basswood, white birch, red spruce, and balsam fir. This area contains much steep, rough land. With a few exceptions, farms have been abandoned. Presently, much of the area is national forest or is owned by large private parties. Generally, the best management is practiced in this area because a large part of the area, or 78,943 acres, is national forest.

Severe and wasteful cutting of woodland is, in general, changing to more conservative and scientific management. Change in land use contributes to better management, fewer owners, and slightly larger ownerships. Future trends forecast by the U.S. Forest Service and the Vermont Department of Forests and Parks indicate a larger need for wood in one form or another. The pattern and size of ownership will probably continue to change. Diversified uses of woodland for recreation, water control, rural residences, and community development are likely to continue.

Wood production, like any crop dependent upon soil capabilities and fertility, yields the best returns from the best soils. Only 54 percent of this county is wooded; therefore, nearly half of the land is in other uses, particularly farming, recreation, and rural nonfarm residences. Because these uses demand the best soils, it is assumed that only a small part of the best woodland sites are available for wood production.

Woodland interpretations

In table 3 the soils of the county are rated according to their productivity and limitations for use as woodland. In this table the soils are rated excellent, good, fair, and poor for the growth of northern hardwoods, white pine, and red spruce. Also listed are factors that affect management and the degree and kind of limitations that influence the establishment of timber trees or Christmas trees in plantations.

Estimated productivity ratings of the soils for natural stands of trees are based on site indexes. The site index for a given species of tree on a given soil is the average total height attained by dominant and codominant trees at the age of 50 years. Site index studies were not made on all soils in the county. Site index information for soils on which studies were not made is based on studies made on similar soils in Vermont, Maine, and New Hampshire.

Site class represents a grouping of site indexes within a defined range for a species, or a combination of species, of trees. Site class ratings are normally designated as I, II, III, and IV, or as used in table 3, *excellent, good, fair,* and *poor,* respectively.

With the ratings in table 3, the following yield data can be used to estimate for each mapping unit the average growth per acre of unmanaged stands of red spruce, white pine, and northern hardwoods at age 50 years. For red spruce and northern hardwoods, all trees have a diameter of 12 inches at breast height and up to an 8-inch top. For white pine, all trees have a diameter of 7 inches at breast height and up to a 6-inch top.

Forest species and productivity ratings	*Site index range*	*Average yield per acre*
	Feet	*Board Feet*
Red spruce:		
Excellent	50 and more	11,700
Good	40 to 49	9,900
Fair	30 to 39	5,800
Poor	29 or less	2,000
White pine:		
Excellent	70 and more	50,000
Good	60 to 69	36,000
Fair	50 to 59	24,000
Poor	49 or less	14,000
Northern hardwoods:		
Excellent	59 and more	3,000
Good	53 to 58	2,300
Fair	45 to 52	900
Poor	44 or less	

In table 3 the soils given a rating of *excellent* are capable of producing high yields of good quality forest crops. Intensive management is justified on these soils. The soils given a rating of *good* have an average potential for woodland use. Growth rates of adapted species are slower than on excellent sites. Management can be justified on these soils, but management is not so intensive as on the soils with an excellent rating. The soils rated *fair* have less than average potential for woodland use. Good timber can be produced on these soils but growth rates are slow. The soils rated *poor* are generally unsuited for timber production. Growth rates are very slow. Soils are generally ex-

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TABLE 3.—*Estimated productivity and limitations of the soils for trees*

Soil series and map symbols	Estimated productivity ratings for natural stands of—			Factors affecting management		Limitations for establishing plantations of timber and Christmas trees					
	Northern hardwoods	White pine	Red spruce	Limitations for survival of planted seedlings	Windthrow hazard	Sugar maple	White pine	Red pine	Norway spruce	White spruce and balsam fir	Scotch pine
Adams: (AdA, AdB, AdD, AdE)	Good	Good	Good	Moderate: droughty.	Slight	Severe: droughty.	Moderate: [1] droughty.	Moderate: [1] droughty.	Moderate: droughty.	Severe: droughty.	Slight.
Amenia: (AmB, AmC, AsC, AsD)	Excellent.	Excellent.	Excellent.	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Berkshire and Marlow: (BeA, BeB, BeC, BsC, BsE)	Good	Good	Excellent.	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Buckland: (BuC, BuD)	Excellent.	Excellent.	Excellent.	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Cabot: (CaB, CbC)	Fair	Good	Excellent.	Severe: wet.	Moderate: wet.	Moderate: wet.	Moderate: wet.	Severe: wet.	Moderate: wet.	Slight	Severe: wet.
Calais: (ClC, ClE) (For interpretations of the Glover soils in these mapping units, see the Glover series.)	Good	Good	Excellent.	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Canandaigua: (Cn)	Fair	Good	Excellent.	Moderate: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Moderate: wet.	Severe: wet.
Cobbly alluvial land: (Co) (Not suitable for productive woodland.)											
Colton: (CtA, CtB, CtD, CtE)	Good	Good	Good	Moderate: droughty.	Slight	Severe: droughty.	Moderate: [1] droughty.	Moderate: [1] droughty.	Moderate: droughty.	Severe: droughty.	Slight.
Covington: (Cv)	Fair	Good	Excellent.	Severe: frequent flooding,	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Moderate: wet.	Severe: wet.

				frost heave.								
Covington and Panton: (Cw)	Fair	Good	Excellent	Severe: wet, frost heave.	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Severe: wet.	Moderate: wet.	Severe: wet.
Duane: (DaA, DaB)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Dutchess: (DcB, DcC, DcD, DsC, DsE)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Elmwood, coarse variant: (ElB, ElC)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Farmington: (FaC, FaE)	Fair	Fair	Fair	Severe: droughty.	Severe: shallow.	Severe: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Severe: droughty.	Severe: droughty.
(FdB, FdC, FdD, FdE)	Good	Fair	Good	Severe: droughty.	Moderate: shallow.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Severe: droughty.	Severe: droughty.
(FnB, FnC, FnD) (For interpretations of the Nellis soils in FnB, FnC, and FnD, see the Nellis series.)	Fair	Fair	Fair	Severe: droughty.	Severe: shallow.	Severe: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Severe: droughty.	Severe: droughty.
Fresh water marsh: (Fw) (Not suitable for productive woodland.)											
Glover (Mapped only with Calais soils.)	Good	Fair	Good	Severe: droughty.	Moderate: shallow.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Slight.
Hadley: (Hf)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
(Hh)	Good	Good	Excellent	Severe: frequent flooding.	Slight	Slight[2]	Slight[2]	Slight[2]	Slight[2]	Slight[2]	Slight[2]
Limerick: (Le)	Fair	Good	Excellent	Severe: wet.	Severe: wet.	Severe:[2] wet.	Moderate:[2] wet.	Severe:[2] wet.	Moderate:[2] wet.	Slight[2]	Severe:[2] wet.
(Lf)	Poor	Fair	Fair	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.
Livingston: (Lh, Lk)	Poor	Fair	Fair	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.

TABLE 3.—*Estimated productivity and limitations of the soils for trees*—Continued

Soil series and map symbols	Estimated productivity ratings for natural stands of—			Factors affecting management		Limitations for establishing plantations of timber and Christmas trees					
	Northern hardwoods	White pine	Red spruce	Limitations for survival of planted seedlings	Windthrow hazard	Sugar maple	White pine	Red pine	Norway spruce	White spruce and balsam fir	Scotch pine
Lyman (LmB, LmC)	Good	Fair	Good	Severe: droughty.	Severe: shallow.	Slight	Slight	Slight	Slight	Slight	Slight.
(LxC, LxE) (For interpretations of the Berkshire soils in these mapping units, see the Berkshire and Marlow series.)	Good	Fair	Good	Severe: droughty.	Severe: shallow.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Slight.
Massena: (MaA, MnB)	Fair	Good	Excellent	Moderate: wet.	Moderate: wet.	Severe: wet.	Moderate: wet.	Severe: wet.	Moderate: wet.	Slight	Severe: wet.
Melrose: (MrA, MrB, MrC, MrD, MrE)	Good	Good	Excellent	Slight	Slight	Moderate: droughty.	Moderate: [1] droughty.	Slight	Moderate: [1] droughty.	Moderate: droughty.	Slight.
Muck and Peat: (Mv)	Poor	Poor	Poor	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.	Severe: very wet.
Nassau: (NaB, NaC, NaD) (For interpretations of the Dutchess soils in these mapping units, see the Dutchess series.)	Good	Fair	Good	Moderate: shallow.	Moderate: shallow.	Slight	Slight	Slight	Slight	Slight	Slight.
(NdC)	Good	Fair	Good	Moderate: droughty.	Moderate: shallow.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Slight.
Nellis: (NeB, NeC, NeD, NsC, NsD)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Peru: (PeA, PeB, PeC, PsC, PsD)	Excellent	Excellent	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.

Raynham: (RaB, RaC, RaD)	Excellent	Excellent	Excellent	Severe: wet.	Severe: wet.	Slight	Slight	Severe: wet.	Slight	Slight	Slight.
Rock land: (Rk) (Too shallow to be suitable for trees.)											
Salmon: (SaB, SaC, SaE)	Good	Good	Excellent	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
Stetson: (StA, StB, StD, StE)	Good	Good	Good	Slight	Slight	Moderate: droughty.	Moderate: [1] droughty.	Slight	Moderate: [1] droughty.	Moderate: droughty.	Slight.
Swanton: (Sw)	Fair	Good	Excellent	Severe: wet.	Severe: wet.	Severe: wet.	Moderate: wet.	Severe: wet.	Moderate: wet.	Slight	Moderate: wet.
Vergennes: (VgB, VgC, VgD, VgE)	Excellent	Excellent	Excellent	Severe: frost heaving.	Slight	Slight	Slight	Moderate: reaction, fine textured.	Slight	Slight	Slight.
(VrB, VrC, VrD)	Good	Fair	Good	Severe: frost heaving.	Slight	Slight	Slight	Moderate: reaction, fine textured.	Slight	Slight	Slight.
Walpole: (Wa)	Fair	Good	Excellent	Severe: wet.	Severe: wet.	Severe: wet.	Moderate: wet.	Severe: wet.	Moderate: wet.	Slight	Moderate: wet.
Winooski: (Wo)	Excellent	Excellent	Excellent	Severe: frequent flooding.	Slight	Severe: wet.	Slight [2]	Slight [2]	Slight [2]	Slight [2]	Slight. [2]

[1] Slight on north and east slopes of less than 25 percent.
[2] Ratings are for trees that survive the seedling stage.

tremely dry or extremely wet. Forest management for wood crop production is seldom justified on these soils, except for special cases such as watershed protection or wildlife development.

The information given for the capability of the various soils to produce trees is based on soil-forest site studies made by the Soil Conservation Service, the Maine Forest Service, the New Hampshire Extension Service, and the Vermont Department of Forests and Parks.

The yield data are from the following sources: Red spruce—from an unpublished site index curve prepared by the Soil Conservation Service and the Vermont Department of Forests and Parks; white pine—USDA Bulletin 13 (*7*); northern hardwoods—site indexes and volume from unpublished data developed by the Soil Conservation Service and the Vermont Department of Forests and Parks.

For northern hardwoods, the estimated productivity ratings and the percentage of the total acreage of each major woodland area in the county having these ratings are as follows:

	Excellent	*Good*	*Fair and poor*
	Percent	*Percent*	*Percent*
Champlain Valley	43	19	38
Foothills	19	68	13
Green Mountains	3	79	18

For red spruce, the ratings and percentages are:

	Excellent	*Good*	*Fair and poor*
	Percent	*Percent*	*Percent*
Champlain Valley	73	8	19
Foothills	94	5	1
Green Mountains	32	50	18

Among the factors affecting management of woodland soils are limitations for survival of planted seedlings and windthrow hazard. These limitations and the limitations for establishing plantations of timber and Christmas trees are rated *slight, moderate,* or *severe.* If the rating is moderate or severe, the cause of limitation, such as wet, droughty, or shallow is given.

Seedling survival.—Even when healthy seedlings of a suitable tree are correctly planted or occur naturally in adequate numbers, some of them will not survive if characteristics of the soil are unfavorable. The ratings reflect the percent of survival. Where the soil properties present no special problems and the survival rate is 85 percent or more, the rating is *slight.* The rating is *moderate* if the soil properties inhibit survival and the survival rate is less than 85 percent but more than 50 percent. If the soil properties make survival doubtful and special practices or special planting stock must be used to insure a survival rate of 50 percent or more, then the rating is *severe.*

Windthrow hazard.—Soil characteristics affect the development of tree roots and the firmness with which the roots anchor the tree in the soil so that it resists the force of the wind. The windthrow hazard is *slight* if roots hold the tree firmly against a normal high velocity wind and individual trees are likely to remain standing if protective trees on all sides are removed. The soils with this rating are more than 20 inches deep and not more wet than moderately well drained. The hazard is *moderate* if trees remain standing unless wind velocity is high and soils are unusually wet. The soils with this rating are generally somewhat poorly drained or poorly drained. Some better drained soils are also rated moderate if they are only 10 to 20 inches deep to bedrock or to a pan layer that limits the depth of roots. A rating of *severe* indicates that the rooting is not deep enough to give adequate stability against normal wind. Individual trees are likely to be blown over if they are released on all sides. Soils with this rating are very poorly drained or are less than 10 inches deep to bedrock or to a firm layer that prevents root penetration.

Limitations for establishing plantations of six species of timber and Christmas trees are rated for each soil in the county. A rating of *slight* means good to excellent growth on most sites and no soil limitations to tree planting and managing for timber or Christmas tree production. A *moderate* rating means fair to poor growth on most sites and slight or moderate soil limitations to tree planting and managing. A rating of *severe* indicates poor growth on most sites and severe soil limitations to tree planting and managing.

The use of logging equipment can be limited by several soil conditions or a combination of them. Some of these conditions are steep slopes, surface stones, outcrops of bedrock, and seasonal high water tables. Also, a surface layer that contains a large amount of clay or silt is a limitation to the use of logging equipment because traction is poor if the layer is wet.

In general, soils having slopes up to 25 or 30 percent have moderate limitations for the use of logging equipment. Soils having slopes of more than 30 percent have, in general, severe limitations for the use of logging equipment.

Extremely stony soils vary from place to place in the amount of large stones on the surface, but generally there are enough surface stones on these soils to impose moderate limitations on the use of logging equipment, particularly wheel tractors. If the soils are covered with snow, the limitations are reduced.

Very rocky and extremely rocky soils vary from place to place in the number and size of rock outcrops, but in general, they are moderately to severely limited. In most places, very rocky and extremely rocky soils are covered with many loose stones. Rock land, a miscellaneous land type, varies in slope from nearly level to very steep, and limitations on the use of equipment vary accordingly from slight to very severe.

Somewhat poorly drained and poorly drained soils have a high water table and are normally wet from about the middle of the fall to fairly late in the spring. During this period, except when the soils are frozen hard, traction for logging equipment is poor, and the equipment may get stuck in wet, soft areas. These soils, therefore, have severe limitations.

Very poorly drained mineral soils are wet and soft during the entire year except for a brief period in the summer. Traction on them is poor or very poor, and equipment may get stuck unless the soils are frozen hard. Muck and Peat, a land type, is wet throughout

the year, and the organic material is very soft. Therefore, it has very severe limitations for the use of logging equipment. It is rarely frozen hard enough to carry heavy logging equipment.

Soils having a surface layer of clay or silty clay have poor trafficability when the surface gets wet. Such soils are the Vergennes, Panton, Covington, and Livingston soils. This is also true of some soils having a silt loam surface layer, particularly the soils of the Canandaigua, Limerick, and Raynham series. All of these soils have a subsurface layer that has the same characteristics as the surface layer. These soils have severe limitations for trafficability.

Use of the Soils for Wildlife[2]

The soils of Addison County support several general types of vegetation that provide habitats well suited to wildlife.

The hill sections, containing the Green Mountain National Forest, are covered by hardwood trees. Stands of conifer trees are restricted largely to areas of shallow, rocky soils or to poorly drained soils of the intermediate valleys. Wildlife associated with the soils in the hills, are deer, bear, bobcat, snowshoe hare, ruffed grouse, beaver, red fox, porcupine, small mammals, and songbirds.

In the Champlain Valley, there are large acreages used for intensive dairy farming. Principal crops in these areas are grasses and legumes, managed in long rotations with silage corn. Small areas of native vegetation, consisting of herbaceous plants, shrubs, or hardwood trees, occupy the wet soils or shallow soils having outcrops of bedrock, which are widely interspersed throughout the farmland. Wildlife associated with the valley soils are deer, cottontail rabbit, ruffed grouse, woodcock, woodchuck, raccoon, red fox, muskrat, beaver, small mammals, and songbirds. The larger, slow-moving streams, as well as the seasonally flooded stream borders and potholes, furnish habitat for waterfowl.

Deer occur in certain areas within soil associations that generally are not well suited as habitats for deer. This is because there are so many deer in the State that the better ranges have deteriorated and the deer have moved into adjacent, but less suitable, areas.

Within the Champlain Valley there are large acreages of wetlands under intensive management for waterfowl and furbearers. The Vermont Department of Fish and Game has constructed dikes to control water levels and manages adjacent fields for waterfowl food production. These managed wetland soils provide breeding areas for wood, black, and mallard ducks; Canada geese; and muskrats; as well as many species of shore birds and songbirds. The marshes provide feeding and resting areas for scaup, goldeneye, redhead duck, ringneck duck, mergansers, and Canada geese during migration.

[2] E. A. SWENSON, biologist, Soil Conservation Service, and personnel of the Vermont Department of Fish and Game assisted in preparing this section.

Limitations of the soils for wildlife habitat

In table 4 the soils are rated according to their limitations for selected habitat elements and for three major kinds of wildlife. These ratings can aid landowners in the selection of sites to be managed as wildlife habitat. They indicate the intensity of management needed, and they provide a basis for grouping soils so that management of broad areas can be planned.

The major soil characteristics evaluated are depth to rock, droughtiness, stoniness, wetness, risk of flooding, hazard of erosion, and slope. Also considered are the ease of establishment, survival, vigor of growth, longevity, productivity, as well as the degree of management required to develop a specific habitat element.

Present land use and existing vegetation are not considered in the rating system. Mapping units are rated without regard to adjoining mapping units. The size, shape, or location of the mapping unit does not affect the rating.

The habitat elements and the criteria for rating the soils according to their limitations for them are defined as follows:

Planted small grains and corn.—Cultivated grains or seed-producing annuals, such as corn, oats, wheat, rye, millet, buckwheat, and sunflowers, that have been planted to produce wildlife food. The rating is *slight* if the soils have few or no limitations for repeated annual planting and there is reliable production of all suitable species. A *moderate* rating indicates that soils have some limitations for the establishment of plantings and reliability of production. If soil conditions are such that the choice of species is very limited, their establishment is difficult, and the reliability of production is low, the rating is *severe*. A rating of *very severe* is given if soil conditions are such that small grains and corn cannot be grown.

Planted grasses and legumes.—Domestic perennial grasses and legumes, such as fescue, bromegrass, bluegrass, redtop, timothy, orchardgrass, reed canarygrass, clover, trefoil, vetches, and alfalfa, that have been planted to furnish wildlife cover and food. The rating is *slight* if the soils have few or no limitations for planting a wide variety of grasses and legumes that are long-lived and do not require intensive management. A rating of *moderate* is given if the soils have some limitations for planting a wide variety of grasses and legumes. Intensive management may be required for long-lived stands. A rating of *severe* indicates that soil conditions are such that the choice of species is very limited and management is difficult. The rating is *very severe* if soil conditions are such that it is very difficult or impractical to plant grasses and legumes.

Wild herbaceous upland plants.—Naturally established grasses and other plants, such as bluestem, oatgrass, foxtail, quackgrass, pokeweed, nightshade, goldenrod, dandelion, ragweed, and strawberries, that are used for food and cover principally by upland forms of wildlife. The rating is *slight* if the soils have few or no limitations for the natural establishment and vigorous growth of a wide variety of species. A rating of *moderate* is given if soil conditions limit the variety of

TABLE 4.—*Limitations of the soils for wildlife habitat and kinds of wildlife*

Soil series and map symbols	Habitat elements							Kinds of wildlife		
	Planted small grains and corn	Planted grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Conifers	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
Adams:										
(AdA, AdB)	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Very severe: droughty.	Very severe: droughty.	Moderate	Severe	Very severe.
(AdD, AdE)	Very severe: droughty; steep to very steep slopes.	Very severe: droughty; steep to very steep slopes.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Very severe: droughty.	Very severe: steep to very steep slopes.	Severe	Severe	Very severe.
Amenia:										
(AmB)	Moderate: moist; gentle slopes.	Slight	Slight	Slight	Severe: rapid growth.	Severe	Very severe: gentle slopes.	Slight	Slight	Severe.
(AmC)	Moderate: moist; gentle slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: gentle slopes.	Slight	Slight	Very severe.
(AsC, AsD)	Very severe: stony; moist.	Very severe: stony.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Very severe.	Moderate	Very severe.
Berkshire and Marlow:										
(BeA)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
(BeB)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Slight	Slight	Very severe.
(BeC)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
(BsC, BsE)	Very severe: stony; steep slopes.	Very severe: stony; steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate to steep slopes.	Severe	Moderate	Very severe.
Buckland:										
(BuC, BuD)	Very severe: stony; moist.	Very severe: stony.	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Severe to very severe: moderate slopes.	Severe	Moderate	Very severe.
Cabot:										
(CaB)	Severe:	Moderate:	Moderate:	Slight	Moderate:	Moderate:	Slight to	Moderate	Moderate	Slight to

	gentle slopes; wet.	wet.	wet.		wet.	gentle slopes.	severe: gentle slopes.		very severe.
(CbC)	Very severe: stony; wet.	Very severe: stony; wet.	Moderate: wet.	Slight	Moderate: wet.	Moderate to severe: gentle to moderate slopes.	Slight to very severe: gentle to moderate slopes.	Severe	Moderate	Slight to very severe.
Calais: (ClC, ClE) (For Glover part of ClC and ClE, see Glover series.)	Very severe: stony; steep slopes.	Very severe: stony; steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate to steep slopes.	Severe	Moderate	Very severe.
Canandaigua: (Cn)	Severe: wet; gentle slopes.	Moderate: wet.	Moderate: wet.	Slight	Moderate: wet.	Slight to moderate: gentle slopes.	Slight to moderate: gentle slopes.	Moderate	Moderate	Slight to severe.
Cobbly alluvial land: (Co)	Very severe: flooding.	Very severe: flooding.	Moderate: droughty.	Slight	Severe: flooding.	Very severe: droughty.	Very severe: too dry.	Very severe.	Moderate	Very severe.
Colton: (CtA, CtB)	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Very severe: droughty.	Very severe: droughty.	Moderate	Moderate	Very severe.
(CtD)	Severe: droughty; steep slopes.	Very severe: droughty; steep slopes.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Very severe: droughty.	Very severe: steep slopes.	Severe	Severe	Very severe.
(CtE)	Very severe: droughty; very steep slopes.	Very severe: droughty; very steep slopes.	Moderate: droughty.	Moderate: droughty.	Moderate: droughty.	Very severe: droughty.	Very severe: very steep slopes.	Severe	Severe	Very severe.
Covington: (Cv)	Severe: wet; flooding.	Moderate: wet; flooding.	Moderate: wet; flooding.	Slight	Moderate: wet.	Slight	Moderate: flooding.	Moderate	Moderate	Moderate.
(Cw)	Severe: wet; gentle slopes.	Moderate: wet.	Moderate: wet.	Slight	Moderate: wet.	Moderate: gentle slopes.	Moderate: gentle slopes.	Moderate	Moderate	Moderate.
Duane: (DaA)	Moderate: moist; gentle slopes.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Severe: too dry.	Slight	Slight	Severe.
(DaB)	Moderate: moist; moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Very severe: moderate slopes.	Slight	Slight	Severe.

TABLE 4.—*Limitations of the soils for wildlife habitat and kinds of wildlife*—Continued

Soil series and map symbols	Habitat elements							Kinds of wildlife		
	Planted small grains and corn	Planted grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Conifers	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
Dutchess:										
(DcB)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
(DcC)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
(DcD)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Moderate	Moderate	Very severe.
(DsC, DsE)	Very severe: stony; moderate slopes.	Very severe: stony.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Severe	Moderate	Very severe.
Elmwood, coarse variant:										
(ElB, ElC)	Moderate: moist; gentle or moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Very severe: too dry; gentle slopes.	Slight	Slight	Slight.
Farmington										
(FaC, FaE)	Very severe: shallow to rock.	Very severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate to steep slopes.	Severe	Severe	Very severe.
(FdB)	Moderate: gentle slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: droughty; gentle slopes.	Slight	Moderate	Very severe.
(FdC)	Moderate: moderate slopes.	Moderate: moderate slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Slight	Moderate	Very severe.
(FdD)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
(FdE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: very steep slopes.	Severe	Moderate	Very severe.
(FnB)	Moderate: shallow to rock; droughty.	Moderate: shallow to rock.	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate slopes.	Slight	Moderate	Very severe.
(FnC)	Severe:	Moderate:	Slight	Slight	Severe:	Very	Very	Slight	Moderate	Very

	shallow to rock; steep slopes.	shallow to rock; steep slopes.			rapid growth.	severe: droughty.	severe: steep slopes.			severe.
(FnD) (For Nellis part of FnB, FnC, FnD, see the Nellis series.)	Very severe: shallow to rock; very steep slopes.	Very severe: shallow to rock; very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: very steep slopes.	Moderate	Moderate	Very severe.
Fresh water marsh: (Fw)	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Slight	Slight	Very severe.	Very severe.	Slight. (Does not consider planting small grain and corn.)
Glover: (Mapped only with Calais soils.)	Very severe: shallow to rock; stony.	Very severe: shallow to rock; stony.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate to steep slopes.	Severe	Severe	Very severe.
Hadley:										
(Hf)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
(Hh)	Moderate: subject to flooding.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
Limerick:										
(Le)	Severe: wet; subject to flooding.	Moderate: wet; subject to flooding.	Moderate: wet; subject to flooding.	Slight	Moderate: wet.	Slight	Moderate: subject to flooding.	Moderate	Moderate	Moderate.
(Lf)	Very severe: very wet; subject to flooding.	Severe: very wet; subject to flooding.	Severe: very wet; subject to flooding.	Slight	Slight	Slight	Severe: subject to flooding.	Severe	Slight	Moderate.
Livingston:										
(Lh)	Very severe: very wet.	Severe: very wet.	Severe: very wet.	Slight	Slight	Slight	Slight	Severe	Slight	Slight.
(Lk)	Very severe: very wet; subject to flooding.	Severe: very wet; subject to flooding.	Severe: very wet; subject to flooding.	Slight	Slight	Slight	Moderate: subject to flooding.	Severe	Slight	Moderate.
Lyman:										
(LmB, LmC) (For Berkshire part of LmB and LmC, see mapping unit BeC under the Berkshire series.)	Severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate to steep slopes.	Moderate	Moderate	Very severe.

TABLE 4.—*Limitations of the soils for wildlife habitat and kinds of wildlife*—Continued

Soil series and map symbols	Habitat elements							Kinds of wildlife		
	Planted small grains and corn	Planted grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Conifers	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
(LxC, LxE) (For Berkshire part of LxC and LxE, see mapping units BsC and BsE under the Berkshire series.)	Very severe: shallow to rock.	Very severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate to steep slopes.	Severe	Severe	Very severe.
Massena:										
(MaA)	Severe: wet.	Moderate: wet.	Moderate: wet.	Slight	Moderate: wet.	Slight	Slight	Moderate	Moderate	Slight.
(MnB)	Very severe: wet; stony.	Very severe: wet; stony.	Moderate: wet.	Slight	Moderate: wet.	Slight to severe: moderate slopes.	Slight to very severe: gentle to moderate slopes.	Severe	Moderate	Slight to very severe.
Melrose:										
(MrA, MrB)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: too dry.	Slight	Slight	Very severe.
(MrC)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Slight	Slight	Very severe.
(MrD)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
(MrE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: very steep slopes.	Severe	Moderate	Very severe.
Muck and Peat:										
(Mv)	Very severe: very wet.	Severe: very wet.	Very severe: very wet.	Slight	Slight	Slight	Slight	Severe	Slight	Slight to moderate.
Nassau:										
(NaB)	Severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: gentle slopes.	Moderate	Moderate	Very severe.
(NaC)	Severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: gentle slopes.	Moderate	Moderate	Very severe.
(NaD)	Very severe: shallow to rock;	Severe: shallow to rock; steep	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: steep slopes.	Moderate	Moderate	Very severe.

	steep slopes.	slopes.								
(NdC)	Very severe: shallow to rock.	Very severe: shallow to rock.	Moderate: shallow to rock.	Moderate: shallow to rock.	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate slopes.	Severe	Severe	Very severe.
(For Dutchess parts of NaB, NaC, and NaD, see the Dutchess series.)										
Nellis:										
(NeB)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: gentle slopes.	Slight	Slight	Very severe.
(NeC)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Slight	Slight	Very severe.
(NeD)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
(NsC, NsD)	Very severe: stony; moderate slopes.	Very severe: stony.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: gentle to moderate slopes.	Severe	Moderate	Very severe.
Peru:										
(PeA)	Moderate: moist.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Severe: too dry.	Slight	Slight	Severe.
(PeB)	Moderate: moderate slopes; moist.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry; steep slopes.	Very severe: moderate slopes.	Slight	Slight	Severe.
(PeC)	Severe: steep slopes; moist.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; very steep slopes.	Very severe: steep slopes.	Moderate	Slight	Very severe.
(PsC, PsD)	Very severe: stony; moist.	Very severe: stony.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; steep slopes.	Very severe: nearly level to steep slopes.	Severe	Moderate	Very severe.
Quarry:										
(Qu) (Properties are so variable that interpretations were not made.)										
Raynham:										
(RaB, RaC)	Moderate: moist; gentle slopes.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Very severe: too dry; gentle slopes.	Slight	Slight	Severe.

TABLE 4.—*Limitations of the soils for wildlife habitat and kinds of wildlife*—Continued

Soil series and map symbols	Habitat elements							Kinds of wildlife		
	Planted small grains and corn	Planted grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Conifers	Wetland plants	Shallow water areas	Openland	Woodland	Wetland
(RaD)	Severe: steep slopes; moist.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; steep slopes.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
Rock land: (Rk)	Very severe: very rocky; shallow.	Very severe: very rocky; steep slopes.	Variable; requires onsite determinations.	Variable; requires onsite determinations.	Variable; requires onsite determinations.	Very severe: droughty.	Very severe: too dry; steep slopes.	Very severe.	Variable; requires onsite determinations.	Very severe.
Salmon: (SaB)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: droughty.	Slight	Slight	Very severe.
(SaC)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: moderate slopes.	Slight	Slight	Very severe.
(SaE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: very steep slopes.	Severe	Moderate	Very severe.
Stetson: (StA)	Slight	Slight	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: droughty.	Slight	Slight	Very severe.
(StB)	Moderate: moderate slopes.	Slight	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: moderate slopes.	Slight	Slight	Very severe.
(StD)	Severe: steep slopes.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: steep slopes.	Severe	Moderate	Very severe.
(StE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: droughty.	Very severe: very steep slopes.	Severe	Moderate	Very severe.
Swanton: (Sw)	Severe: wet.	Moderate: wet.	Moderate: wet.	Slight	Moderate: wet.	Slight	Slight	Moderate	Moderate	Slight.
Vergennes: (VgB, VgC)	Moderate: gentle slopes; moist.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Very severe: gentle slopes.	Moderate	Slight	Very severe.

(VgD)	Severe: steep slopes; moist.	Moderate: steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; steep slopes.	Very severe: steep slopes.	Moderate	Slight	Very severe.
(VgE)	Very severe: very steep slopes; moist.	Very severe: very steep slopes.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; very steep slopes.	Very severe: very steep slopes.	Severe	Slight	Very severe.
Vergennes, moderately shallow variant:										
(VrB, VrC)	Moderate: gentle slopes; shallow to rock.	Moderate: gentle slopes; shallow to rock.	Slight	Slight	Severe: rapid growth.	Very severe: too dry.	Very severe: gentle slopes.	Moderate	Moderate	Very severe.
(VrD)	Severe: steep slopes; shallow to rock.	Moderate: steep slopes; shallow to rock.	Slight	Slight	Severe: rapid growth.	Very severe: too dry; steep slopes.	Very severe: steep slopes.	Moderate	Moderate	Very severe.
Walpole:										
(Wa)	Severe: wet.	Moderate: wet.	Moderate: wet.	Slight	Moderate: wet.	Slight	Slight	Moderate	Moderate	Slight.
Winooski:										
(Wo)	Moderate: moist; subject to flooding.	Slight	Slight	Slight	Severe: rapid growth.	Severe: too dry.	Severe: too dry.	Slight	Slight	Severe.

species but not their growth. The rating is *severe* if soil conditions are such that very few species grow, and *very severe* if soil conditions are such that growth and food production are so sparse as to be of little value to wildlife.

Hardwood trees and shrubs.—Nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, or foliage used extensively as food by wildlife, and that commonly grow wild but also may be planted. Examples are oak, beech, cherry, birch, poplar, maple, thornapple, dogwood, wild apple, autumn-olive, honeysuckle, blueberry, barberry, viburnum, brambles, grapes, and Virginia creeper. The rating is *slight* if the soils have few or no limitations for a wide variety of species that produce vigorous growth and dependable food supply. It is *moderate* if the soils have some limitations for the growth of most hardwood plants and food production is somewhat limited. A rating of *severe* is given if soil conditions are such that the kind of plant species that can be grown is very limited and food production is undependable. A rating of *very severe* indicates that soil conditions are such that growth and food production are so sparse as to be of little value to wildlife.

Conifers.—Cone-bearing trees and shrubs that are important to wildlife mainly as cover but also furnish food in the form of browse, seeds, or fruitlike cones. Examples are pine, spruce, hemlock, balsam fir, cedar, field juniper, and larch. Slow growth and delay of canopy closure are desirable for this kind of wildlife habitat. The rating is *slight* if the soils are suitable for a variety of adapted species and if growth is retarded and canopy closure is delayed. The rating is *moderate* if growth rate and canopy closure are slow to moderate, and management of the stand is necessary to retain value for wildlife. A rating of *severe* is given if the soils are suitable for most or all adapted species, if growth rate and canopy closure are rapid, and if intensive management of the stand is required to retain value for wildlife. The rating is *very severe* if growth is so sparse as to be of little value to wildlife.

Wetland plants.—Annual and perennial wild herbaceous plants that grow on permanently wet soils, excluding aquatic plants, that produce food or cover extensively used by wetland forms of wildlife. Examples are smartweed, bluejoint, reed canarygrass, pickerelweed, sedge, rush, reed, cattail, wild millet, alder, buttonbush, and red-osier dogwood. The rating is *slight* if the soils have few or no limitations for the growth of a wide variety of food-producing wetland plants; *moderate* if soils have some limitations for growing food-producing, annual wetland plants but a wide variety of perennial species will grow. The rating is *severe* if soil conditions are such that growth of food-produc-

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to compact layer	Depth to bedrock	Depth from surface (typical profile)	Classification			Coarse fraction greater than 3 inches in diameter
					Dominant USDA texture	Unified	AASHO	
	Inches	*Inches*	*Inches*	*Inches*				*Percent*
Adams (AdA, AdB, AdD, AdE).	48+	60+	60+	0 to 10	Loamy fine sand.	SM	A–2	0
				10 to 16	Fine sand	SM or SP-SM.	A–2 or A–3.	0
				16 to 34	Fine sand	SM or SP-SM.	A–2 or A–3.	0
Amenia (AmB, AmC, AsC, AsD).	12 to 36+	18 to 36+	48+	0 to 5	Loam	ML	A–4 or A–6.	0 to 20
				5 to 23	Loam	ML	A–4 or A–6.	0 to 20
				23 to 30	Fine sandy loam.	ML or SM.	A–4 or A–6.	0 to 20
Berkshire (BeA, BeB, BeC, BsC, BsE). (For Marlow part of these mapping units, see Marlow series).	36 to 48	48+	60+	0 to 5	Gravelly fine sandy loam.	SM or GM.	A–2 or A–4.	0 to 20
				5 to 17	Gravelly fine sandy loam.	SM or GM.	A–2 or A–4.	0 to 20
				17 to 30	Gravelly sandy loam.	SP-SM, SM, or GM.	A–1 or A–2.	0 to 20
Buckland (BuC, BuD).	12 to 36	12 to 24	48+	0 to 7	Loam	SM or ML.	A–4	0 to 20
				7 to 15	Loam	SM	A–2 or A–4.	0 to 20

ing, annual plants is very limited but some of the more vigorous perennial plants are suited. A rating of *very severe* is given if growth and food production are so sparse as to be of little value to wetland wildlife.

Shallow water areas.—Impounded or excavated areas in which water generally is not more than 5 feet deep. The water is impounded or controlled by low dikes, shallow dugout ponds, and level ditches. The rating is *slight* if the soils have few or no limitations for constructing water control measures and maintaining desired water level; it is *moderate* if the soils have some limitations for choosing and constructing water control measures or if there is some difficulty in maintaining desired water level. A rating of *severe* is given if soil conditions are such that the choice of measures is very limited, the soils present serious construction problems, and water control is difficult. It is *very severe* if shallow water areas are impossible or impractical to construct.

The kinds of wildlife are defined as follows:

Openland wildlife.—Birds and mammals that occur in cropland, meadows, pastures, and nonforested overgrown land. Examples are meadowlark, blackbird, killdeer, sparrow, pheasant, cottontail rabbit, and woodchuck. The ratings are based on the ratings given to (1) planted small grains and corn, (2) planted grasses and legumes, (3) wild herbaceous upland plants, and (4) hardwood trees and shrubs.

Woodland wildlife.—Birds and mammals that occur in wooded areas, such as thrushes, warblers, vireos, ruffed grouse, deer, bear, snowshoe rabbit, porcupine, squirrel, and raccoon. The ratings are based on the ratings given to (1) planted small grains and corn, (2) wild herbaceous upland plants. (3) hardwood trees and shrubs, and (4) conifers.

Wetland wildlife.—Birds and mammals that live in ponds, marshes, and swamps, such as ducks, geese, heron, snipe, rail, coot, muskrat, mink, and beavers. The ratings are based on the ratings given to (1) planted small grains and corn, (2) wetland plants, and (3) shallow water areas.

Use of the Soils in Engineering [3]

This section provides information about the use of soils as material in construction. Most of the information is presented in table 5, "Estimated soil properties significant in engineering," table 6, "Interpretations of the soils for engineering," table 7, "Limitations of the soils for nonfarm uses," and table 8, "Engineering test data."

[3] L. J. DONDERO and H. R. SINCLAIR, JR., soil scientists, and K. P. WILSON, State conservation engineer, Soil Conservation Service, prepared this section.

significant in engineering

Percentage passing sieve[1]—			Reaction	Permeability	Available water capacity	Optimum moisture for compaction [2]	Maximum dry density [2]	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)							
			pH	*Inches per hour*	*Inches per inch of soil*	*Percent*	*Pounds per cubic foot*		
98 to 100	97 to 100	15 to 30	4.5 to 6.0	2.0 to 6.3	0.05 to 0.08	5 to 20	100 to 115	Low	Low.
98 to 100	97 to 100	5 to 20	5.1 to 6.5	2.0 to 6.3	0.04 to 0.07	5 to 20	100 to 115	Low	Low.
98 to 100	97 to 100	5 to 20	4.5 to 7.3	6.3+	0.02 to 0.06	5 to 8	100 to 115	Low	Low.
90 to 100	85 to 98	65 to 75	5.6 to 7.3	0.20 to 2.0	0.18 to 0.26	18 to 24	90 to 110	Moderate to low.	Moderate.
90 to 100	90 to 100	50 to 60	5.6 to 7.3	0.20 to 2.0	0.16 to 0.20	12 to 16	110 to 120	Moderate to low.	Moderate.
90 to 100	90 to 100	40 to 60	6.6 to 7.8	0.20 to 0.63	0.12 to 0.16	8 to 10	120 to 135	Moderate to low.	Moderate.
75 to 95	75 to 90	30 to 50	4.0 to 5.5	2.0 to 6.3	0.16 to 0.22	20 to 23	90 to 110	Low	Moderate.
65 to 85	60 to 80	30 to 45	4.2 to 6.0	0.63 to 2.0	0.14 to 0.18	13 to 24	90 to 110	Low	Moderate.
60 to 90	45 to 85	10 to 35	4.5 to 6.0	0.63 to 2.0	0.10 to 0.14	10 to 17	105 to 125	Low	Moderate.
80 to 100	75 to 95	35 to 55	5.1 to 6.0	0.63 to 2.0	0.18 to 0.22	18 to 22	110 to 115	Moderate to low.	Moderate.
75 to 95	70 to 90	20 to 45	5.6 to 7.3	0.63 to 2.0	0.14 to 0.18	9 to 15	115 to 130	Moderate to low.	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to compact layer	Depth to bedrock	Depth from surface (typical profile)	Classification			Coarse fraction greater than 3 inches in diameter
					Dominant USDA texture	Unified	AASHO	
	Inches	*Inches*	*Inches*	*Inches*				*Percent*
Buckland—Continued				15 to 24	Gravelly fine sandy loam.	SM	A-2 or A-4.	0 to 20
Cabot (CaB, CbC).	0 to 12	12 to 24	48+	0 to 7	Gravelly loam.	ML	A-4 or A-6.	0 to 20
				7 to 13	Loam	ML	A-4 or A-6.	0 to 20
				13 to 19	Loam	ML	A-4 or A-6.	0 to 20
Calais (CIC, CIE). (For Glover part of these mapping units, see Glover series.)	36 to 48	42+	48+	0 to 2	Loam	ML	A-4	0 to 20
				2 to 10	Loam	ML	A-4	0 to 20
				10 to 25	Loam	ML	A-4	0 to 20
Canandaigua (Cn).	0 to 12	72+	72+	0 to 10	Silt loam	OL, ML, or CL.	A-6 or A-7.	0
				10 to 22	Silt loam	ML or CL.	A-6 or A-7.	0
Cobbly alluvial land (Co). (Properties too variable to estimate.)								
Colton (CtA, CtB, CtD, CtE).	60+	72+	72+	0 to 9	Gravelly sandy loam.	SP-SM or SM.	A-1 or A-2.	0 to 5
				9 to 19	Gravelly sand.	GW, GW-GM, SW-SM, or SW.	A-1	0 to 10
				19 to 27	Gravelly sand.	GW, GW-GM, SW-SM, or SW.	A-1	5 to 10
Covington (Cv, Cw). (For Panton part of Cw, see Panton series.)	[3] 12 to 48	72+	48 to 72	0 to 8	Silty clay	MH-CH, CL, or MH.	A-7	0
				8 to 45	Clay	CL, MH-CH, or CH.	A-7	0
Duane (DaA, DaB).	12 to 36	72+	72+	0 to 6	Fine sandy loam.	SM	A-2 or A-4.	0 to 5
				6 to 17	Gravelly sandy loam.	GM, GW, SM, SP, or SW.	A-1, A-2, or A-3.	0 to 10
				17 to 30	Gravelly	GM,	A-1,	0 to 10

significant in engineering—Continued

Percentage passing sieve[1]—			Reaction	Permeability	Available water capacity	Optimum moisture for compaction [2]	Maximum dry density [2]	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)							
			pH	*Inches per hour*	*Inches per inch of soil*	*Percent*	*Pounds per cubic foot*		
80 to 95	75 to 90	20 to 50	5.6 to 7.3	0.20 to 0.63	0.10 to 0.14	8 to 12	120 to 135	Low	Moderate.
85 to 100	80 to 95	60 to 75	5.6 to 7.3	0.63 to 2.0	0.20 to 0.25	18 to 24	90 to 100	Moderate to low.	High.
90 to 100	80 to 98	50 to 60	6.1 to 7.3	0.63 to 2.0	0.15 to 0.20	12 to 16	110 to 120	Moderate to low.	High.
90 to 100	70 to 100	55 to 65	6.1 to 7.3	0.20 to 0.63	0.15 to 0.20	8 to 10	120 to 135	Moderate to low.	High.
90 to 100	80 to 90	60 to 75	4.5 to 6.5	0.63 to 2.0	0.18 to 0.22	15 to 25	90 to 100	Moderate to low.	Moderate.
85 to 95	75 to 85	55 to 75	5.1 to 6.5	0.63 to 2.0	0.12 to 0.16	9 to 12	105 to 110	Moderate to low.	Moderate.
85 to 95	75 to 85	55 to 75	5.1 to 7.3	0.20 to 0.63	0.11 to 0.14	8 to 12	115 to 125	Low	Moderate.
95 to 100	90 to 100	80 to 95	6.1 to 7.3	0.20 to 0.63	0.20 to 0.24	16 to 25	80 to 95	High	Moderate.
95 to 100	90 to 100	65 to 90	6.6 to 7.3	0.20 to 0.63	0.17 to 0.22	10 to 18	90 to 110	Moderate	Moderate.
45 to 95	40 to 75	5 to 30	4.5 to 6.0	2.0 to 6.3	0.08 to 0.13	10 to 15	110 to 120	Low	Low.
40 to 75	35 to 60	0 to 10	4.5 to 6.0	6.3+	0.01 to 0.05	9 to 12	115 to 135	Low	Low.
30 to 65	25 to 50	0 to 10	5.1 to 6.5	6.3+	0.01 to 0.05	8 to 11	115 to 135	Low	Low.
100	99 to 100	80 to 100	5.1 to 7.3	<0.20	0.18 to 0.25	16 to 18	85 to 105	High	High.
100	99 to 100	85 to 100	5.6 to 7.8	<0.20	0.16 to 0.20	16 to 18	85 to 105	High	High.
95 to 100	90 to 100	20 to 40	4.5 to 6.0	2.0 to 6.3	0.12 to 0.17	10 to 18	100 to 110	Low	Moderate.
50 to 80	50 to 75	4 to 25	4.5 to 6.0	2.0 to 6.3	0.10 to 0.15	13 to 17	110 to 120	Low	Moderate.
50 to 85	40 to 70	2 to 20	4.5 to 6.0	6.3+	0.05 to 0.08	10 to 15	100 to 120	Low	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to compact layer	Depth to bedrock	Depth from surface (typical profile)	Classification			Coarse fraction greater than 3 inches in diameter
					Dominant USDA texture	Unified	AASHO	
	Inches	*Inches*	*Inches*	*Inches*				*Percent*
Duane—Continued					Loamy sand.	SM, SP, SW, or GW.	A–2, or A–3.	
				30 to 42	Coarse sand.	SW, SP, or SP-SM.	A–1	0 to 5
Dutchess (DcB, DcC, DcD, DsC, DsE).	36 to 48	48+	60+	0 to 10	Loam	ML	A–4	0 to 20
				10 to 28	Loam	ML or SM.	A–4	0 to 20
Elmwood, coarse variant (ElB, ElC).	6 to 12	18 to 42	72+	0 to 18	Fine sandy loam.	SM or ML.	A–4	0
				18 to 22	Clay loam	ML or CL.	A–4, A–6, or A–7.	0
Farmington (FaC, FaE, FnB, FnC, FnD). (For Nellis part of FnB, FnC, and FnD, see Nellis series.)	48+	(1)	10 to 20	0 to 13	Silt loam	SM or ML.	A–4	0 to 20
				13	Limestone bedrock.			
Farmington, moderately deep variant (FdB, FdC, FdD, FdE).	48+	(1)	20 to 40	0 to 8	Silt loam	SM-ML.	A–4	0 to 20
				8 to 27	Silt loam	SM-ML.	A–4	0 to 20
				27	Shale.			
Fresh water marsh (Fw). (Properties too variable to estimate.)								
Glover. (Mapped only with Calais soils.)	48+	(1)	0 to 40	0 to 15	Loam	SM or ML.	A–4	0 to 20
				15	Bedrock.			
Hadley (Hf, Hh).	[3] 0 to 36	72+	72+	0 to 23	Very fine sandy loam.	SM or ML.	A–4	0
				23 to 36	Very fine sandy loam.	SM or ML.	A–4	0
Limerick (Le, Lf).	[3] 0 to 12	60+	72+	0 to 20	Silt loam	ML	A–4	0
				20 to 36	Silt loam	ML	A–4	0
Livingston (Lh, Lk).	[3] 0	(1)	72+	0 to 7	Clay	OL or OH.	A–7	0
				7 to 62	Clay	MH, CH, ML, or CL.	A–7	0
Lyman (LmB, LmC, LxC, LxE). (For Berkshire part of these mapping units, see Berkshire series.)	48+	(1)	10 to 20	0 to 12	Loam	SM or GM.	A–2 or A–4.	0 to 20
				12	Bedrock.			

significant in engineering—Continued

Percentage passing sieve[1]—			Reaction	Permeability	Available water capacity	Optimum moisture for compaction [2]	Maximum dry density [2]	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	*pH*	*Inches per hour*	*Inches per inch of soil*	*Percent*	*Pounds per cubic foot*		
85 to 95	75 to 90	2 to 10	5.1 to 6.5	6.3+	0.05 to 0.08	10 to 15	100 to 120	Low	Moderate.
65 to 85	60 to 80	55 to 60	5.1 to 6.0	0.63 to 2.0	0.18 to 0.22	18 to 22	90 to 110	Moderate	Moderate.
60 to 85	55 to 80	45 to 55	5.6 to 6.0	0.63 to 2.0	0.12 to 0.16	10 to 13	110 to 120	Moderate	Moderate.
95 to 100	90 to 100	45 to 55	5.1 to 6.5	2.0 to 6.3	0.13 to 0.17	12 to 14	105 to 115	Low to moderate.	High.
100	95 to 100	65 to 95	5.6 to 7.3	<0.2 to 0.63	0.16 to 0.18	8 to 18	95 to 110	Moderate	High.
65 to 90	60 to 85	45 to 60	5.6 to 7.3	0.63 to 2.0	0.13 to 0.17	15 to 22	90 to 105	Low	Low.
65 to 90	60 to 80	45 to 60	5.6 to 7.3	0.63 to 2.0	0.18 to 0.26	15 to 22	90 to 110	Moderate to low.	Low.
65 to 90	60 to 80	45 to 60	5.6 to 7.3	0.63 to 2.0	0.16 to 0.20	12 to 20	90 to 110	Moderate to low.	Low.
65 to 85	60 to 80	35 to 55	5.1 to 6.5	0.63 to 2.0	0.14 to 0.18	10 to 18	100 to 120	Low	Low.
98 to 100	98 to 100	40 to 85	6.1 to 7.3	0.63 to 2.0	0.16 to 0.25	12 to 18	95 to 105	Low	Low to moderate.
98 to 100	96 to 100	40 to 90	6.6 to 7.3	0.63 to 2.0	0.14 to 0.20	12 to 18	95 to 105	Low	Low to moderate.
95 to 100	95 to 100	60 to 90	5.6 to 7.3	0.63 to 2.0	0.18 to 0.28	20 to 25	85 to 95	Moderate	High.
98 to 100	96 to 100	60 to 90	5.6 to 7.3	0.63 to 2.0	0.14 to 0.20	12 to 20	95 to 110	Moderate	High.
100	100	60 to 90	5.1 to 5.5	0.20 to 0.63	0.16 to 0.20	12 to 25	70 to 85	High	High.
100	98 to 100	95 to 100	5.1 to 7.8	<0.20	0.18 to 0.25	20 to 30	85 to 105	High	High.
65 to 85	60 to 85	30 to 50	4.5 to 5.5	0.63 to 2.0	0.14 to 0.18	10 to 20	100 to 120	Low	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to compact layer	Depth to bedrock	Depth from surface (typical profile)	Classification			Coarse fraction greater than 3 inches in diameter
					Dominant USDA texture	Unified	AASHO	
	Inches	*Inches*	*Inches*	*Inches*				*Percent*
Marlow (Mapped only with Berkshire soils.)	12 to 24	18 to 36	48+	0 to 5	Loam	SM	A-2 or A-4.	0 to 20
				5 to 22	Loam	SM or GM.	A-2 or A-4.	0 to 20
				22 to 36	Loam	SM or GM.	A-2 or A-4.	0 to 20
Massena (MaA, MnB).	0 to 12+	40+	60+	0 to 7	Silt loam	ML	A-4	0 to 20
				7 to 12	Loam	ML or SM.	A-4	0 to 20
				12 to 25	Fine sandy loam.	SM or ML.	A-2 or A-4.	0 to 20
Melrose (MrA, MrB, MrC, MrD, MrE).	12 to 36	[5] 18 to 42	60+	0 to 30	Fine sandy loam.	SM or ML.	A-2 or A-4.	0
				30 to 40	Clay	CL	A-4, A-6, or A-7.	0
Muck and Peat (Mv.) (Properties too variable to estimate.)								
Nassau (NaB, NaC, NaD, NdC.) (For Dutchess part of mapping units NaB, NaC, and NaD, see Dutchess series.)	48+	([4])	10 to 20	0 to 19	Silt loam	ML, SM, or GM.	A-4	0 to 20
				19	Slate bedrock.			
Nellis (NeB, NeC, NeD, NsC, NsD).	36 to 72	48+	48+	0 to 10	Loam	ML	A-4	0 to 20
				10 to 35	Loam	ML or SM.	A-4 or A-6.	0 to 20
				35 to 38	Loam	ML or SM.	A-4	0 to 20
Panton. (Mapped only with Covington soils.)	[3] 12 to 48	72+	48 to 72	0 to 4	Silty clay	MH-CL, CH, or MH.	A-7	0
				4 to 8	Silty clay	MH-CH, CL, or MH.	A-7	0
				8 to 80	Clay	MH-CH, CL, or MH.	A-7	0
Peru (PeA, PeB, PeC, PsC, PsD).	0 to 12	12 to 30	48+	0 to 8	Loam	SM or ML.	A-2 or A-4.	0 to 20
				8 to 13	Fine sandy loam.	SM or ML.	A-2 or A-4.	0 to 20
				13 to 18	Gravelly fine sandy loam.	SM	A-2 or A-4.	0 to 20
Quarry (Qu). (Properties too variable to estimate.)								

significant in engineering—Continued

Percentage passing sieve[1]—			Reaction	Permeability	Available water capacity	Optimum moisture for compaction [2]	Maximum dry density [2]	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	*pH*	*Inches per hour*	*Inches per inch of soil*	*Percent*	*Pounds per cubic foot*		
70 to 95	65 to 90	30 to 50	4.0 to 5.5	2.0 to 6.3	0.18 to 0.22	18 to 22	90 to 110	Low	Moderate.
50 to 90	35 to 85	20 to 45	4.5 to 6.0	0.63 to 2.0	0.14 to 0.18	10 to 16	110 to 120	Low	Moderate.
50 to 95	35 to 85	20 to 45	4.5 to 6.0	<0.63	0.10 to 0.14	9 to 12	120 to 130	Low	Moderate.
90 to 100	85 to 100	60 to 80	6.1 to 7.3	0.63 to 2.0	0.18 to 0.26	18 to 20	90 to 105	Moderate	High.
80 to 95	70 to 80	40 to 64	6.6 to 7.8	0.63 to 2.0	0.14 to 0.18	10 to 18	100 to 120	Low	High.
95 to 100	90 to 98	25 to 70	6.6 to 7.8	0.63 to 2.0	0.12 to 0.14	9 to 15	110 to 120	Low	High.
95 to 100	90 to 100	25 to 55	4.5 to 7.3	2.0 to 6.3	0.13 to 0.17	12 to 16	105 to 115	Low	Moderate.
100	95 to 100	65 to 95	5.6 to 7.3	<0.20 to 0.63	0.16 to 0.20	8 to 18	95 to 110	High	Moderate.
65 to 90	60 to 80	45 to 60	4.5 to 6.0	0.63 to 2.0	0.13 to 0.17	15 to 25	90 to 110	Low	Low.
90 to 100	85 to 100	60 to 80	5.6 to 7.3	0.63 to 2.0	0.18 to 0.26	10 to 20	110 to 120	Moderate to low.	Low.
90 to 100	85 to 95	45 to 75	6.6 to 7.3	0.63 to 2.0	0.16 to 0.20	10 to 20	110 to 120	Moderate to low.	Low.
75 to 95	70 to 90	40 to 65	6.6 to 7.8	0.63 to 2.0	0.12 to 0.16	10 to 15	115 to 130	Moderate to low.	Low.
100	99 to 100	80 to 100	5.1 to 7.3	<0.20	0.18 to 0.25	16 to 18	85 to 105	High	High.
100	99 to 100	85 to 100	5.1 to 7.3	<0.20	0.16 to 0.20	16 to 18	85 to 105	High	High.
100	99 to 100	85 to 100	5.1 to 7.8	<0.20	0.16 to 0.20	16 to 18	85 to 105	High	High.
70 to 95	65 to 95	30 to 55	4.4 to 5.5	0.63 to 2.0	0.14 to 0.20	10 to 16	110 to 120	Moderate	Moderate.
75 to 100	70 to 95	25 to 55	5.1 to 6.0	0.20 to 0.63	0.10 to 0.14	9 to 15	110 to 120	Low	Moderate.
60 to 80	50 to 75	20 to 45		<0.20	0.8 to 0.12	8 to 14	115 to 135	Low	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to compact layer	Depth to bedrock	Depth from surface (typical profile)	Classification			Coarse fraction greater than 3 inches in diameter
					Dominant USDA texture	Unified	AASHO	
	Inches	*Inches*	*Inches*	*Inches*				*Percent*
Raynham (RaB, RaC, RaD).	12 to 24	(4)	72+	0 to 11	Silt loam	ML	A-4	0
				11 to 23	Silt loam	ML or ML-CL.	A-4	0
Rock land (Rk). (Onsite investigation needed.)								
Salmon (SaB, SaC, SaE).	60+	60+	60+	0 to 7	Very fine sandy loam.	SM or ML.	A-4	0
				7 to 12	Very fine sandy loam.	SM or ML.	A-4	0
				12 to 30	Very fine sandy loam.	SM or ML.	A-4	0
Stetson (StA, StB, StD, StE).	60+	72+	72+	0 to 10	Gravelly fine sandy loam.	SM	A-1 or A-2.	0 to 5
				10 to 38	Gravelly sandy loam.	SP-SM or SM.	A-1 or A-2.	5 to 10
				38 to 45	Gravelly coarse sand.	GP, SM, SP, or GM.	A-1 or A-2.	5 to 10
Swanton (Sw).	0 to 12	[6] 18 to 42	60+	0 to 22	Fine sandy loam.	SM	A-4	0
				22 to 32	Clay	ML or CL.	A-4 or A-6.	0
Vergennes (VgB, VgC, VgD, VgE).	6 to 18	60+	42+	0 to 47	Clay	MH or CH.	A-7	0
Vergennes, moderately shallow variant (VrB, VrC, VrD).	6 to 18	(4)	20 to 40	0 to 26	Clay	MH or CH.	A-7	0 to 5
				26	Bedrock.			
Walpole (Wa).	6 to 12	60+	60+	0 to 5	Silt loam	OL or SM.	A-4	0
				5 to 20	Gravelly fine sandy loam.	SM	A-4	0
				20 to 35	Gravelly sand.	SM or SP-SM.	A-1 or A-2.	0
Winooski (Wo).	[5] 0 to 12	60+	60+	0 to 20	Very fine sandy loam.	ML	A-4	0
				20 to 42	Silt loam	ML	A-4	0

[1] Based on 100 percent passing the 3-inch sieve.
[2] Estimates based on data from AASHO Designation T 99, Method A.
[3] Subject to flooding in places.

significant in engineering—Continued

Percentage passing sieve[1]—			Reaction	Permeability	Available water capacity	Optimum moisture for compaction [2]	Maximum dry density [2]	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)							
			pH	*Inches per hour*	*Inches per inch of soil*	*Percent*	*Pounds per cubic foot*		
100	95 to 100	70 to 95	5.6 to 6.5	0.63 to 2.0	0.18 to 0.25	8 to 18	90 to 105	Moderate	High.
100	95 to 100	65 to 95	5.6 to 6.5	0.20 to 0.63	0.16 to 0.20	8 to 18	95 to 110	Moderate	High.
99 to 100	98 to 100	40 to 55	5.1 to 6.0	0.63 to 2.0	0.20 to 0.25	8 to 18	95 to 105	Moderate	Moderate.
100	99 to 100	45 to 55	5.1 to 6.0	0.63 to 2.0	0.18 to 0.22	8 to 18	95 to 105	Moderate	Moderate.
100	99 to 100	45 to 55	5.1 to 6.0	0.63 to 2.0	0.16 to 0.20	8 to 18	100 to 110	Moderate	Moderate.
70 to 85	60 to 80	15 to 30	4.5 to 6.5	2.0 to 6.3	0.12 to 0.17	15 to 18	105 to 115	Low	Low.
45 to 95	40 to 75	5 to 30	4.5 to 6.5	2.0 to 6.3	0.08 to 0.13	10 to 15	110 to 120	Low	Low.
45 to 70	35 to 60	0 to 15	5.1 to 6.5	6.3+	0.01 to 0.05	9 to 12	115 to 135	Low	Low.
95 to 100	90 to 100	40 to 45	5.1 to 6.5	2.0 to 6.3	0.13 to 0.17	12 to 16	105 to 115	Moderate	High.
100	95 to 100	85 to 95	5.6 to 7.3	0.63 to <0.20	0.16 to 0.20	8 to 18	95 to 110	High	High.
100	98 to 100	90 to 100	5.1 to 7.8	<0.20	0.16 to 0.20	16 to 18	85 to 105	High	High.
100	98 to 100	90 to 100	5.1 to 7.8	<0.20	0.16 to 0.20	16 to 18	85 to 105	High	High.
90 to 100	85 to 100	35 to 50	4.2 to 6.5	0.63 to 2.0	0.12 to 0.17	12 to 20	95 to 105	Low	Moderate.
85 to 100	70 to 100	35 to 45	4.2 to 7.3	2.0 to 6.3	0.10 to 0.15	13 to 17	110 to 120	Low	Moderate.
80 to 100	70 to 100	5 to 15	5.1 to 7.3	6.3+	0.05 to 0.08	10 to 15	100 to 120	Low	Moderate.
98 to 100	98 to 100	55 to 85	5.6 to 7.3	0.63 to 2.0	0.16 to 0.25	12 to 18	95 to 105	Moderate	Moderate.
98 to 100	96 to 100	55 to 90	5.6 to 7.3	0.63 to 2.0	0.14 to 0.20	12 to 18	95 to 105	Moderate	Moderate.

[4] No compact layer.
[5] Depth to clay.
[6] Depth to finer textured material.

TABLE 6.—*Interpretation of the soils for engineering*

Soil series and map symbols	Suitability as source of—				Soil features affecting—					
							Cut-and-fill ponds			
	Topsoil	Sand	Gravel	Road fill	Highway location	Dugout ponds	Reservoir area	Embankment	Agricultural drainage	Diversion ditches and waterways
Adams (AdA, AdB, AdD, AdE).	Fair to depth of 6 to 10 inches; poor deeper.	Good	Unsuitable; mainly fine sand.	Fair; contains little binder; mainly sand.	Erosion on exposed embankments.	Rapid permeability; deep to water table.	Rapid permeability.	Poor stability; permeable and pipable when compacted.	Not needed.	Erodible on any slope.
Amenia: (AmB, AmC)	Good to depth of 8 to 12 inches; poor deeper.	Unsuitable.	Unsuitable.	Fair; may be wet in spring; cobblestones and stones throughout.	Seep areas; frost heave.	Moderate permeability; high lime content; temporary high water table.	Moderate permeability; high lime content.	Poor stability; very slow permeability when compacted; contains stones.	Seep spots	Seep spots; stones throughout.
(AsC, AsD)	Fair to depth of 8 to 12 inches; poor deeper; many stones.	Unsuitable.	Unsuitable.	Fair; may be wet in spring; cobblestones and stones throughout.	Seep areas; frost heave.	Moderate permeability; high lime content; temporary high water table.	Moderate permeability; high lime content.	Poor stability; slow permeability when compacted; contains stones.	Seep spots	Seep spots; stones throughout.
Berkshire (BeA, BeB, BeC, BsC, BsE). (For Marlow part of these mapping units, see Marlow series.)	Good or fair to depth of 6 to 10 inches; poor deeper; BsC and BsE: very stony.	Unsuitable.	Unsuitable.	Good; cobblestones and stones throughout.	Stones throughout; frost heave.	Moderate permeability; deep to water table.	Moderate permeability.	Poor to fair stability; moderate permeability when compacted; contains stones.	Not needed.	Erodible; stones throughout.
Buckland (BuC, BuD)	Fair to depth of 8 to 10 inches; very stony.	Unsuitable.	Unsuitable.	Good; may be wet in spring; cobblestones and stones throughout.	Seep areas; frost heave.	Moderately slow permeability in compact layer; temporary high water table.	Moderately slow permeability in compact layer.	Fair stability; slow permeability when compacted.	Seep spots; moderately slow permeability in compact layer.	Stones throughout; in places compact layer extends to depth of 36 inches.
Cabot (CaB, CbC)	CaB: fair to depth of 8 to	Unsuitable.	Unsuitable.	Fair; high water table;	High water table; frost	Moderately slow perme-	Moderately slow perme-	Poor stability; moder-	High water table; moder-	Stones throughout;

	10 inches; poor deeper. CbC: poor, very stony.			cobblestones and stones throughout.	heave.	ability in compact layer; normally high water table.	ability in compact layer.	ate permeability when compacted.	ately slow permeability in compact layer.	compact layer and seepage at depth of 12 to 24 inches.
Calais (CIC, CIE) (For Glover part of these mapping units, see Glover series.)	Fair to depth of 6 to 12 inches; poor deeper; very stony.	Unsuitable.	Unsuitable.	Unsuitable; cobblestones and stones throughout.	Stones throughout; frost heave.	Moderate permeability; deep to water table.	Moderate permeability.	Poor to fair stability; moderate permeability when compacted; contains stones.	Not needed.	Erodible; stones throughout.
Canandaigua (Cn)	Fair to depth of 6 to 12 inches; poor deeper.	Unsuitable.	Unsuitable.	Poor; silt	High water table; frost heave.	Pervious lenses in substratum, water table normally high.	Pervious lenses in substratum.	Subject to piping; low shear strength.	High water table; moderately slow permeability.	Erodible; seepage.
Cobbly alluvial land (Co) (Material so variable that interpretations were not made.)										
Colton (CtA, CtB, CtD, CtE).	Poor to depth of 6 to 10 inches; gravelly and sandy.	Good; contains gravel; needs screening.	Good	Good; gravel and sand with some binder.	Good drainage and bearing value.	Rapid permeability; deep water table.	Rapid permeability.	Rapid permeability when compacted.	Not needed.	Permeable; erodible.
Covington (Cv)	Poor; clay and silt.	Unsuitable.	Unsuitable.	Unsuitable.	Compressible clay and silt; flooding.	Flooding; very slow to slow permeability; normally high water table.	Flooding; very slow to slow permeability.	Good core material; low shear strength.	Very slow to slow permeability; high water table.	Flooding; clayey.
Covington and Panton (Cw).	Poor; clay and silt.	Unsuitable.	Unsuitable.	Unsuitable.	Clay and silt; poor bearing value.	Very slow to slow permeability; normally high water table.	Very slow to slow permeability.	Good core material; low shear strength.	Very slow to slow permeability; high water table.	Erodible; clayey.

TABLE 6.—*Interpretation of the soils for engineering*—Continued

Soil series and map symbols	Suitability as source of—				Soil features affecting—					
	Topsoil	Sand	Gravel	Road fill	Highway location	Dugout ponds	Cut-and-fill ponds: Reservoir area	Cut-and-fill ponds: Embankment	Agricultural drainage	Diversion ditches and waterways
Duane (DaA, DaB)	Good; wet in spring.	Fair; high water table.	Poor	Good	High water table.	High water table; rapid permeability; temporary seasonal water table.	Rapid permeability.	Rapid permeability.	High water table; pervious material.	Erodible.
Dutchess (DcB, DcC, DcD, DsC, DsE).	Fair to depth of 6 to 8 inches; slaty. DsC, DsE: very stony.	Unsuitable.	Unsuitable.	Fair, excess fines; cobblestones and stones throughout.	Seepage in deep cuts; stones throughout.	Moderate permeability; deep water table.	Moderate permeability.	Fair shear strength.	Not needed.	Stones throughout.
Elmwood, coarse variant (ElB, ElC).	Good to depth of 8 to 14 inches; poor deeper.	Fair to depth of 18 to 42 inches; clay loam or clay below.	Unsuitable.	Poor; clay loam or clay at 18 to 42 inches.	Clay loam or clay at 18 to 42 inches.	Moderately rapid permeability in SM or ML material; temporary seasonal water table.	Moderately rapid permeability in SM or ML material.	Clay loam or clay at 18 to 42 inches; pipable.	Very slow to moderately slow permeability in clay loam or clay material.	Clay loam or clay at 18 to 42 inches.
Farmington (FaC, FaE, FnB, FnC, FnD). (For Nellis part of mapping units FnB, FnC, and FnD, see unit NeB under the Nellis series.)	Poor to depth of 4 to 6 inches; shallow and very rocky.	Unsuitable.	Unsuitable.	Poor; shallow and very rocky.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock; solution channels.	Shallow to bedrock.	Not needed.	Shallow to bedrock.
Farmington, moderately deep variant (FdB, FdC, FdD, FdE).	Fair to depth of 6 to 8 inches; moderately deep and very rocky.	Unsuitable.	Unsuitable.	Poor; moderately deep and very rocky.	Moderately deep to bedrock.	Moderately deep to bedrock.	Moderately deep to bedrock; solution channels.	Moderately deep to bedrock.	Not needed.	Moderately deep to bedrock.

Fresh water marsh (Fw)	Unsuitable.	Unsuitable.	Unsuitable.	Unsuitable.	Permanent flooding.	Normally flooded all year.	Flooded	Variable	Permanent flooding; needs outlet.	Not applicable.
Glover (Mapped only in undifferentiated groups with Calais soils.)	Poor; shallow to rock.	Unsuitable.	Unsuitable.	Unsuitable; crushable rock to mine.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock.	Not needed.	Shallow to bedrock.
Hadley:										
(Hf)	Good to depth of 18 to 36 inches; poor deeper.	Unsuitable.	Unsuitable.	Poor; erodible.	Subject to very occasional flooding.	Moderate permeability; deep water table.	Moderate permeability.	Poor stability; pipable.	Not needed.	Very erodible.
(Hh)	Good to depth of 18 to 36 inches; poor deeper.	Unsuitable.	Unsuitable.	Poor; erodible.	Subject to flooding.	Subject to flooding; deep water table.	Subject to flooding.	Poor stability; pipable.	Not needed.	Very erodible.
Limerick (Le, Lf)	Fair; high water table.	Unsuitable.	Unsuitable.	Poor; silt; and very fine sand; wet.	High water table; flooding.	High water table; subject to flooding; water table normally high.	Subject to flooding.	Pipable; poor stability.	Moderate permeability; high water table; needs outlets.	Not applicable.
Livingston:										
(Lh)	Poor; clay; very wet.	Unsuitable.	Unsuitable.	Unsuitable.	Very poorly drained clay.	Very slow permeability; high water table.	Very slow permeability; high lime content.	Poor to fair shear strength; pipable.	High water table; very slow permeability; needs outlets.	Not applicable.
(Lk)	Poor; clay; very wet.	Unsuitable.	Unsuitable.	Unsuitable.	Very poorly drained clay; poor bearing value.	Very slow permeability; high water table; flooding; high lime content.	Very slow permeability; flooding; high lime content.	Poor to fair shear strength; pipable.	High water table; very slow permeability; needs outlets.	Not applicable.
Lyman (LmB, LmC, LxC, LxE). (For Berkshire part of these mapping units, see Berkshire series.)	Poor; shallow to rock. LxC, LxE: very rocky and stony.	Unsuitable.	Unsuitable.	Unsuitable; crushable rock to mine.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock.	Not needed.	Shallow to bedrock.

TABLE 6.—*Interpretation of the soils for engineering*—Continued

Soil series and map symbols	Suitability as source of—				Soil features affecting—					
	Topsoil	Sand	Gravel	Road fill	Highway location	Dugout ponds	Cut-and-fill ponds: Reservoir area	Cut-and-fill ponds: Embankment	Agricultural drainage	Diversion ditches and waterways
Marlow (Mapped only in undifferentiated groups with Berkshire soils.)	Fair to depth of 6 to 10 inches; poor deeper; very stony.	Unsuitable.	Unsuitable.	Good; cobblestones and stones throughout.	Seep areas and seepage along compact layer on cuts; frost heave.	Slow permeability; deep water table.	Slow permeability in compact layer.	Fair stability; slow permeability when compacted; contains stones.	Seep spots; slow permeability in compact layer.	Compact layer at depth of 12 to 36 inches; stones throughout.
Massena (MaA, MnB)	Fair; wet	Unsuitable.	Unsuitable.	Poor; silt loam.	High water table; frost heave.	Water table normally high; moderate permeability.	Moderate permeability.	Pipable; poor to fair stability; moderate permeability when compacted.	High water table; stones throughout.	High water table; stones throughout.
Melrose (MrA, MrB, MrC, MrD, MrE).	Good to depth of 8 to 10 inches; poor below.	Unsuitable.	Unsuitable.	Fair to depth of 18 to 42 inches; erodible.	Clay layer at depth of 18 to 42 inches; frost heave.	Slow permeability in CL material; deep water table.	Slow permeability in CL material.	Pipable	Seep spots.	Clay at depth of 18 to 42 inches.
Muck and Peat (Mv)	Good to poor; normally very wet.	Unsuitable.	Unsuitable.	Unsuitable.	Organic material; very wet.	High water table.	Organic material; high water table.	Organic material.	Organic material; high water table; needs outlets.	Not applicable.
Nassau (NaB, NaC, NaD, NdC). (For Dutchess part of these mapping units, see Dutchess series.)	Poor; shallow to rock. NdC: extremely rocky.	Unsuitable.	Unsuitable.	Poor; shallow to rock.	Shallow to bedrock.	Shallow to bedrock.	Shallow to fractured rock.	Shallow to bedrock.	Not needed.	Shallow to bedrock.
Nellis: (NeB, NeC, NeD)	Good to depth of 8 to 14 inches; poor deeper.	Unsuitable.	Unsuitable.	Fair; may contain considerable fines; cobblestones and	Seepage in deep cuts; stones throughout; frost heave.	Moderate permeability; deep water table.	Moderate permeability.	Moderate permeability when compacted; pipable.	Not needed.	Erodible; stones throughout.

				stones throughout.						
(NsC, NsD)	Fair to depth of 8 to 12 inches; poor deeper; extremely stony.	Unsuitable.	Unsuitable.	Fair; may contain considerable fines; cobblestones and stones throughout.	Seepage in deep cuts; frost heave.	Moderate permeability; deep water table.	Moderate permeability.	Moderate permeability when compacted; pipable.	Not needed.	Erodible; stones throughout.
Peru: (PeA, PeB, PeC)	Good to depth of 8 to 12 inches; poor below.	Unsuitable.	Unsuitable.	Good to fair; wet in spring; cobblestones and stones throughout.	Seepage in shallow cuts along compact layer; frost heave.	Slow permeability in compact layer; temporary high water table.	Slow permeability in compact layer.	Moderate permeability when compacted; fair stability.	Seepage in compact layer; stones throughout.	Seepage in compact layer; erodible; stones throughout.
PsC, PsD	Fair to depth of 8 to 12 inches; poor below.	Unsuitable.	Unsuitable.	Good to fair; wet in spring; cobblestones and stones throughout.	Seepage in shallow cuts along compact layer; frost heave.	Slow permeability in compact layer; temporary high water table.	Slow permeability in compact layer.	Moderate permeability when compacted; fair stability.	Seepage in compact layer; stones throughout.	Seepage in compact layer; erodible; stones throughout.
Quarry (Qu). (Interpretations not made.)										
Raynham (RaB, RaC, RaD)	Fair; silty; wet in spring.	Unsuitable.	Unsuitable.	Poor; silt; low bearing strength.	High water table; poor bearing value; frost heave.	Temporary high water table, moderately slow permeability.	Moderately slow permeability.	Fair shear strength; pipable.	High water table; moderately slow permeability.	Moderately slow permeability; erodible; wet.
Rock land (Rk)	Unsuitable.	Unsuitable.	Unsuitable.	Unsuitable; mine for crushed rock or heavy, coarse fill.	Bedrock at surface.	Bedrock at surface.	Bedrock at surface.	Bedrock at surface.	Not needed.	Bedrock at surface.

TABLE 6.—*Interpretation of the soils for engineering*—Continued

Soil series and map symbols	Suitability as source of—				Soil features affecting—					
							Cut-and-fill ponds		Agricultural drainage	Diversion ditches and waterways
	Topsoil	Sand	Gravel	Road fill	Highway location	Dugout ponds	Reservoir area	Embankment		
Salmon (SaB, SaC, SaE)	Good to depth of 8 to 14 inches; poor deeper; very fine sandy loam.	Good; very fine sand.	Unsuitable.	Fair; low strength; erodible.	Erosion on all cuts; frost heave.	Deep water table; moderate permeability.	Moderate permeability.	Moderate permeability; fair shear strength.	Not needed.	Very erodible.
Stetson (StA, StB, StD, StE).	Fair to depth of 6 to 10 inches; gravelly and sandy.	Good; contains gravel; needs screening.	Good	Good; gravel and sand; some binder.	No special limitations.	Rapid permeability; deep water table.	Rapid permeability.	Moderate to rapid permeability.	Not needed.	Erodible and permeable.
Swanton (Sw)	Fair; high water table.	Unsuitable.	Unsuitable.	Fair to depth of 18 to 42 inches; clay layer not suited; wet.	High water table; clay at depth of 18 to 42 inches; frost heave.	Water table normally high; slow permeability in CL or ML material.	Slow permeability in CL or ML material.	Pipable in SM or ML material.	Perched seasonal high water table.	Seepage along clay layer; clay at depth of 18 to 40 inches.
Vergennes: (VgB, VgC, VgD, VgE).	Poor; clay.	Unsuitable.	Unsuitable.	Unsuitable.	Poor bearing value; frost heave.	Very slow permeability; temporary high water table.	Very slow permeability.	Pipable; poor stability.	Very slow permeability.	Clay; erodible.
(VrB, VrC, VrD)	Poor; clay.	Unsuitable.	Unsuitable.	Unsuitable.	20 to 40 inches to bedrock; frost heave.	20 to 40 inches to bedrock.	20 to 40 inches to bedrock.	20 to 40 inches of clay over bedrock.	20 to 40 inches of clay over bedrock.	Bedrock at depth of 20 to 40 inches.
Walpole (Wa)	Poor; silty and wet.	Poor; silt	Poor; silt	Poor; wet.	High water table; frost heave.	Water table normally high; rapid permeability.	Rapid permeability.	Moderate to rapid permeability; poor stability; pipable.	High water table; pervious material; seepage; needs outlets.	Not applicable.

Winooski (Wo)	Good to depth of 12 to 36 inches or more.	Unsuitable.	Unsuitable.	Poor; fine; wet, silty material.	Subject to flooding; high water table.	Temporary high water table; flooding.	High water table; flooding; moderate permeability.	Poor stability; pipable; poor compaction characteristics.	High water table; flooding; needs outlets.	Not applicable.

TABLE 7.—*Limitations of the soils for nonfarm uses*

[Interpretations are not given for Quarry and Rock land, because they are too variable]

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
Adams:								
(AdA)	Slight	Moderate: gentle slopes.	Slight	Severe: coarse texture.	Slight [1]	Severe: rapid permeability.	Slight	Slight.
(AdB)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Severe: coarse texture; moderate slopes.	Moderate: [1] moderate slopes.	Very severe: rapid permeability; moderate slopes.	Moderate: moderate slopes.	Severe: coarse texture; moderate slopes.
(AdD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: coarse texture; steep slopes.	Severe: [1] steep slopes.	Very severe: rapid permeability; steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.
(AdE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: coarse texture; very steep slopes.	Severe: [1] very steep slopes.	Very severe: rapid permeability; very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Amenia:								
(AmB)	Moderate: slightly wet.	Moderate: gentle slopes; slightly wet.	Moderate: slightly wet; gentle slopes.	Slight	Severe: moderately slow permeability; temporary high water table.	Moderate: gentle slopes.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; moderately well drained internally.
(AmC)	Moderate: moderate slopes; slightly wet.	Very severe: moderate slopes; slightly wet.	Severe: slightly wet; moderate slopes.	Moderate: moderate slopes.	Severe: moderately slow permeability; moderate slopes; temporary high water table.	Severe: moderate slopes.	Moderate: moderately slow permeability; moderate slopes.	Moderate: moderate slopes; moderately slow permeability.

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TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
(AsC)	Severe: moderate slopes; slightly wet; extremely stony.	Very severe: moderate slopes; slightly wet; extremely stony.	Severe: slightly wet; moderate slopes.	Severe: extremely stony; moderate slopes.	Severe: moderately slow permeability; temporary high water table.	Severe: moderate slopes; stony.	Severe: extremely stony.	Severe: surface stones.
(AsD)	Severe: steep slopes; extremely stony; slightly wet.	Very severe: steep slopes; extremely stony; slightly wet.	Very severe: steep slopes; slightly wet.	Severe: extremely stony; steep slopes.	Severe: moderately slow permeability; steep slopes.	Severe: steep slopes; stony.	Very severe: steep slopes; extremely stony.	Very severe: steep slopes; surface stones.
Berkshire and Marlow:								
(BeA)	Slight	Slight	Slight	Slight	Slight	Moderate: moderate permeability.	Slight	Slight.
(BeB)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.	Severe: moderate permeability; moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes; stony.
(BeC)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.
(BsC)	Severe: extremely stony; steep slopes.	Very severe: extremely stony; steep slopes.	Very severe: steep slopes.	Severe: extremely stony; steep slopes.	Severe: steep slopes.	Severe: steep slopes; extremely stony.	Very severe: steep slopes; extremely stony.	Severe: steep slopes; extremely stony.
(BsE)	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes.	Very severe: extremely stony; very steep slopes.	Severe: very steep slopes.	Severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.
Buckland:								
(BuC)	Severe: moderate slopes; extremely stony; slightly wet.	Very severe: moderate slopes; extremely stony; slightly wet.	Severe: moderate slopes; slightly wet.	Severe: extremely stony; moderate slopes.	Severe: moderately slow permeability; temporary high water table.	Severe: moderate slopes; extremely stony.	Severe: extremely stony; moderate slopes; moderately slow permeability; slightly wet.	Severe: extremely stony.
(BuD)	Severe: extremely stony; steep slopes; slightly wet.	Very severe: extremely stony; steep slopes; slightly wet.	Very severe: steep slopes; slightly wet.	Severe: extremely stony; steep slopes.	Severe: moderately slow permeability; temporary high water table; steep slopes.	Severe: steep slopes; extremely stony.	Very severe: steep slopes; extremely stony; moderately slow permeabili-	Very severe: steep slopes; extremely stony.

							ty; slightly wet.	
Cabot: (CaB)	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table; gentle slopes.	Severe: normally high water table.	Severe: normally high water table; moderately slow permeability.	Moderate: gentle slopes.	Severe: normally high water table; moderately slow permeability.	Very severe: normally high water table.
(CbC)	Severe: normally high water table; moderate slopes; extremely stony.	Very severe: normally high water table; moderate slopes; extremely stony.	Severe: normally high water table; moderate slopes.	Severe: normally high water table; moderate slopes.	Severe: moderately slow permeability; normally high water table.	Severe: moderate slopes; stony.	Severe: normally high water table; extremely stony; moderately slow permeability.	Very severe: normally high water table; stony.
Calais: (ClC)	Severe: steep slopes; extremely stony.	Very severe: steep slopes; extremely stony.	Very severe: steep slopes; extremely stony.	Severe: extremely stony; steep slopes.	Severe: steep slopes; moderately slow permeability.	Severe: steep slopes.	Severe: steep slopes; extremely stony.	Very severe: steep slopes; extremely stony.
(ClE) (For Glover part of mapping units ClC and ClE, see Glover series.)	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: extremely stony; very steep slopes.	Severe: very steep slopes; moderately slow permeability.	Severe: very steep slopes.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.
Canandaigua: (Cn)	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Slight	Severe: normally high water table.	Very severe: normally high water table.
Cobbly alluvial land: (Co)	Very severe: subject to flooding.	Very severe: subject to flooding.	Very severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.	Severe: many cobblestones.	Very severe: subject to flooding; cobbly.	Very severe: flood hazard.
Colton: (CtA)	Slight	Moderate: gentle slopes.	Slight	Severe: coarse texture.	Slight[1]	Severe: rapid permeability.	Slight	Moderate: coarse fragments in surface layer.
(CtB)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Severe: coarse texture; moderate slopes.	Moderate:[1] moderate slopes.	Severe: rapid permeability; moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes; coarse fragments in surface layer.
(CtD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes; coarse texture.	Severe:[1] steep slopes.	Severe: rapid permeability; steep slopes.	Severe: steep slopes.	Severe: steep slopes.

TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
(CtE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes; coarse texture.	Severe: [1] very steep slopes.	Severe: rapid permeability; very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Covington: (Cv)	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Severe: normally high water table.	Severe: subject to flooding; fine texture; normally high water table.	Severe: subject to flooding; slow permeability; normally high water table.	Moderate: subject to flooding.	Severe: subject to flooding; fine texture; normally high water table; slow permeability.	Very severe: normally high water table; fine texture; flood hazard.
Covington and Panton: (Cw)	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: fine texture; normally high water table.	Severe: slow permeability; normally high water table.	Slight	Severe: normally high water table; fine texture; slow permeability.	Severe: normally high water table; fine texture.
Duane: (DaA)	Moderate: slightly wet.	Moderate: gentle slopes; slightly wet.	Moderate: slightly wet; gentle slopes.	Slight	Moderate: [1] temporary seasonal high water table.	Severe: rapid permeability.	Moderate: slightly wet.	Moderate: slightly wet.
(DaB)	Moderate: slightly wet; moderate slopes.	Very severe: slightly wet; moderate slopes.	Severe: slightly wet; moderate slopes.	Moderate: moderate slopes.	Moderate: [1] temporary seasonal high water table; moderate slopes.	Severe: rapid permeability; moderate slopes.	Moderate: slightly wet; moderate slopes.	Moderate: slightly wet.
Dutchess: (DcB)	Slight	Moderate: gentle slopes.	Moderate: gentle slopes.	Slight	Moderate: gentle slopes.	Moderate: gentle slopes; moderate permeability.	Slight	Moderate: stony.
(DcC)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Severe: moderate slopes; moderate permeability.	Moderate: moderate slopes.	Moderate: moderate slopes; stony.
(DcD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.

(DsC)	Severe: extremely stony; moderate slopes.	Very severe: extremely stony; moderate slopes.	Severe: moderate slopes.	Severe: extremely stony; moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes; extremely stony.	Severe: extremely stony; moderate slopes.	Severe: extremely stony.
(DsE)	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes.	Very severe: extremely stony; very steep slopes.	Severe: very steep slopes.	Severe: steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.
Elmwood, coarse variant: (EIB)	Moderate: slightly wet.	Moderate: gentle slopes; slightly wet.	Moderate: slightly wet; gentle slopes.	Slight	Severe: moderately slow to very slow permeability.	Moderate: gentle slopes.	Severe: fine textured or moderately fine textured substratum; moderately slow to very slow permeability; slightly wet.	Moderate: moderately slow to very slow permeability; slightly wet.
(EIC)	Moderate: moderate slopes; slightly wet.	Very severe: moderate slopes; slightly wet.	Severe: moderate slopes; slightly wet.	Moderate: moderate slopes.	Severe: moderately slow to very slow permeability; moderate slopes.	Severe: moderate slopes.	Severe: fine textured or moderately fine textured substratum; moderately slow to very slow permeability; slightly wet; moderate slopes.	Moderate: moderate slopes; moderately slow to very slow permeability.
Farmington: (FaC)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock.
(FaE)	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: very steep slopes; shallow to bedrock.	Very severe: shallow to bedrock; very steep slopes.	Severe: shallow to bedrock; very steep slopes.	Severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.
(FdB)	Severe: moderately deep to bedrock.	Severe: moderately deep to bedrock.	Severe: moderately deep to bedrock; gentle slopes.	Moderate: moderately deep to bedrock.	Severe: moderately deep to bedrock.	Severe: moderately deep to bedrock.	Moderate: moderately deep to bedrock; stony.	Moderate: moderately deep to bedrock.
(FdC)	Severe: moderately deep to bedrock; moderate slopes.	Very severe: moderately deep to bedrock; moderate slopes.	Very severe: moderately deep to bedrock; moderate slopes.	Moderate: moderately deep to bedrock; moderate slopes.	Severe: moderately deep to bedrock; moderate slopes.	Severe: moderately deep to bedrock; moderate slopes.	Moderate: moderately deep to bedrock; stony; moderate slopes.	Moderate: moderately deep to bedrock; moderately steep slopes.

TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
(FdD)	Very severe: moderately deep to bedrock; steep slopes.	Very severe: moderately deep to bedrock; steep slopes.	Very severe: moderately deep to bedrock; steep slopes.	Severe: steep slopes; moderately deep to bedrock.	Severe: moderately deep to bedrock; steep slopes.	Severe: moderately deep to bedrock; steep slopes.	Severe: moderately deep to bedrock; stony; steep slopes.	Severe: steep slopes.
(FdE)	Very severe: very steep slopes; moderately deep to bedrock.	Very severe: very steep slopes; moderately deep to bedrock.	Very severe: very steep slopes; moderately deep to bedrock.	Very severe: very steep slopes; moderately deep to bedrock.	Severe: very steep slopes; moderately deep to bedrock.	Severe: moderately deep to bedrock; very steep slopes.	Very severe: very steep slopes; moderately deep to bedrock; stony.	Very severe: very steep slopes.
(FnB)	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Very severe: moderate slopes; shallow to bedrock.	Very severe: shallow to bedrock; moderate slopes.	Severe: shallow to bedrock.	Severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes; rocky.	Very severe: shallow to bedrock.
(FnC)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes; rocky.	Very severe: shallow to bedrock; steep slopes.
(FnD) (For Nellis part of mapping units FnB, FnC, and FnD, see units NeC, NeD, and NsD under the Nellis series.)	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Severe: shallow to bedrock; very steep slopes.	Severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.
Fresh water marsh: (Fw)	Very severe: flooded normally year round.	Very severe: flooded normally year round.	Very severe: flooded normally year round.	Very severe: flooded normally year round.	Severe: flooded normally year round.	Severe: flooded normally year round.	Very severe: flooded normally year round.	Very severe: flooded normally year round.
Glover (Mapped only in undifferentiated groups with Calais soils.)	Very severe: shallow to bedrock; steep to very steep slopes.	Very severe: shallow to bedrock; steep to very steep slopes.	Very severe: shallow to bedrock; steep to very steep slopes.	Severe to very severe: shallow to bedrock; steep to very steep slopes.	Severe: shallow to bedrock; steep to very steep slopes.	Severe: shallow to bedrock; steep to very steep slopes.	Very severe: shallow to bedrock; steep to very steep slopes.	Very severe: shallow to bedrock; steep to very steep slopes.
Hadley: (Hf)	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
(Hh)	Very severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.

Limerick: (Le)	Very severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.	Severe: normally high water table; subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.	Very severe: normally high water table; subject to flooding.
(Lf)	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Severe: normally high water table; subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.	Very severe: normally high water table; subject to flooding.
Livingston: (Lh)	Very severe: normally high water table.	Very severe: normally high water table.	Very severe: normally high water table.	Very severe: fine texture; normally high water table.	Severe: normally high water table; slow permeability.	Severe: organic matter.	Very severe: fine texture; normally high water table.	Very severe: normally high water table; fine texture.
(Lk)	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; normally high water table.	Very severe: subject to flooding; fine texture; normally high water table.	Severe: subject to flooding; slow permeability; normally high water table.	Severe: moderate slopes; subject to flooding; organic matter.	Very severe: fine texture; normally high water table; subject to flooding.	Very severe: subject to flooding; normally high water table; fine texture.
Lyman: (LmB)	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Severe: shallow to bedrock.
(LmC)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.
(LxC)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock.
(LxE)	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: very steep slopes; shallow to bedrock.	Severe: shallow to bedrock; very steep slopes.	Severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.	Very severe: shallow to bedrock; very steep slopes.
(For Berkshire part of these mapping units, see units BeB, BeC, and BsE under the Berkshire series.)								
Massena: (MaA)	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Moderate: nearly level; moderate permeability.	Severe: normally high water table.	Very severe: normally high water table.

TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
(MnB)	Severe: normally high water table; extremely stony.	Severe: normally high water table; extremely stony.	Severe: normally high water table; gentle slopes.	Severe: extremely stony; normally high water table.	Severe: normally high water table.	Moderate: nearly level to gently sloping; moderate permeability; extremely stony.	Severe: normally high water table; extremely stony.	Very severe: normally high water table.
Melrose:								
(MrA)	Slight	Slight	Slight	Slight	Very severe: slow permeability.	Slight	Severe: fine-textured substratum; slow permeability.	Moderate: slow permeability.
(MrB)	Slight	Moderate: gentle slopes.	Moderate: gentle slopes.	Slight	Very severe: slow permeability.	Moderate: gentle slopes.	Severe: fine-textured substratum; slow permeability.	Moderate: slow permeability.
(MrC)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Very severe: slow permeability; moderate slopes.	Severe: moderate slopes.	Severe: fine-textured substratum; slow permeability; moderate slopes.	Moderate: moderate slopes; slow permeability.
(MrD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: slow permeability; steep slopes.	Very severe: steep slopes.	Severe: fine-textured substratum; slow permeability.	Severe: steep slopes; slow permeability.
(MrE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: slow permeability; very steep slopes.	Very severe: very steep slopes.	Very severe: slow permeability; very steep slopes.	Very severe: very steep slopes; slow permeability.
Muck and Peat:								
(Mv)	Very severe: normally high water table; organic matter.	Very severe: normally high water table; organic matter.	Very severe: normally high water table; organic matter.	Very severe: normally high water table.	Severe: normally high water table.	Severe: organic matter.	Very severe: normally high water table.	Very severe: normally high water table.
Nassau:								
(NaB)	Very severe: shallow to bedrock.	Very severe: shallow to bedrock.	Very severe: shallow to bedrock; gentle slopes.	Very severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Very severe: shallow to bedrock.	Severe: shallow to bedrock.

(NaC)	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Severe: shallow to bedrock; moderate slopes.	Severe: shallow to bedrock; moderate slopes.	Very severe: shallow to bedrock; moderate slopes.	Severe: shallow to bedrock.
(NaD) (For Dutchess part of mapping units NaB, NaC, and NaD, see units DcB, DcC, and DcD under the Dutchess series.)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.
(NdC)	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Severe: shallow to bedrock; steep slopes.	Very severe: shallow to bedrock.	Very severe: shallow to bedrock; steep slopes.
Nellis:								
(NeB)	Slight	Moderate: gentle slopes.	Moderate: gentle slopes.	Slight	Moderate: gentle slopes.	Moderate: gentle slopes; moderate permeability.	Slight	Moderate: stony.
(NeC)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes; stony.
(NeD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(NsC)	Severe: extremely stony; moderate slopes.	Severe: extremely stony; moderate slopes.	Severe: moderate slopes; extremely stony.	Severe: extremely stony; moderate slopes.	Severe: moderate slopes.	Severe: moderate slopes; moderate permeability; extremely stony.	Severe: extremely stony; moderate slopes.	Very severe: extremely stony.
(NsD)	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Severe: very steep slopes.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.	Very severe: very steep slopes; extremely stony.
Peru:								
(PeA)	Moderate: slightly wet.	Moderate: gentle slopes; slightly wet.	Moderate: slightly wet; gentle slopes.	Slight	Severe: slow permeability; temporary high water table.	Moderate: gentle slopes.	Severe: slow permeability; slightly wet.	Severe: slow permeability.
(PeB)	Moderate: moderate slopes; slightly wet.	Very severe: moderate slopes; slightly wet.	Severe: slightly wet; moderate slopes.	Moderate: moderate slopes.	Severe: slow permeability; temporary high water table.	Severe: moderate slopes.	Severe: slow permeability; slightly wet.	Severe: slow permeability.

TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
(PeC)	Severe: steep slopes; slightly wet.	Very severe: steep slopes; slightly wet.	Severe: slightly wet; steep slopes.	Severe: steep slopes.	Severe: slow permeability; steep slopes.	Severe: steep slopes.	Severe: slow permeability; steep slopes.	Very severe: slow permeability; steep slopes.
(PsC)	Severe: extremely stony; steep slopes; slightly wet.	Very severe: extremely stony; steep slopes; slightly wet.	Severe: slightly wet; extremely stony; steep slopes.	Severe: extremely stony; steep slopes.	Severe: slow permeability; seasonal high water table; steep slopes.	Severe: steep slopes.	Very severe: slow permeability; slightly wet; steep slopes; extremely stony.	Very severe: slow permeability; extremely stony.
(PsD)	Very severe: very steep slopes; slightly wet; extremely stony.	Very severe: very steep slopes; slightly wet; extremely stony.	Very severe: very steep slopes; slightly wet; extremely stony.	Very severe: very steep slopes; extremely stony.	Severe: slow permeability; very steep slopes.	Severe: extremely stony.	Very severe: very steep slopes; slow permeability; extremely stony.	Very severe: very steep slopes; slow permeability; extremely stony.
Raynham:								
(RaB)	Severe: normally high water table.	Severe: normally high water table.	Moderate: normally high water table; gentle slopes.	Moderate: normally high water table.	Severe: normally high water table; moderately slow permeability.	Moderate: gentle slopes.	Severe: normally high water table; moderately slow permeability.	Very severe: normally high water table.
(RaC)	Severe: normally high water table; moderate slopes.	Very severe: normally high water table; moderate slopes.	Severe: normally high water table; moderate slopes.	Moderate: normally high water table; moderate slopes.	Severe: normally high water table; moderately slow permeability.	Severe: moderate slopes.	Severe: normally high water table; moderate slopes; moderately slow permeability.	Very severe: normally high water table.
(RaD)	Severe: steep slopes; normally high water table.	Very severe: steep slopes; normally high water table.	Very severe: steep slopes; normally high water table.	Severe: normally high water table; steep slopes.	Severe: steep slopes; moderately slow permeability; normally high water table.	Severe: steep slopes.	Severe: steep slopes; moderately slow permeability.	Very severe: steep slopes; normally high water table.
Salmon:								
(SaB)	Slight	Moderate: gentle slopes.	Moderate: gentle slopes.	Slight	Slight	Moderate: gentle slopes; moderate permeability.	Slight	Slight.

(SaC)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(SaE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Stetson: (StA)	Slight	Moderate: gentle slopes.	Moderate: gentle slopes.	Slight	Slight [1]	Very severe: rapid permeability.	Slight	Slight.
(StB)	Moderate: moderate slopes.	Very severe: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: [1] moderate slopes.	Very severe: rapid permeability; moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(StD)	Severe: steep slopes.	Very severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: [1] steep slopes.	Very severe: rapid permeability; steep slopes.	Severe: steep slopes.	Very severe: steep slopes.
(StE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Severe: [1] very steep slopes.	Very severe: rapid permeability; very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.
Swanton: (Sw)	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table.	Severe: normally high water table; slow permeability.	Slight	Severe: slow permeability; normally high water table.	Very severe: normally high water table.
Vergennes: (VgB)	Severe: slightly wet; clay; gentle slopes.	Severe: slightly wet; clay; gentle slopes.	Severe: gentle slopes; clay; slightly wet.	Severe: fine texture.	Severe: very slow permeability; temporary high water table.	Moderate: gentle slopes.	Severe: fine texture; slightly wet.	Severe: very slow permeability; fine texture.
(VgC)	Severe: slightly wet; clay; moderate slopes.	Severe: slightly wet; clay; moderate slopes.	Severe: moderate slopes; clay; slightly wet.	Severe: fine texture.	Severe: very slow permeability; temporary high water table.	Severe: moderate slopes.	Severe: fine texture; slightly wet; moderate slopes.	Severe: very slow permeability; fine texture.
(VgD)	Severe: steep slopes; slightly wet; clay.	Very severe: steep slopes; slightly wet; clay.	Severe: steep slopes; slightly wet; clay.	Severe: fine texture; steep slopes.	Severe: very slow permeability; temporary high water table.	Very severe: steep slopes.	Severe: fine texture; steep slopes.	Severe: very slow permeability; fine texture; steep slopes.
(VgE)	Very severe: very steep slopes; slightly wet; clay.	Very severe: very steep slopes; slightly wet; clay.	Very severe: very steep slopes; clay.	Very severe: very steep slopes; fine texture.	Severe: very slow permeability; very steep slopes.	Very severe: very steep slopes.	Very severe: fine texture; very steep slopes.	Very severe: very steep slopes; fine texture.

TABLE 7.—*Limitations of the soils for nonfarm uses*—Continued

Soil series and map symbols	Houses of 3 stories or less with basements	Light industrial and commercial buildings without basements	Streets and parking lots	Lawns and landscaping	Sewage disposal		Sanitary land fills	Cemeteries
					Septic tank filter fields	Lagoons		
Vergennes, moderately shallow variant: (VrB)	Severe: moderately shallow to bedrock; clay; gentle slopes.	Severe: moderately shallow to bedrock; clay; gentle slopes.	Severe: moderately shallow to bedrock; clay; gentle slopes.	Severe: fine texture; moderately shallow to bedrock.	Severe: moderately shallow to bedrock; very slow permeability.	Severe: moderately shallow to bedrock; gentle slopes.	Very severe: moderately shallow to bedrock; fine texture; slightly wet.	Severe: moderately shallow to bedrock; fine texture.
(VrC)	Severe: moderately shallow to bedrock; clay; moderate slopes.	Severe: moderately shallow to bedrock; clay; moderate slopes.	Severe: moderately shallow to bedrock; clay; moderate slopes.	Severe: fine texture; moderately shallow to bedrock.	Severe: moderately shallow to bedrock; very slow permeability.	Severe: moderately shallow to bedrock; moderate slopes.	Very severe: moderately shallow to bedrock; fine texture; moderate slopes.	Severe: moderately shallow to bedrock; fine texture.
(VrD)	Severe: steep slopes; clay; moderately shallow to bedrock.	Very severe: steep slopes; clay; moderately shallow to bedrock.	Very severe: steep slopes; clay; moderately shallow to bedrock.	Severe: fine texture; moderately shallow to bedrock; steep slopes.	Severe: moderately shallow to bedrock; very slow permeability; steep slopes.	Very severe: moderately shallow to bedrock; steep slopes.	Very severe: moderately shallow to bedrock; steep slopes.	Severe: moderately shallow to bedrock; steep slopes.
Walpole: (Wa)	Severe: normally high water table.	Severe: normally high water table; gentle slopes.	Severe: normally high water table; gentle slopes.	Severe: normally high water table.	Severe: normally high water table.	Very severe: rapid permeability.	Severe: normally high water table.	Very severe: normally high water table.
Winooski: (Wo)	Very severe: subject to flooding; slightly wet.	Very severe: subject to flooding; slightly wet.	Severe: subject to flooding. slightly wet.	Severe: subject to flooding.	Severe: subject to flooding; temporary seasonal water table.	Severe: subject to flooding.	Severe: subject to flooding; slightly wet.	Very severe: subject to flooding.

[1] Pollution to water supply is a hazard.

TABLE 8.—*Engineering test data*

[Tests made by the Bureau of Public Roads (BPR) in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Soil name and location	Parent material	Depth	Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
			Percentage passing sieve—				Percentage smaller than—							
			No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified
		Inches									*Pct.*			
Covington silty clay:														
1 mile W. of West Addison. (Modal profile)	Estuarine and lacustrine clay.	0 to 8	100	96	94	90	90	84	66	50	56	20	A–7–5(15)	MH
		11 to 20	100	97	96	94	94	91	83	70	57	29	A–7–6(19)	MH–CH
		33 to 45	---	--	--	--	100	97	85	68	56	29	A–7–6(19)	CH
Livingston clay:														
Town of Addison, Vermont Fish and Game Service Refuge. (Modal profile)	Estuarine and lacustrine silt and clay.	0 to 7	100	98	96	93	91	83	73	67	90	36	A–7–5(20)	OH or MH
		7 to 20	---	--	100	93	92	89	83	76	76	45	A–7–5(20)	CH
		46 to 62	100	98	97	96	96	94	89	84	73	41	A–7–5(20)	CH
1 mile SE. of Cornwall. (More silty and more mucky than modal profile)	Estuarine and lacustrine silt and clay.	1 to 6	100	72	67	61	59	51	37	30	127	33	A–7–5(20)	OH
		6 to 19	---	100	99	95	94	87	77	71	63	34	A–7–6(20)	CH
		37 to 50	100	99	99	98	98	95	93	90	74	38	A–7–5(20)	MH–CH
Panton silty clay:														
¼ mile W. of Vermont Fish and Game Service Refuge Headquarters on Vermont Highway No. 17. (Modal profile)	Estuarine and lacustrine clay.	0 to 4	100	97	95	92	90	81	62	45	48	18	A–7–5(13)	ML
		8 to 15	100	99	99	98	98	94	85	73	68	37	A–7–5(20)	MH–CH
		25 to 31	---	--	--	--	100	95	91	75	58	30	A–7–6(20)	CH
2 miles SE. of Weybridge. (Sandy clay loam substratum)	Estuarine and lacustrine clay.	0 to 5	100	99	98	96	95	87	71	57	78	28	A–7–5(19)	MH
		13 to 34	---	--	100	99	99	91	73	62	56	28	A–7–6(18)	MH–CH
		34 to 60	100	99	98	86	80	64	56	52	48	23	A–7–6(15)	CL
3.5 miles S. of Cornwall on Vermont Highway No. 30. (Surface layer coarser textured than in modal profile)	Estuarine and lacustrine clay.	0 to 8	100	97	96	84	72	46	29	23	30	8	A–4(8)	ML–CL
		8 to 21	---	--	100	83	66	42	33	30	32	14	A–6(10)	CL
		47 to 60	100	99	99	98	98	96	94	87	73	39	A–7–5(20)	MH–CH

TABLE 8.—*Engineering test data*—Continued

Soil name and location	Parent material	Depth	Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
			Percentage passing sieve—				Percentage smaller than—							
			No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified
		Inches									*Pct.*			
Vergennes clay:														
1 mile S. of Weybridge Hill. (Modal profile)	Estuarine and lacustrine clay.	0 to 6	---	100	99	97	95	90	81	75	59	27	A–7–5(19)	MH–CH
		16 to 25	---	---	--	---	--	100	99	95	76	42	A–7–5(20)	MH–CH
		35 to 47	---	---	--	100	99	97	96	81	67	36	A–7–5(20)	MH–CH
1 mile SE. of Cornwall. (More poorly drained than modal)	Estuarine and lacustrine silt and clay.	0 to 5	---	---	--	100	99	98	98	92	83	41	A–7–5(20)	MH
		11 to 17	---	---	--	--	--	--	100	85	62	32	A–7–5(20)	MH–CH
		17 to 39	100	96	95	94	94	93	93	85	65	32	A–7–5(20)	MH–CH
2 miles SE. of Weybridge. (More sandy in substratum than modal)	Estuarine and lacustrine silt and clay.	3 to 11	100	99	98	96	95	86	70	55	47	21	A–7–6(14)	ML–CL
		11 to 23	---	---	100	99	99	95	90	84	72	37	A–7–5(20)	MH–CH
		24 to 34	[2] 99	99	99	96	95	89	82	70	56	26	A–7–5(18)	MH–CH
		41 to 60	---	---	100	55	25	10	3	3	NP	[3] NP	A–4(4)	ML

[1] Mechanical analysis according to the AASHO Designation T88(*1*). Results by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[2] Percentage passing sieve: 1½ inches—100; 1 inch—99; ¾ inch—99; ⅜ inch—99; No. 4 sieve—99.

[3] NP = Nonplastic.

These tables, with the soil map and information given elsewhere in this survey, can be used by engineers to—

1. Make soil and land-use studies that will aid in selecting and developing industrial, business, residential, and recreation sites.
2. Plan the construction of drainage and irrigation systems, farm ponds, diversions, and other soil and water conservation structures.
3. Make preliminary evaluations of soil conditions that will aid in selecting locations for highways, airports, pipelines, cables, and buildings and in planning detailed soil surveys at the selected locations.
4. Locate sources of sand, gravel, topsoil, and other construction materials.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining such structures.
6. Supplement information from other sources and make engineering maps and reports.
7. Develop other preliminary estimates for construction purposes pertinent to a specific area.

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

Some of the terms used in this survey have special meanings in soil science that do not correspond with the meanings of the same terms in engineering. These terms are defined in the Glossary at the back of this survey. For additional information about the soils, engineers may want to refer to "Descriptions of the Soils," "Formation and Classification of Soils," and other sections of this survey.

Soil classification systems

The texture of the soils has been classified in table 5 according to the systems used by the U.S. Department of Agriculture (*20*), the U.S. Army Corps of Engineers (*23*), and the American Association of State Highway Officials (AASHO) (*1*). The latter two systems are described in the "PCA Soil Primer'" (*14*).

Under the U.S. Department of Agriculture system, soils are classified according to texture, structure, color, and other morphological characteristics. The textural classification is in some ways comparable to the systems used by engineers.

Many engineers use the Unified Soil Classification System, in which soils are divided into three classes: (1) coarse grained, (2) fine grained, and (3) highly organic. The coarse-grained soils are divided into eight groups, ranging from well-graded clean gravel (GW) to clayey sand (SC). The fine-grained soils are divided into six groups, ranging from silty soil with a low liquid limit (ML) to organic silt and clay with a high liquid limit (OH). Highly organic soil is classified as Pt.

Most highway engineers use the AASHO system, in which there are seven basic groups of soils ranging from group A–1 to A–7. Soils in group A–1 contain predominantly sand and gravel and generally have a high load-carrying capacity. Soils in group A–7 are composed predominantly of clay and have a low load-carrying capacity when wet.

Estimated properties of the soils

In table 5 the soil series and the mapping unit symbols are listed, and estimates are given of texture, permeability, available water capacity, shrink-swell potential, and other soil properties. The estimates are based on field classification and descriptions, available physical and chemical tests of representative samples, available test data from comparable soils in adjacent areas, and on experience of soil scientists and engineers. The estimates are for representative profiles, which are divided into layers significant in engineering. More detailed information about each soil is contained in the section "Descriptions of the Soils."

The depth to the seasonal high water table is important because it may limit the use of sites for highways, buildings, septic tank effluent disposal systems, and other engineering uses. It is also important in choosing sites for dug ponds.

The depth to a compact layer is important for foundation design. The compact layer, which is relatively impermeable, adversely affects disposal fields for septic tanks. This compact layer is an asset when an impermeable layer is needed for retaining water in ponds and sewage lagoons.

Depth to bedrock is important because it may greatly affect the cost of any excavation and is important in foundation design.

Reaction is expressed in pH values. A definition of pH, and adjective terms used to express soil reaction, are given in the Glossary.

Permeability is the rate at which water moves through the undisturbed soil material. The estimates are based mainly on soil structure and texture and on tests of undisturbed cores of similar soils.

Available water capacity is the approximate amount of capillary water available to plants when the soil is wet to field capacity.

Optimum moisture for compaction is the range in content of soil moisture at which the greatest compaction can be obtained. It is expressed as a percentage of the dry weight of the soil.

Maximum dry density is the weight, in pounds, of one cubic foot of soil after it has been compacted at optimum moisture content and then dried.

Shrink-swell potential indicates the degree of volume change to be expected primarily on the basis of the amount and type of clay present. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. Maintaining structures built on or with soils having a high shrink-swell potential is difficult.

Susceptibility to frost action was estimated for the soils as they occur in place. Frost action is the heaving caused by ice lenses forming in the soil and the subsequent loss of strength as a result of excess moisture during thawing periods. Soils that have a high percentage of silt and very fine sand are highly susceptible to frost action.

Interpretations of the soils for engineering

In table 6 soils are rated as sources of topsoil, sand, gravel, and road fill, and specific soil features are listed that affect highway location, farm pond construction, agricultural drainage, and the construction of diversion ditches and waterways. Undesirable features are emphasized, but important desirable features are also listed. The information in this table is based on the estimated properties shown in table 5, on available test data in table 8, and on field experience. Actually, the information applies only to the soil depth indicated in the table, but it is reasonably reliable to a depth of about 4 feet for most soils and to a depth of several more feet for some soils.

Topsoil is a fertile soil material, ordinarily rich in organic matter, used as a topdressing on slopes, road shoulders, ditchbanks, and other places where vegetation is needed. The ratings indicate suitability for such use.

The ratings for suitability as source of sand and gravel do not indicate quality or depth of the deposits.

Road fill is material used to build embankments. Factors that determine suitability are load-carrying ability, compaction characteristics, workability, depth to water table, and depth to bedrock.

Highway location is influenced by factors of the undisturbed soil that affect construction and maintenance of highways. Such factors are compressibility, the hazards of flooding and seepage, stability of slopes, susceptibility to frost action, and depth to water table and to bedrock.

A farm dug-out pond is generally made in depressional or nearly level soils. Depth to water table, permeability, depth to bedrock, and the hazard of flooding are features affecting the feasibility of a dug-out pond.

Farm pond reservoir areas may be affected by loss of water from seepage; the soil features described are those that influence such seepage.

Farm pond embankments serve as dams. The soil features of both the subsoil and the substratum are those important to the use of soils for constructing embankments.

Agricultural drainage includes surface and subsurface drainage systems. Features that affect construction of such systems are a high water table, seepage, permeability, flooding, sloughing, and depth to bedrock.

Diversion ditches and waterways are structures designed to divert or to channel water. The soil features described are those that affect use of the soil as material for construction, or for establishing vegetation. These are seepage, erodibility, shallowness to bedrock or pan layers, and presence of stones.

Limitations of the soils for nonfarm uses

Table 7 has been prepared mainly for the use of landowners, planners, developers, and others in expanding communities. It gives limitations of the soils in the county for nonfarm uses.

Construction of houses with basements, light industrial and commercial buildings, and streets and parking lots is affected chiefly by features of the undisturbed soil. The major soil properties influencing the limitation for these uses are depth to seasonal high water table, slope, depth to bedrock, surface rockiness and stoniness, and hazard of flooding.

Limitations for lawns and landscaping are for soil in place and are not for areas where the original soil layers have been mixed by excavation and bulldozing. Soil properties affecting these soil limitations are depth to seasonal high water table, slope, depth to bedrock, surface rockiness and stoniness, texture of the surface layer, and hazard of flooding. If plants that require a specific narrow range of acidity or alkalinity are to be grown, the soil should be tested after grading has been completed and then treated according to the results of the soil tests.

Septic tank filter fields are affected mainly by soil permeability, presence of a seasonal high water table, slope, and susceptibility to flooding.

Sewage lagoons are influenced by soil features such as permeability, depth to seasonal high water table, slope, and hazard of flooding.

Cemeteries are influenced by features of the undisturbed soil. The soil features that determine the limitations are depth to seasonal high water table, permeability, depth to bedrock, surface rockiness and stoniness, texture of the surface layer, slope, and hazard of flooding.

The ratings of slight, moderate, severe, and very severe reflect the potential use and expense of preparation of the soils for the selected uses.

A rating of *slight* means a high potential and little or only ordinary expense of preparation for development for that specific use. For most uses the soil is generally well drained and level to gently sloping.

A rating of *moderate* means the area has a correctable problem, which entails some expense above that ordinarily expected, or, if all other aspects of the soil are favorable, that there is a slope or grade that affects the rating.

A rating of *severe* indicates the area has critical limitations and considerable expense in preparation would be necessary before it could be used. The major problems, other than slope, are flooding by streams, wetness, shallowness to bedrock, degree of stoniness, or an undesirable soil texture. A rating of severe for a particular use does not imply that a soil so rated cannot be put to that use.

A rating of *very severe* indicates the area is undesirable. These areas have limitations that are almost uncorrectable, such as flooding by streams, very steep slopes, excessive wetness, and poor drainage.

Engineering test data

Table 8 contains test data on soil samples from se-

lected soil series in Addison County, Vermont. These tests were made by the Bureau of Public Roads.

One sample of each series selected represents the central, or modal, concept of the series. The table shows the locations where samples were collected, the depth to which sampling was done, and the results of tests to determine particle-size distribution and other properties significant in soil engineering.

Mechanical analysis shows the percentages, by weight, of soil particles that pass sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve, but silt and clay do pass through the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method rather than the pipette method.

Liquid limit and plasticity index indicate the effect of water on the consistence of the soil material. The plastic limit is the moisture content at which the soil material passes from a semisolid 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.

Use of the Soils for Recreational Development

This section contains information about the suitability of the soils for recreation sites, as given in table 9. This table gives the limitations of the soils for seven kinds of recreational developments.

Buildings referred to in table 9 are considered to be simple, single story, frame or masonry buildings without basements, such as shelters, recreational halls, or cabins.

Paths and trails are narrow, not graded, not vegetated, and not paved. They are suitable for walking or horseback riding.

Intensive play areas are athletic fields, playgrounds, and similar areas that are graded, vegetated, and maintained for intensive use.

Picnic areas are areas in their natural condition that may be wooded. Sites used for picnic tables can be leveled if necessary.

Intensive camp areas are camp areas for seasonal use that are not paved and that are used for living in tents, tent trailers, or travel trailers.

Golf courses are those that are vegetated and maintained for intensive use. These include short par 3 courses having 9 or 18 holes. Greens are excluded.

Access roads means seasonal roads that are graded, but not paved, and are suitable for conventional two-wheel-drive vehicles. Included are parking areas that are not paved.

These seven recreational developments are rated according to the limitations that affect the establishment and maintenance of the areas. A rating of *slight* indicates that the soil properties are favorable and that there are only minor limitations. A *moderate* rating indicates that the soil properties create slight problems, and a *severe* rating indicates that there are difficult problems. *Very severe* indicates that the soil has very difficult limitations and that the development is impractical to construct or maintain. For ratings of moderate, severe, and very severe, the kind of limitation, such as *slightly wet* or *steep slopes,* is given.

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TABLE 9.—*Limitations of the soils for recreational uses*

Soil series and map symbols	Buildings	Paths and trails	Intensive play areas	Picnic areas	Intensive camp areas	Golf courses	Access roads
Adams:							
(AdA)	Slight	Slight	Slight	Slight	Slight	Moderate: droughty.	Slight.
(AdB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: droughty; moderate slopes.	Moderate: moderate slopes.
(AdD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(AdE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Amenia:							
(AmB)	Moderate: slightly wet.	Slight	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.
(AmC)	Moderate: moderate slopes; slightly wet.	Slight	Severe: moderate slopes.	Moderate: moderate slopes; moist.	Moderate: moderate slopes; slightly wet.	Moderate: moderate slopes; slightly wet.	Moderate: moderate slopes; slightly wet.
(AsC)	Moderate: moist; stony.	Moderate: stony.	Severe: moderate slopes; stony.	Moderate: slightly wet; moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes; stony; moist.	Moderate: stony; moist.
(AsD)	Severe: steep slopes.	Moderate: steep slopes; stony.	Very severe: steep slopes; stony.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Berkshire and Marlow:							
(BeA)	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
(BeB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(BeC)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(BsC)	Moderate: moderate slopes; very stony.	Moderate: very stony.	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: very stony; moderate slopes.	Moderate: very stony; moderate slopes.	Moderate: very stony; moderate slopes.
(BsE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.
Buckland:							
(BuC)	Moderate: slightly wet; very stony; moderate slopes.	Moderate: very stony.	Severe: very stony; moderate slopes.	Moderate: slightly wet; moderate slopes.	Severe: moderate slopes.	Moderate: slightly wet; very stony.	Moderate: slightly wet; very stony.

(BuD)	Severe: steep slopes.	Moderate: steep slopes; very stony.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Cabot: (CaB, CbC)	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet.
Calais: (ClC)	Severe: steep slopes.	Moderate: steep slopes; very stony.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(ClE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
(For Glover part of mapping units ClC and ClE, see the Glover series.)							
Canandaigua: (Cn)	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet.
Cobbly alluvial land: (Co)	Very severe: subject to flooding.	Moderate: subject to flooding.	Very severe: subject to flooding.	Very severe: subject to flooding.	Very severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.
Colton: (CtA)	Slight	Slight	Slight	Slight	Slight	Moderate: droughty.	Slight.
(CtB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes; droughty.	Moderate: moderate slopes.
(CtD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(CtE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Covington: (Cv)	Very severe: wet; flooding.	Severe: wet; clayey surface layer.	Very severe: wet; clayey surface layer; flooding.	Very severe: wet; clayey surface layer; flooding.	Very severe: wet; clayey surface layer; flooding.	Very severe: wet; clayey surface layer; flooding.	Severe: wet; clayey surface layer; flooding.
Covington and Panton: (Cw)	Severe: wet	Severe: wet; clayey surface layer.	Severe: wet; clayey surface layer.	Severe: wet; clayey surface layer.	Very severe: wet; clayey surface layer.	Severe: wet; clayey surface layer.	Severe: wet; clayey surface layer.
Duane: (DaA)	Moderate: slightly wet.	Slight	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.
(DaB)	Moderate: slightly wet; moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes; slightly wet.	Severe: moderate slopes.	Moderate: slightly wet; moderate slopes.	Moderate: slightly wet; moderate slopes.

TABLE 9.—*Limitations of the soils for recreational uses*—continued

Soil series and map symbols	Buildings	Paths and trails	Intensive play areas	Picnic areas	Intensive camp areas	Golf courses	Access roads
Dutchess:							
(DcB)	Slight	Slight	Moderate: gentle slopes.	Slight	Moderate: gentle slopes.	Slight	Slight.
(DcC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(DcD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(DsC)	Moderate: moderate slopes; very stony.	Moderate: very stony.	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes; very stony.	Moderate: moderate slopes; very stony.
(DsE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Elmwood, coarse variant:							
(EIB)	Moderate: slightly wet.	Slight	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.
(EIC)	Moderate: slightly wet; moderate slopes.	Slight	Severe: moderate slopes.	Moderate: slightly wet; moderate slopes.	Severe: moderate slopes.	Moderate: slightly wet; moderate slopes.	Moderate: slightly wet; moderate slopes.
Farmington:							
(FaC)	Severe: moderate and steep slopes; bedrock outcrops.	Moderate: bedrock outcrops.	Very severe: moderate and steep slopes; bedrock outcrops.	Very severe: moderate and steep slopes; bedrock outcrops.	Very severe: moderate and steep slopes; bedrock outcrops.	Severe: bedrock outcrops.	Severe: bedrock outcrops.
(FaE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
(FdB)	Slight	Slight	Severe: bedrock outcrops.	Slight	Moderate: gentle slopes.	Moderate: light silt loam surface layer.	Moderate: light silt loam surface layer.
(FdC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: light silt loam surface layer.	Moderate: moderate slopes.
(FdD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes; silty surface.	Severe: steep slopes.
(FdE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
(FnB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes; bedrock outcrops.	Moderate: moderate slopes.	Severe: moderate slopes; bedrock outcrops.	Moderate: moderate slopes; shallow.	Moderate: moderate slopes.

(FnC)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(FnD)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
(For Nellis part of mapping units FnB, FnC, and FnD, see units NeC, NeD, and NsD under the Nellis series.)							
Fresh water marsh: (Fw)	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.
Glover: (Mapped with Calais soils in unit ClC.)	Severe: moderate and steep slopes; bedrock outcrops.	Moderate: bedrock outcrops.	Severe: moderate and steep slopes; bedrock outcrops.	Moderate: moderate and steep slopes.	Severe: moderate and steep slopes; bedrock outcrops.	Severe: bedrock outcrops.	Severe: bedrock outcrops.
(Mapped with Calais soils in unit ClE.)	Very severe: very steep slopes; bedrock outcrops.	Severe: very steep slopes; bedrock outcrops.	Very severe: very steep slopes; bedrock outcrops.	Very severe: very steep slopes; bedrock outcrops.	Very severe: very steep slopes; bedrock outcrops.	Very severe: very steep slopes; bedrock outcrops.	Very severe: very steep slopes; bedrock outcrops.
Hadley: (Hf)	Severe: subject to flooding.	Slight	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Slight.
(Hh)	Very severe: subject to flooding.	Slight	Very severe: subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.
Limerick: (Le)	Very severe: subject to flooding.	Severe: wet	Very severe: subject to flooding.	Very severe: subject to flooding; wet.	Very severe: subject to flooding; wet.	Very severe: subject to flooding; wet.	Severe: subject to flooding.
(Lf)	Very severe: very wet; frequent flooding.	Very severe: very wet.	Very severe: very wet; frequent flooding.	Very severe: very wet; frequent flooding.	Very severe: very wet; frequent flooding.	Very severe: very wet; frequent flooding.	Severe: frequent flooding.
Livingston: (Lh, Lk)	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.
Lyman: (LmB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes; bedrock outcrops.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes; bedrock outcrops.	Moderate: moderate slopes; bedrock outcrops.
(LmC)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes; bedrock outcrops.	Severe: steep slopes; bedrock outcrops.
(LxC)	Severe: moderate and steep slopes; bedrock outcrops.	Severe: bedrock outcrops.	Severe: moderate and steep slopes; bedrock outcrops.	Moderate: moderate and steep slopes; bedrock outcrops.	Severe: moderate and steep slopes; bedrock outcrops.	Severe: bedrock outcrops.	Severe: bedrock outcrops.

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TABLE 9.—*Limitations of the soils for recreational uses*—continued

Soil series and map symbols	Buildings	Paths and trails	Intensive play areas	Picnic areas	Intensive camp areas	Golf courses	Access roads
(LxE)	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
(For Berkshire part of mapping unit LmB, see unit BeB under the Berkshire series. For Berkshire part of LmC, see unit BeC. For Berkshire part of LxC, see unit BsC. For Berkshire part of LxE, see unit BsE.)							
Massena: (MaA, MnB)	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet.
Melrose: (MrA)	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
(MrB)	Slight	Slight	Moderate: moderate slopes.	Slight	Moderate: gentle slopes.	Slight	Slight.
(MrC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(MrD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(MrE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Muck and Peat: (Mv)	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: very wet.	Very severe: organic surface.
Nassau: (NaB)	Slight	Slight	Severe: bedrock outcrops.	Slight	Severe: bedrock outcrops.	Moderate: bedrock outcrops.	Slight.
(NaC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes; bedrock outcrops.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes; bedrock outcrops.	Moderate: moderate slopes; bedrock outcrops.
(NaD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes; bedrock outcrops.	Severe: steep slopes; bedrock outcrops.
(NdC)	Severe: steep slopes; bedrock outcrops.	Severe: steep slopes; bedrock outcrops.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes; bedrock outcrops.	Severe: bedrock outcrops.

(For Dutchess part of mapping unit NaB, see unit DcB under the Dutchess series. For Dutchess part of NaC, see unit DcC. For Dutchess part of NaD, see unit DcD.)							
Nellis:							
(NeB)	Slight	Slight	Moderate: gentle slopes.	Slight	Moderate: gentle slopes.	Slight	Slight.
(NeC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(NeD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(NsC)	Moderate: moderate slopes; very stony.	Moderate: very stony.	Severe: moderate slopes; very stony.	Moderate: moderate slopes; very stony.	Severe: moderate slopes; very stony.	Moderate: moderate slopes; very stony.	Moderate: moderate slopes; very stony.
(NsD)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Peru:							
(PeA)	Moderate: slightly wet.	Slight	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.	Moderate: slightly wet.
(PeB)	Moderate: slightly wet; moderate slopes.	Slight	Severe: moderate slopes.	Moderate: slightly wet; moderate slopes.	Severe: moderate slopes.	Moderate: moderate slopes; slightly wet.	Moderate: moderate slopes; slightly wet.
(PeC)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(PsC)	Severe: moderate and steep slopes; slightly wet.	Moderate: very stony; moderate and steep slopes.	Very severe: moderate and steep slopes; very stony.	Severe: slightly wet; moderate and steep slopes.	Very severe: moderate and steep slopes.	Severe: moderate and steep slopes; slightly wet; very stony.	Severe: moderate and steep slopes; very stony.
(PsD)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Quarry:							
(Qu) (Properties are so variable that interpretations were not made.)							
Raynham:							
(RaB, RaC)	Moderate: moderate slopes; slightly wet.	Moderate: heavy silt loam surface layer.	Severe: moderate slopes.	Moderate: moderate slopes; slightly wet.	Severe: moderate slopes.	Severe: moderate slopes; heavy silt loam surface layer.	Moderate: slightly wet; heavy silt loam surface layer; moderate slopes.

TABLE 9.—*Limitations of the soils for recreational uses*—continued

Soil series and map symbols	Buildings	Paths and trails	Intensive play areas	Picnic areas	Intensive camp areas	Golf courses	Access roads
(RaD)	Severe: steep slopes.	Moderate: heavy silt loam surface layer.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
Rock land: (Rk)	Very severe: exposed bedrock.	Very severe: exposed bedrock.	Very severe: exposed bedrock.	Very severe: exposed bedrock.	Very severe: exposed bedrock.	Very severe: exposed bedrock.	Very severe: exposed bedrock.
Salmon: (SaB)	Slight	Slight	Moderate: gentle slopes.	Slight	Moderate: gentle slopes.	Moderate: droughty.	Moderate: gentle slopes.
(SaC)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Severe: moderate slopes.	Moderate: droughty; moderate slopes.	Moderate: moderate slopes.
(SaE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Stetson: (StA)	Slight	Slight	Slight	Slight	Slight	Slight	Slight.
(StB)	Moderate: moderate slopes.	Slight	Severe: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.	Moderate: moderate slopes.
(StD)	Severe: steep slopes.	Moderate: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes.
(StE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.
Swanton: (Sw)	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet.
Vergennes: (VgB, VqC)	Moderate: moderate slopes; frost heaving.	Severe: moderate slopes; slippery and sticky when wet.	Severe: moderate slopes.	Severe: moderate slopes.	Very severe: moderate slopes; slippery and sticky when wet.	Severe: clay surface layer.	Severe: moderate slopes; slippery and sticky when wet.
(VgD)	Severe: steep slopes.	Severe: slippery and sticky when wet.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep slopes.	Severe: steep slopes.	Severe: steep slopes; slippery and sticky when wet.
(VgE)	Very severe: very steep slopes.	Severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.	Very severe: very steep slopes.

(VrB)	Moderate: moderate slopes; moderately shallow to bedrock.	Severe: slippery and sticky when wet.	Severe: moderate slopes; slippery and sticky when wet; moderately shallow to bedrock.	Severe: moderate slopes; slippery and sticky when wet.	Very severe: slippery and sticky when wet; moderately shallow to bedrock.	Severe: clay surface layer.	Severe: moderate slopes; slippery and sticky when wet.
(VrC)	Moderate: moderate slopes; moderately shallow to bedrock.	Severe: slippery and sticky when wet.	Severe: moderate slopes; slippery and sticky when wet; moderately shallow to bedrock.	Severe: moderate slopes; slippery and sticky when wet.	Very severe: slippery and sticky when wet; moderately shallow to bedrock.	Severe: clay surface layer.	Severe: moderate slopes; slippery and sticky when wet.
(VrD)	Severe: steep slopes.	Severe: slippery and sticky when wet.	Very severe: steep slopes.	Severe: steep slopes.	Very severe: steep; moderately shallow to bedrock.	Severe: steep slopes; clay surface layer.	Severe: steep slopes; slippery and sticky when wet.
Walpole: (Wa)	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet	Severe: wet.
Winooski: (Wo)	Very severe: subject to flooding.	Slight	Very severe: subject to flooding.	Severe: subject to flooding.	Very severe: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.

Formation and Classification of Soils[4]

This section consists of three main parts. In the first part, the factors of soil formation are discussed. The second part is a discussion of the processes of soil formation in the county. The third part is a discussion of the classification of each soil series according to the current system of classifying soils.

Factors of Soil Formation

The characteristics of a soil at any given location are determined by the interaction of (1) the physical, mineralogical, and chemical composition of the parent material; (2) the plant and animal life in and on the soil; (3) the climate under which the soil material has developed; (4) the relief, or relative elevation of the land, and drainage; and (5) the length of time the soil material has been in place. One or more of the factors may exert a dominating influence on the kind of soils formed in a particular area. Commonly, however, the effect of any one factor is difficult to isolate, and the cumulative effect of all is evident. It is apparent that differences in parent material, drainage, and age have been of primary importance in causing differences among the soils in Addison County.

In the following discussion, the most important morphological characteristics of the soils of Addison County are discussed in relationship to the factors of soil formation.

Parent material

The parent material of the soils in Addison County consists of alluvium, organic deposits, and deposits associated with glaciation. The texture and mineralogical composition of the soils are directly related to the nature of the parent material. To a lesser degree, other soil features, such as drainage, depth to rock, and degree of horizonation, are also related to the nature of the parent material.

Many of the soils are high in content of clay or are underlain at a depth of 2 to 3 feet by clay. Soils such as the Covington, Panton, Livingston, and Vergennes soils are high in calcium, potassium, and magnesium because they were formed from lacustrine and estuarine sediments high in clay and from basic minerals. The clay minerals are mainly mica and interstratified micavermiculite. There are small amounts of vermiculite. The slow permeability and high content of calcium in the parent material affect the kinds of soils formed. In Addison County, none of the soils high in clay is well drained, and all of the soils have a base saturation of more than 50 percent.

Another important group of soils, including the Farmington, Nellis, Amenia, and Massena soils, formed in glacial till that contained a high proportion of limestone and that, in general, was high in silt and low in clay.

Glacial till that was low in lime and had medium texture was the parent material for soils that have a texture of loam. Examples of these soils in Addison County are the Buckland, Cabot, Calais, and Glover soils.

The parent material of the Berkshire, Dutchess, Lyman, Nassau, Peru, and Marlow soils was acid glacial till. As a result of having developed in glacial till low in basic minerals, these soils are naturally low in fertility.

In the absence of a perched water table close to the surface, or of excessive surface water, the soils that formed in the glacial till are well drained. In such soils, and to a lesser extent in soils that are not well drained, the somewhat sandy texture and the absence of bases have contributed to the speed and degree to which spodic horizons have developed.

Another feature of the glacial till that has affected soil characteristics is the compaction of the till. The grayish compact layer called a fragipan in the Calais, Cabot, Marlow, Peru, and Buckland soils is considered to be inherited, at least in part, from the parent material. This layer has had a pronounced influence on soil characteristics such as drainage, content of organic matter, and amount of translocation.

A small but important group of soils formed from glaciofluvial deposits of sand and gravel. These soils include the Adams, Colton, Duane, Stetson, and Walpole soils. The parent material probably contained carbonates, but generally the soils developed from these materials are acid. The soils are high in sand, many of them contain gravel, and all are low in silt and clay. Another group of related soils formed in deposits of lacustrine silt and very fine sandy loam. These include soils of the Canandaigua, Salmon, and Raynham series.

There are soils in Addison County that show strong textural differences between soil horizons. This is the result of layered parent material. The soils have profiles that are called two storied. These two-storied soils formed in glaciofluvial sand deposits on estuarine or lacustrine clay loam, silty clay, or clay material. These soils are in the Elmwood, Melrose, and Swanton series.

Another small but important group of soils are the Hadley, Winooski, and Limerick soils of flood plains. Water-deposited sediment similar to that from which these soils formed is still collecting. This material contained a high proportion of very fine sand together with smaller amounts of silt, gravel, and stone fragments and, in general, little clay.

The organic soils of Addison County formed in deposits of decomposed reeds, sedges, and woody plants. In areas that have not been drained, the parent material of these soils is still collecting on the surface as plants die.

The unconsolidated deposits that cover the county vary in thickness. Where bedrock is within about 40 inches of the surface, the soil-forming processes are affected. In general, little weathering of bedrock has taken place during the period of soil formation. However, the kind of bedrock at this depth influences the absorption of nutrients by roots and subsequent recycling of nutrients in the soil. The dominant textures of

[4] By OLIVER W. RICE, JR., soil scientist, Soil Conservation Service.

the soils of Addison County have been inherited from their parent material. The textures range from sand to clay. It is presumed that practically all coarse fragments in the soils have been inherited from the parent material, and that the weathering of residual rock into coarse fragments and the comminution of large stone fragments into smaller ones have been of minor importance. During soil formation, there has been a gross volume increase of the soil mass by such processes as development of structure and loosening by root penetration. Therefore, the percent of volume occupied by the coarse fragments in the solum is generally less than the percent of volume in the substratum.

Soils that formed in glacial till contain stone fragments that comprise as much as 50 percent of the soil by volume, in some places. Berkshire, Dutchess, and Nellis soils are examples of such soils. The Colton and Stetson soils have inherited from their parent material not only their texture but their high content of gravel and cobblestones.

Plant and animal life

In Addison County, the effects of animals and vegetation on soil formation are evident. The native vegetation in the county was mixed hardwoods and conifers. In general, the Champlain Valley was covered mainly by stands of white pine, hemlock, oak, maple, and beech. The Green Mountains and foothills were covered mainly by maple, birch, beech, red spruce, and hemlock. Areas that were wet and shallow to bedrock probably had the most conifers. Wet areas also had sphagnum moss and other mosses that contributed substantially to the accumulation of organic deposits. In these areas there are now mineral soils that contain large amounts of organic matter, or organic soils. Local differences in drainage and minor changes in parent material, elevation, aspect, and other features contributed to differences in the density of forests, the composition of species, and the kinds of associated ground cover.

The major effect of organisms in soil formation has been the darkening of the surface layer by organic matter, the translocation and cycling of bases and nutrients by plants, the mixing of soil horizons by windthrow of trees and by animals digging and burrowing, and the effect on kind of weathering and rate of weathering caused by micro-organisms growing in the soil.

In soils such as the Adams, Berkshire, and Colton, organic matter has played a dominant role in the development of the distinctive A2 and spodic horizons. Changes in the soil because of changes in vegetation and use of the land since the first white settlers came are small. The original organic cover has been mixed in the top 6 inches, fertilizer and lime have been added to the soil, and a grassland type of farming has followed in much of the county. As yet use of the soils by man has not resulted in a different classification of the soils. Many areas originally cleared or harvested for timber now support excellent stands of yellow birch, maple, and beech. Aspen covers many of the heavily cutover areas. Presumably soil-forming processes in reforested areas are proceeding as they did before the areas were cleared or the trees were harvested for timber.

Climate

Addison County has a cool-temperate, humid, continental climate. There are differences in the climate within the county because of elevation and the distance from Lake Champlain. These differences are discussed in the subsection "Climate", page 113. The gross effects of climate are evident in the soils of the county.

All of Addison County was covered with ice thousands of years ago. During this time and immediately afterward, most of the parent material was deposited. From the end of the ice-covered period to the present time, there have probably been periods when the climate was slightly different from that of today. However, all the climate-related features of the soils of Addison County can be attributed to the effects of a climate similar to the present climate.

Moderately warm summers, well-distributed rainfall, and a cover of vigorously growing vegetation have interacted to supply large amounts of organic material to the soil surface. The organic matter that has accumulated on the surface has not decayed completely, because the summers have been neither very long nor very hot. In addition, the ground is frozen for several months each year. Consequently, a relatively large amount of organic matter has accumulated on the surface and in the top 12 inches of many of the soils.

Frozen soils during much of the year have held leaching to a moderate level. As a consequence, the base status of the C horizon is thought to be very similar to the base status of the original parent material. In addition, nutrients and bases from the annual fall of leaves and other vegetation are not readily lost from the surface layer, because of the frozen soil.

The moderately warm summers and cold winters have limited the rate of chemical reaction and the rate of mechanical breakdown of parent material. Consequently, weathering of parent material into secondary minerals has not progressed so far as in soils formed in similar parent material in warmer climates. Most of the soils that developed from parent material high in quartz contain a supply of readily weatherable minerals. However, soils of the Adams, Colton, and Duane series contain smaller amounts than other soils. The morphology of Addison County soils indicates that there was little formation of clay minerals and little clay movement in the soils. Only soils of the Covington, Panton, and Vergennes series have argillic horizons.

Relief and drainage

In Addison County, the difference in elevation is approximately 3,960 feet. Much of the Champlain Valley is between 100 and 500 feet in elevation. The eastern edge of the county is between 1,000 and 2,000 feet. The highest point, Mt. Abraham, is 4,052 feet above sea level.

There is a large percentage of moderately well

drained soils having slopes between 0 and 8 percent. Excessively drained soils mainly have slopes of more than 30 percent. Many of these soils are shallow to bedrock and are located in the Green Mountains and their foothills. In the Champlain Valley, where many of the excessively drained or somewhat excessively drained soils, such as those of the Adams, Colton, and Stetson series, have coarse parent material, a large proportion of these soils have slopes between 3 and 20 percent.

Throughout the county about half of the well-drained soils commonly have slopes that range from about 3 to 15 percent. Within areas of relatively homogenous parent material, many of the differences in soils are associated with differences in drainage.

Throughout the county a large proportion of the somewhat poorly drained, poorly drained, and very poorly drained soils has slopes of less than 3 percent.

In the Green Mountains and the foothills, a small acreage of somewhat poorly drained and poorly drained soils has slopes that range up to about 20 percent. The drainage of all of these soils is affected by a seasonal high water table, seepage, and accumulation of surface water.

In the Champlain Valley, in areas where the parent material is mainly clay, the best drained soils in clay are the Vergennes soils, which are moderately well drained. Somewhat poorly drained, poorly drained, and very poorly drained soils in clay are in areas that have slow surface drainage, have slopes of less than 8 percent, or are ponded.

Soils in areas of excessive relief have a thinner solum and are shallower to bedrock than soils in areas where slopes are more gentle. This is partly because of original depth of parent material. It is also partly the result of a higher rate of geological erosion in the areas having steeper slopes.

Time

The degree of soil development is related to the length of time that soil-forming processes have acted on parent material, as well as their intensity. In Addison County the soil material in the highlands has been in place for 10 to 12 thousands years. The lacustrine and estuarine sediments are younger. The alluvium along streams is geologically very young and is still being deposited.

Distinctive horizons having accumulations of organic matter, aluminum, and iron have had time to form in many of the highland soils such as the Berkshire soils. These horizons form more quickly in soils whose parent material is sandy and low in clay and bases. In soils of the Champlain Valley, there is less evidence of horizon differentiation. Nellis and Farmington soils have bright-colored horizons that have been changed by soil-forming processes and that have, normally, no mineral accumulation. Many of the soils in Addison County have been in place long enough to have developed a B horizon enriched in clay, but only the Vergennes, Panton, and Covington soils have such a horizon. Probably more soils would have this horizon if conditions for clay formation or translocation had been more favorable. Parent material of such soils as the Nellis and Farmington soils could supply enough clay for formation of a horizon of clay accumulation, but translocation proceeded at a slow rate because of the high base status of the parent material.

Processes of Soil Formation

This subsection highlights the major processes which have contributed to the differentiation of horizons in Addison County soils and to the development of distinctive morphology of each kind of soil.

The most important soil-forming processes that have caused horizon differentiation in Addison County soils are (1) accumulation and distribution within the horizon of organic matter; (2) the progressive leaching of salts and carbonates; (3) chemical weathering, chiefly by hydrolysis, of the primary minerals into silicate clay minerals and their transfer to deeper layers; (4) chemical changes such as oxidation, reduction, and hydration, and the transfer or loss from the soil of the products of these changes; and (5) mechanical breakdown of coarse fragments into finer fragments of rock and soil material.

There are also processes that tend to modify, retard, or reverse the effects of those already listed. The most important of these modifying processes are (1) mixing of soil by windthrow, animal activity, or frost wedging; (2) the accumulation of fresh soil material through physical weathering or deposition; and (3) the interception and subsequent recycling by plants of leached bases.

Organic matter has accumulated to some degree in all the soils in Addison County. The organic soils are accumulations of vegetation whose rate of decomposition has been retarded by saturation with water. The color of the surface layer of all mineral soils is a rough guide to the relative amount of organic matter. The surface layer of Livingston soils is black because of the organic matter. Livingston soils contain the highest percentage of organic matter of the mineral soils. In most of the soils there is a sharp reduction in content of organic matter below the A horizon. Some soils that formed in recent alluvium, however, contain enough organic matter to appreciably affect their color to a depth of 24 inches or more. In the group of soils in the Spodosols order (*18*), organic matter and sesquioxides have moved from the A horizon and precipitated in the B horizon. The B horizon, especially the upper part, is higher in content of organic matter than the A2 horizon. Soils of this kind are in the Adams, Berkshire, Marlow, Peru, Salmon, Stetson, Colton, Duane, Dutchess, Elmwood, Lyman, and Melrose series.

At least partial removal of salts and carbonates has taken place in the soils that formed in material that contained appreciable amounts of salts and carbonates. As a result, most of these soils are acid in the upper layer, and removal of soluble salts has been complete. Removal of carbonates has proceeded to different depths, depending on the amount originally present and on the drainage and texture of the soil. Soils of the Amenia, Covington, Farmington, Livingston, Mas-

sena, Nellis, Panton, and Vergennes series formed from calcareous parent material. In all of these soils the reaction of the surface layer is medium acid to neutral, and acidity decreases with depth.

Of the soils in Addison County, only those in the Champlain Valley contain appreciable amounts of clay. The parent material of other soils contained only a small amount of clay, and apparently soil formation has produced only a small amount. In soils of the Covington, Panton, and Vergennes series, the dominant clay minerals are interstratified mica-vermiculite and mica. In these soils the clay content was inherited from the parent material. Mineralogical data, given in table 12, suggest that interstratified mica-vermiculite has formed in the upper horizon of these soils.

Only Covington, Panton, and Vergennes soils show evidence of appreciable clay accumulation in the B horizon. In places, soils of the highlands show evidence of silt transfer into a layer just below the B horizon. In the Marlow, Peru, Buckland, and Cabot soils, this layer, called a fragipan, is dense and has a characteristic brittleness as if it were slightly cemented. The layer restricts downward movement of water in these soils, and there is a subsequent accumulation of transported material.

Chemical changes have been an important part of horizon differentiation in many of the Addison County soils. Many of the chemical changes are not apparent, and no detailed study of the formation of these soils has been made. However, there are some obvious features caused by chemical changes. Soils such as the Nellis soils have a brown-colored B horizon because of iron liberated from primary minerals. The iron coats the soil particles by precipitation, and subsequent oxidation of the iron gives the soil its characteristic color. Other soils, such as the Berkshire soils, have a light-colored A2 horizon in unplowed areas, and this light color has resulted from the solution of sesquioxides, and the removal to lower horizons of these materials in the form of soluble metal-organic complexes. As a part of this action, the complexes are precipitated, and the iron oxides in the B horizon cause the reddish or brownish color.

The horizons of many soils in Addison County have characteristic morphology as the result of being saturated with water for extended periods. Mottling results as iron is reduced and segregated, as in the lower horizons of such soils as the Amenia, Buckland, and Peru soils. Gleying results when a horizon is subjected to intense reduction during soil development. Cabot, Covington, Panton, and Livingston soils were intensively reduced during soil formation.

The principal agents of mechanical breakdown of rock fragments in Addison County have been freezing and thawing. The glacial till in which many of the soils formed contains many coarse fragments. Soils that formed in this material contain appreciably more silt and very fine sand in the solum than in the C horizon or parent material. The source of the finer material has not been established.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and revised later (*19*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 (*21*). It is under continual study. Readers interested in the development of the system should refer to the latest literature available (*17*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 10 shows the classification of each soil series of Addison County by family, subgroup, and order, according to the current system. It also shows one category—the great soil group—of the 1938 system.

In the broadest category, the order, there are ten classes, but only four of these are present in Addison County. These are the Alfisols, Histosols, Inceptisols, and Spodosols.

Alfisols are mineral soils that have a clay-enriched layer called an argillic horizon, high in base saturation. In Addison County this argillic horizon is not as high in base status as the original calcareous parent material.

Histosols are organic soils. They consist of organic deposits greater than 12 inches thick if drained, or 18 inches thick if undrained. The classification of these soils below the category of the order has not been completed. In Addison County the only mapping unit in the Histosols order is Muck and Peat.

Inceptisols, from the Latin word "inceptum", or beginning, are mineral soils that do not have differences in horizons that result from intensive weathering or significant illuviation or eluviation.

Spodosols, from the Greek word "spodos", meaning woodash, are mineral soils that have horizons in which organic colloids and iron and aluminum compounds have accumulated in some part of the B horizon.

TABLE 10.—*Soil series classified into higher categories*

Series	Current classification system			1938 classification system
	Family	Subgroup	Order	Great soil group
Adams	Sandy, mixed, frigid	Typic Haplorthods	Spodosols	Podzols.
Amenia	Coarse-loamy, mixed, mesic.	Aquic Eutrochrepts	Inceptisols	Brown Forest soils.
Berkshire	Coarse-loamy, mixed, frigid.	Typic Haplorthods	Spodosols	Podzols.
Buckland	Coarse-loamy, mixed, frigid.	Entic Fragiorthods	Spodosols	Sols Bruns Acides (intergrading to Brown Forest soils).
Cabot	Coarse-loamy, mixed, frigid.	Typic Fragiaquepts	Inceptisols	Low-Humic Gley soils.
Calais	Coarse-loamy, mixed, frigid.	Typic Fragiorthods	Spodosols	Brown Forest soils (intergrading to Sols Bruns Acides).
Canandaigua	Fine-silty, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Colton	Sandy-skeletal, mixed, frigid.	Typic Haplorthods	Spodosols	Podzols.
Covington	Very fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Duane	Sandy-skeletal, mixed, frigid.	Aquic Haplorthods	Spodosols	Podzols.
Dutchess	Coarse-loamy, mixed, mesic.	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Elmwood, coarse variant	Sandy over fine, mixed, mesic.	Aquentic Haplorthods	Spodosols	Brown Podzolic soils.
Farmington	Loamy, mixed, mesic	Lithic Eutrochrepts	Inceptisols	Brown Forest soils.
Farmington, moderately deep variant.	Coarse-loamy, mixed, mesic.	Dystric Eutrochrepts	Inceptisols	Brown Forest soils.
Glover	Loamy, mixed, frigid	Lithic Haplorthods	Spodosols	Brown Forest soils (intergrading to Sols Bruns Acides).
Hadley	Coarse-silty, mixed, mesic.	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Limerick	Coarse-silty, mixed, nonacid, mesic.	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Livingston	Very fine, illitic, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Half Bog soils.
Lyman	Loamy, mixed, frigid	Lithic Haplorthods	Spodosols	Podzols.
Marlow	Coarse-loamy, mixed, frigid.	Typic Fragiorthods	Spodosols	Podzols.
Massena	Coarse-loamy, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Melrose	Coarse-loamy over clayey, mixed, mesic.	Entic Haplorthods	Spodosols	Brown Podzolic soils.
Muck and Peat	(1)	(1)	Histosols	Bog soils.
Nassau	Loamy-skeletal, mixed, mesic.	Lithic Dystrochrepts	Inceptisols	Lithosols (intergrading to Sols Bruns Acides).
Nellis	Coarse-loamy, mixed, mesic.	Typic Eutrochrepts	Inceptisols	Brown Forest soils.
Panton	Very fine, illitic, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Peru	Coarse-loamy, mixed, frigid.	Aquic Fragiorthods	Spodosols	Podzols.
Raynham	Coarse-silty, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Salmon	Coarse-silty, mixed, frigid.	Typic Haplorthods	Spodosols	Podzols.
Stetson	Loamy-skeletal, mixed, frigid.	Typic Haplorthods	Spodosols	Podzols.

TABLE 10.—*Soil series classified into higher categories*—Continued

Series	Current classification system			1938 classification system
	Family	Subgroup	Order	Great soil group
Swanton	Coarse-loamy over clayey, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Vergennes	Very fine, illitic, mesic	Glossaquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Vergennes, moderately shallow variant.	Very fine, illitic, mesic	Glossaquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Walpole	Sandy, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils.
Winooski	Coarse-silty, mixed, mesic.	Aquic Fluventic Dystrochrepts.	Inceptisols	Alluvial soils.

[1] Histosols are not classified at the subgroup and family levels, because classification at these levels was provisional at the time this survey went to the printer.

Laboratory Data for Selected Soil Profiles

Samples for laboratory determinations were taken, by horizons, from sites representative of the Covington, Livingston, Panton, and Vergennes soils. Physical and chemical determinations were made of the samples. The data for the Vergennes soil has been published in Soil Survey Investigation Report No. 20 (*22*). For the other soils, the results of the analyses are given in tables 11 and 12.

The laboratory analyses were made at the Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md.

Interpretations of the data in tables 11 and 12 are given in the preceding subsections. Selected horizons of these profiles were also sampled for engineering test data made by the Bureau of Public Roads. The results of the tests are given in table 8.

All samples used to obtain the laboratory data were collected from carefully selected pits. Unless otherwise noted, all laboratory analyses are made on material that passes the 2-millimeter sieve and are reported on an ovendry basis.

Methods of the Soil Survey Laboratory were used to obtain most of the data in tables 11 and 12. Particle-size distribution was determined by the pipette method (*10, 11, 12*). Organic carbon was determined by chromic acid-titration, using a modification of the Walkley-Black method (*13*). Total nitrogen was determined by the semimicro Kjeldahl method (*2*). Exchangeable cations and cation exchange capacity were determined mainly by methods developed by Peech, Alexander, Dean, and Reed (*13*). Sodium and potassium, however, were determined by flame spectrophotometry. Free iron oxides were determined by modification of Deb's method (*9*). The calcium carbonate equivalent was determined by measuring the volume of carbon dioxide emitted from soil samples treated with hydrochloric acid (*15*).

Bulk densities were determined from the amount of water displaced by plastic-coated clods. Moisture tensions at ⅓ atmosphere were determined on clods with the use of a porous-ceramic pressure plate. Tensions at 15 atmospheres were determined from fragmented samples using a pressure membrane apparatus (*15*). Clay mineralogy was determined by X-ray diffraction and differential thermal analysis (*8*). Reaction was determined by the use of a glass electrode, using a soil-water ratio of 1:1.

Descriptions of the soils sampled are in the section "Descriptions of the Soils." Unless stated otherwise, all colors given in the descriptions are for moist soil.

TABLE 11.—*Physical*
[Dashes indicate deter

Soil	Horizon	Depth	Particle-size distribution			
			Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*
Covington silty clay.	Ap	0–8	1.4	2.6	1.6	3.3
	B21t	8–11	.9	1.9	1.2	2.3
	B22g	11–20	1.1	1.2	.8	1.7
	B23g	20–24	.2	.4	.3	.6
	C1g	24–33	--	--	--	--
	C2g	33–45	.1	.1	.1	.2
Livingston clay.	A1	0–7	--	--	--	--
	B21g	7–20	--	--	(1)	(1)
	B22g	20–28	.1	.5	.5	5.5
	B23g	28–36	.0	.3	.4	1.6
	C1g	36–46	.1	.2	.3	.8
	C2g	46–62	.9	1.1	.5	.7
	C3g	62–70	.8	.6	.4	.9
	C3g	70–78	.6	.5	.3	.6
	C4g	78–86	--	--	--	--
	C5g	86–94	.0	.0	.0	.1
Panton silty clay.	Ap	0–4	1.3	3.2	1.4	1.4
	A2g	4–8	1.2	3.0	1.3	1.2
	B21tg	8–15	.2	.6	.3	.6
	B22tg	15–20	.0	.1	.1	.3
	B23tg	20–25	.2	.2	.1	.2
	B31tg	25–31	.0	.0	.0	.2
	B31tg	31–38	.0	.0	.0	.2
	B32tg	38–46	.0	.0	.0	.1
	C1	46–58	--	--	--	--
	C2	58–70	.0	.0	.0	.1
	C3	70–80	.0	.1	.2	.4

[1] Soil material did not disperse.

General Nature of the County

This section gives some general information about Addison County. The development of the county and the major land uses are discussed first. Then, physiography, geology, relief, and drainage, and climate are described.

Development and Land Use

Addison County was established in 1785. The population increased from about 7,000 in 1791 to about 22,000 in 1890. The first half of the 20th century, however, showed a decline in population, but by 1966 the number had increased again to around 22,000.

Farming and lumbering have always been the most important enterprises in the county. Recently, recreational enterprises, such as hunting, fishing, and skiing, have increased greatly and contributed substantially to the economy, even though only a small percentage of the total land area is used for these purposes.

Farms are increasing in size and decreasing in number. In 1964 there were 883 farms in Addison County, and these farms occupied about 55 percent of the land area. This is a decrease of about 18 percent since 1959 and about 44 percent since 1949. The average size of farm has increased from 282 acres in 1959 to 312 acres in 1964. Owners and part owners operated about 96 percent of the farms, and tenants and managers operated the rest.

The trend in farming has been from general farming, mainly for wheat, to sheep raising and then to dairy farming. According to the U.S. Census of Agriculture, in 1964 there were approximately 672 dairy farms, 43 general farms, 22 fruit farms, 16 livestock farms other than poultry and dairy farms, 11 poultry farms, and 118 miscellaneous and unclassified farms. The largest acreage, 116,030 acres, was in harvested cropland; 55,337 acres were in pasture not wooded or cropped; 30,356 acres were in cropland used only for pasture; and 26,287 were in woodland used for pasture. Woodland not pastured amounted to 39,404 acres.

Except for the very steep and extremely rocky soils of the Green Mountains and similar areas in the foothills, most of the county is well suited to dairy farming. Hay is the most important field crop grown. The soils of Addison County are either too fine in texture or are in an area with too short a growing season for the best growth of most truck crops. There are areas in the western part of the county that are well suited to

data for selected soils
mination not made]

Particle-size distribution—Con.					Bulk density (ovendry)	Moisture held at—		Total volume change on wetting
Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	0.2 to 0.02 mm.	0.02 to 0.002 mm.		1/3 atmosphere (clods)	15 atmospheres (fragmented)	
Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Gm./cc.*	*Percent*	*Percent*	*Cc. 100/gm.*
1.5	41.2	48.4	4.5	39.7	1.19	51.4	25.8	15
.8	34.9	58.0	2.0	34.8	1.61	32.3	17.9	10
.8	30.0	64.4	.5	31.1	1.69	34.1	18.7	9
.3	28.2	70.0	2.2	26.5	1.68	37.4	26.0	11
---	---	---	--	---	1.72	36.0	26.0	11
.2	33.2	66.1	1.5	32.1	1.72	35.3	26.0	13
--	---	---	--	---	1.32	58.8	33.7	42
(1)	---	---	--	---	1.71	48.5	26.7	37
4.2	15.5	73.7	9.2	15.1	1.82	41.4	20.8	24
1.4	19.2	77.1	2.7	19.1	1.70	41.7	21.2	21
1.2	21.3	76.1	4.0	19.0	1.54	40.5	22.5	20
.7	11.6	84.5	1.4	11.3	1.54	41.6	24.1	11
1.3	18.5	77.5	3.8	16.6	---	43.1	24.1	--
.9	23.8	83.3	1.5	13.6	---	46.2	26.5	--
--	20.0	79.8	.0	23.4	---	50.9	28.8	--
.4	12.2	87.3	.8	11.7	---	49.9	48.6	--
2.4	43.8	46.5	8.9	37.9	1.36	35.5	15.3	25
2.3	41.6	49.4	7.9	36.6	1.46	34.2	15.8	5
.6	23.2	74.5	1.1	23.0	1.70	35.8	21.0	17
.4	21.2	77.9	.1	21.6	1.62	38.5	22.8	13
.3	27.6	71.4	.3	27.8	1.64	38.3	29.0	13
.3	25.7	73.8	.5	25.6	1.64	39.3	22.2	12
.3	27.9	71.6	.8	27.5	1.68	39.7	20.4	13
.2	21.6	78.1	.0	21.9	---	43.0	24.5	--
--	33.5	65.9	5.6	28.2	---	43.1	24.8	--
.1	21.3	78.5	.4	21.0	---	43.6	25.4	--
.9	27.1	71.3	4.7	23.5	---	43.0	24.8	--

growing apples. In 1964, 14,803,590 pounds of apples were harvested. Since around 1850, farmers have produced maple syrup commercially, but the number of operating sugarbushes has slowly declined. Maple syrup, however, is still important, and in 1966 production amounted to about 25,000 gallons.

In the following list are the acreages of the principal crops and the number of fruit trees grown in the county in 1964.

	Acres
Corn for grain	161
Corn for silage	8,633
Wheat, harvested	230
Hay	100,808
Potatoes, vegetables for sale, and strawberries	56
	Number
Apple trees	69,920
Other fruit trees	201

The first commercial sawmills were established around the late 1700's. Pine, spruce, and hemlock were heavily cut for lumber. In later years hardwood cutting became important as much of the heavily cut timberland formerly covered with softwoods regenerated to hardwood species. Hardwoods are the principal trees in forests of the county today. Planting of former farmland to pine and spruce started about 1910 and reached a peak in 1962, when 275,000 seedlings were planted. More information is given in the section "Use of the Soils as Woodland".

Physiography, Geology, Relief, and Drainage [5]

Addison County lies within two physiographic divisions—the Green Mountains and the Champlain Valley (*5*). The Green Mountains are part of the New England province, and the Champlain Valley is part of the Ridge and Valley province. The Green Mountains occupy the part of the county roughly east of a north-south line running through Middlebury. About 38 percent of the county is in the Green Mountains, and 62 percent is in the Champlain Valley.

The soils of the Green Mountains are underlain with Cambrian and Precambrian quartzite, schist, and marble. The White Cheshire quartzite forms the west front of the Green Mountains. West of the Green Mountains in the Champlain Valley, the soils are gen-

[5] The information on geology is based in part on information furnished by W. BRADFORD CASWELL, C. WOODBRIDGE HICKOX, and ROBERT A. BIER, JR., majors in geology; and BREWSTER BALDWIN, associate professor of geology, Middlebury College, Middlebury, Vt.

TABLE 12.—*Chemical*
[Dashes indicate deter

Soil	Horizon	Depth	Organic carbon	Nitrogen	Free iron oxide (Fe_2O_3)	$CaCO_3$ equivalent	Reaction (1:1)	Cation exchange capacity (sum)	Calcium
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*pH*	*Meg./100 gm. of soil*	
Covington silty clay.	Ap	0–8	6.27	0.560	3.1	0	5.4	40.3	11.9
	B21t	8–11	.94	.110	4.0	0	5.2	22.5	3.9
	B22g	11–20	.65	.096	3.0	0	6.0	28.9	7.6
	B23g	20–24	.38	.084	2.4	0	7.0	32.0	10.5
	C1g	24–33	.38	.068	1.8	11	7.7	---	---
	C2g	33–45	.35	.062	1.7	15	7.8	---	---
Livingston clay.	A1	0–7	6.06	.593	2.6	0	5.3	57.7	15.7
	B21g	7–20	.93	.152	3.4	0	5.1	45.4	11.1
	B22g	20–28	.40	.094	2.7	0	6.3	44.6	13.0
	B23g	28–36	.25	.082	2.2	0	6.8	43.0	14.1
	C1g	36–46	.15	.064	1.8	2	7.5	---	---
	C2g	46–62	.20	.064	1.8	9	7.8	---	---
	C3g	62–70	.19	.050	1.7	4	7.8	---	---
	C3g	70–78	.22	.074	1.6	3	7.7	---	---
	C4g	78–86	.28	.064	1.7	6	7.6	---	---
	C5g	86–94	.28	.062	1.8	2	7.6	---	---
Panton silty clay.	Ap	0–4	2.38	.207	3.0	0	5.6	24.0	7.8
	A2g	4–8	2.16	.192	3.0	0	5.6	23.8	6.8
	B21tg	8–15	.53	.104	2.1	0	6.8	30.3	9.7
	B22tg	15–20	.44	.076	2.0	0	7.3	27.4	8.7
	B23tg	20–25	.38	.074	1.7	11	8.1	---	---
	B31tg	25–31	.39	.081	1.9	13	8.0	---	---
	B31tg	31–38	.39	.076	1.5	14	7.9	---	---
	B32tg	38–46	.41	.073	1.5	11	7.9	---	---
	C1	46–58	.44	.075	1.1	13	7.9	---	---
	C2	58–70	.42	.076	1.4	13	8.0	---	---
	C3	70–80	.24	---	1.8	3	7.8	---	---

[1] 0=not detected; t=trace; x=small; xx=moderate; xxx =abundant; xxxx=dominant.
[2] Mostly interstratified mica-vermiculite.
[3] Free carbonates.

erally underlain by sandstone and quartzite of Cambrian age or by shale, slate, and limestone of Ordovician age. Most of the valleys are underlain by limestone. Snake and Buck Mountains in the Champlain Valley are prominent ridges that are capped by the dark-red Monkton quartzite. A group of low hills between Cornwall and Orwell are formed by outcrops of limestone bedrock.

The soils of Addison County developed in glacial material, recent alluvium, or organic deposits. The glacial material was deposited on fresh bedrock that had been exposed by movement of the glacial ice. The gross physical features of the county are determined to a great extent by the shape of the bedrock. Some of the bedrock either was not covered by glacial deposition or has been exposed by erosion since deposition. These areas of exposed rock are very common on the higher ridges in the Champlain Valley and in the Green Mountains. In most of the Champlain Valley, however, there is little bedrock exposed. The glacial deposits in some places are 100 feet or more thick.

Addison County was covered by the Labrador Ice Sheet of the late Wisconsin glaciation. The ice sheet is estimated to have been roughly 10,000 feet thick (*16*). During the wastage of the ice, according to D. H. Chapman (*4*), the Champlain Valley was occupied by an ice lobe fed from the north, while the highlands to the east and west were free of ice. The uplift of the Hudson Valley formed a new glacial lake, Lake Vermont, in the southern end of the Champlain Valley. As the ice receded, Lake Vermont grew and submerged much of Addison County west of the Green Mountains, except for the higher areas such as Snake and Buck Mountains. The lake drained southward into the Hudson Valley.

As the ice margin shrank from the south side of the St. Lawrence Lowland, a connection with the sea was made along the lower St. Lawrence River and sea water flooded the valley as far south as Whitehall, New York (*6*). The present Lake Champlain was formed when differential uplift brought the northern end of the Champlain Valley out of the water and cut the valley off from the sea. During the time water covered the Champlain Valley, sediments were carried into the lake by streams flowing from the mountains. The silt and clay carried in these streams were deposited in the still, deep water of the lake, whereas sands were deposited closer to the lakeshore, particularly in such areas as East Middlebury.

The terrain of the eastern part of the county is

data for selected soils

mination not made]

Exchangeable cations (meg./100 gm. of soil)				Base saturation (sum)	Relative composition of clay fraction [1]				
Magnesium	Sodium	Potassium	Hydrogen		Vermiculite	Interstratified [2]	Mica	Chlorite	Kaolinite
				Percent					
6.8	0.1	1.5	20.2	50	t	x	xxx	t	t
6.4	.2	1.0	11.0	51	x	x	xx	t	t
12.8	.6	.6	7.3	75	x	xxx	x	t	t
16.8	1.0	.4	3.3	90	---	----	---	–	–
(3)	(3)	(3)	---	--	x	xx	xxx	t	x
(3)	(3)	(3)	---	--	---	----	---	–	–
16.5	.2	1.4	23.9	59	x	xxxx	x	t	0
18.6	1.1	.8	13.7	70	x	xxx	xx	0	0
24.3	1.6	.6	5.1	89	x	xxx	xx	0	0
23.6	1.7	.4	3.1	93	xxx	xx	x	0	0
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	t	x	xxx	x	0
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	x	x	xxx	x	0
5.3	.2	.4	10.3	57	---	----	---	–	–
6.1	.2	.4	10.3	57	---	----	---	–	–
15.2	.6	.5	4.2	86	---	----	---	–	–
14.7	1.0	.5	2.5	91	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–
(3)	(3)	(3)	---	--	---	----	---	–	–

rugged; it consists of peaks of the Green Mountains and foothills. The main ridge of the Green Mountains runs near the eastern border of the county. The elevation is mainly 1,000 to 2,000 feet above sea level. Some river valleys, however, are somewhat lower, and many peaks are higher than 3,000 feet. Mt. Abraham is the highest at 4,052 feet. Topography is predominantly steep, but many of the wider and lower lying ridges are moderately sloping. The foothills west of the Green Mountains are generally less steep. The terrain of the central part of the county, in the Champlain Valley, is generally rolling to hilly. The elevation is mainly between 200 and 500 feet, but several hills are higher than 500 feet and a few are near 1,000 feet. The western part of the county is predominantly level to gently undulating. A narrow band near Lake Champlain has low relief; its elevation ranges from 100 to 200 feet.

The peaks of the Green Mountains are the drainage divide between the Connecticut River and Lake Champlain. The White River drains all the county east of the main range of the Green Mountains except for a small area in the town of Lincoln, which is drained into Lake Champlain by the Mad and Winooski Rivers. All rivers west of the Green Mountains drain into Lake Champlain. The large streams in the Green Mountains flow in more deeply cut valleys and have steeper gradients than the streams in the Champlain Valley.

Otter Creek is the main stream west of the Green Mountains. Secondary streams flowing into Otter Creek are Dead Creek and the Leicester, Middlebury, New Haven, and Lemon Fair Rivers. East Creek in Orwell, Little Otter Creek and Lewis Creek in Ferrisburg, and Hospital Creek and Whitney Creek in Addison are streams that flow directly into Lake Champlain.

Lake Dunmore, Lake Winona, Cedar Lake, Fern Lake, and Silver Lake are the largest of the numerous lakes in the county. Lake Champlain forms the western boundary of the county.

Climate [6]

Moderately warm summers, cold winters, and ample rainfall are characteristic of the climate of Addison County. Storms from the Atlantic Ocean, about 150 miles to the southeast, sometimes affect the weather in

[6] This section was prepared by ROBERT E. LAUTZENHEISER, State climatologist, U.S. Weather Bureau, Boston, Mass.

the county, but they are not frequent and the sheltering of the county by the Green Mountains minimizes their effect. Set in a belt of generally prevailing westerly winds aloft, the climate in the county is predominantly continental. The direction of surface winds, however, is considerably influenced by the north-south orientation of the Champlain Valley. The wind is generally from the south, though it is frequently from the north in winter. The county is in the path of many low pressure centers, and consequently, in any season there is frequent alternation in wind direction. As is typical of a continental climate, temperature ranges greatly from winter to summer and from day to night.

There is some variation of climate because of elevation and local topography. Generally, the temperature is lower and the precipitation is greater at higher elevations. The average temperature in a narrow, low-lying area near Lake Champlain is higher than that in the rest of the county. This area is also protected from unseasonal freezes by the moderating influence of Lake Champlain. Low level areas, into which cold air may drain and settle during calm, clear nights, are much more susceptible to frost than sloping or higher areas. The surface temperature of soil high in content of organic matter, such as Muck and Peat, is much lower during calm, clear nights than surface temperature of sandy soils having similar relief.

Stations of the U.S. Weather Bureau are located at Cornwall and Salisbury. At the Cornwall observatory, daily temperature extremes and precipitation are recorded, but at the Salisbury station only precipitation is recorded. These stations are not representative of all of Addison County, but estimates for other locations in the county can be made by allowing for location, elevation, and local topography.

Tables 13, 14, and 15 give information concerning temperature. Table 13 shows temperature and precipitation recorded at Cornwall. Table 14 gives frequencies of selected temperatures and averages of heating and growing degree-days, and table 15 shows probabilities of freezing temperatures in spring and fall.

Tables 13, 16, and 17 give information concerning precipitation in Addison County. Table 13 gives precipitation from the Cornwall station, including snow cover data, and table 16 shows precipitation recorded at Salisbury. In table 17 is the probability of specified amounts of precipitation in 1-, 2-, and 3-week periods.

Temperature

The annual mean temperature ranges from 40 to 44° F in the eastern highlands and 44 to 46° elsewhere. The mean monthly temperature is 55° or higher for each of the five months, May through September, and about 70° in the warmest month, July. In an average summer the temperature reaches 90° on 10 days or less, but the frequency from year to year varies widely. At Cornwall, the number has varied from 0 to 28 days. Nights are almost always cool, even in the warmest summers.

Table 13 does not show the extreme high and low temperatures ever recorded, but rather a probability of occurrence of specified temperatures. For planning purposes, these probabilities are more useful than the extremes. Furthermore, the temperatures that can be expected to occur on at least 4 days a month 2 years in

TABLE 13.—*Temperature and precipitation*

[Cornwall, Vermont; elevation 340 feet. Data for 32 years from 1931 to 1962]

Month	Temperature					Precipitation						
	Average daily—			Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average total snowfall	Days with—		
	Maximum	Minimum	Mean	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		Snowfall 1 inch or more	Snow cover 1 inch or more	Precipitation 0.10 inch or more
	°F.	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*			
January	29.3	11.4	20.4	45	−9	2.49	1.4	4.1	15.5	6	25	7
February	31.2	12.1	21.7	45	−9	2.07	1.2	3.6	14.1	6	23	5
March	40.6	21.7	31.2	57	4	2.68	1.2	4.7	12.7	5	19	7
April	55.7	34.5	45.1	74	23	2.51	1.2	3.8	2.9	1	2	7
May	68.9	45.2	57.1	83	33	3.06	1.5	5.5	.2	[1]	0	8
June	77.8	54.5	66.2	91	44	3.35	1.2	5.0	0	0	0	7
July	82.6	59.5	71.1	92	49	3.54	1.5	5.4	0	0	0	7
August	80.6	57.3	69.0	92	46	3.34	1.2	6.4	0	0	0	6
September	72.1	50.2	61.2	87	38	3.33	1.4	5.7	[2]	0	0	7
October	60.4	39.9	50.2	76	25	2.87	1.2	5.3	.3	[1]	[1]	7
November	46.3	30.2	38.3	64	12	2.84	1.6	4.5	4.4	2	2	7
December	32.7	16.6	24.7	49	−4	2.60	.8	4.2	11.6	5	15	6
Year	56.5	36.1	46.3	[3] 93	[4] −12	34.68	28.8	40.8	61.7	25	86	81

[1] Less than 0.5 day.
[2] Trace.
[3] Average annual highest maximum.
[4] Average annual lowest minimum.

TABLE 14.—*Frequencies of selected temperatures and averages of heating and growing degree-days*

[Cornwall, Vermont]

Month	Mean number of days with—				Accumulated heat units		
	Maximum temperature of—		Minimum temperature of—		Heating	Growing	
	90°F. or higher	32°F. or lower	32°F. or lower	0°F. or lower	Base 65°F.	Base 40° F.	Base 50°F.
	Days	*Days*	*Days*	*Days*	*Degree-days*	*Degree-days*	*Degree-days*
January	0	19	30	7	1,375	0	0
February	0	14	28	6	1,205	0	0
March	0	6	27	1	1,040	70	0
April	0	(1)	13	0	590	200	60
May	(1)	0	2	0	255	535	245
June	2	0	0	0	50	790	490
July	3	0	0	0	5	960	660
August	3	0	0	0	35	895	595
September	1	0	1	0	145	640	340
October	0	0	6	0	455	325	100
November	0	0	18	(1)	795	80	0
December	0	15	28	4	1,245	0	0
Year	9	54	153	18	7,195	4,495	2,490

[1] Less than 0.5 day.

TABLE 15.—*Probabilities of freezing temperatures in spring and fall*

[Cornwall, Vermont]

Probability	Dates for given probability and temperature				
	32°F. or lower	28°F. or lower	24°F. or lower	20°F. or lower	16°F. or lower
Spring:					
1 year in 10 later than	May 23	May 9	April 25	April 13	April 7
2 years in 10 later than	May 18	May 4	April 20	April 8	April 2
5 years in 10 later than	May 9	April 25	April 11	March 30	March 24
8 years in 10 later than	April 30	April 16	April 2	March 21	March 15
Fall:					
1 year in 10 earlier than	September 17	September 29	October 17	October 27	November 8
2 years in 10 earlier than	September 22	October 4	October 22	November 1	November 13
5 years in 10 earlier than	October 1	October 13	October 31	November 10	November 22
8 years in 10 earlier than	October 10	October 22	November 9	November 19	December 1

10 are nearly the same as the average monthly extreme temperatures. Therefore, they can be used as estimates of the extremes to be expected for a given month.

Table 14 shows the average frequency of specified temperatures by months, as well as the heating degree-days and growing degree-days. Degree-days are computed by recording each day the average departure from a selected temperature base and then summarizing these departures for the month and for the year. A base of 65° F. is used for heating degree-days, as this is the lowest daily average temperature for which no heat is required for homes. To get the departure for one day, the actual average temperature, if less than 65°, is subtracted from 65°. For example, a day averaging 55° has 10 heating degree-days. In contrast, a day averaging 65° or higher has no heating degree-days because no heat is required. Heating degree-days are useful in calculating the amount of fuel needed in an average year and in comparing a particular season with the average. They are used by gas, electric, and fuel companies in estimating fuel and power requirements and in scheduling fuel delivery.

Knowledge of growing degree-days is useful in planning when to plant and harvest crops. Growing degree-days accumulate when the average temperature

TABLE 16.—*Precipitation*

[Salisbury, Vermont; elevation 370 feet. Data for 16 years from 1947 to 1963]

Month	Precipitation			
	Average monthly total	One year in 10 will have—		Days with precipitation 0.10 inch or more
		Less than—	More than—	
	Inches	*Inches*	*Inches*	
January	2.45	1.0	4.4	7
February	2.41	1.2	4.2	5
March	2.60	1.6	4.0	7
April	3.02	1.5	4.2	8
May	2.84	1.7	3.9	8
June	3.39	1.0	5.5	7
July	3.68	1.5	5.5	7
August	3.35	1.4	5.8	6
September	3.30	.8	5.7	7
October	2.71	1.6	5.5	6
November	3.44	1.6	6.0	7
December	2.73	.9	4.9	6
Year	35.92	30.9	43.1	81

is higher than the lowest temperature at which plants continue to grow. They are calculated by subtracting this base temperature from the actual average for the day. The growing degree-days in table 14 are calculated for two standard bases: 40° F. for cool-weather crops, such as grasses, potatoes, and peas; and 50° for warm-weather crops, such as corn. Thus, a day on which the average temperature is 60° has 20 growing degree-days for cool-weather crops but only 10 for warm-weather crops.

A substantial number of growing degree-days in a given month does not necessarily indicate that crops may be safely planted. A damaging freeze may occur. Table 15 gives the probability of freezing temperatures after specified dates in spring and before specified dates in fall. At Cornwall, for example, there is one chance in ten that the temperature will drop to 32° F. or lower after May 23 and eight chances in ten after April 30. At Cornwall, there are five chances in ten of a 32° freeze after May 9. A temperature of 32° normally damages sensitive plants seriously, but hardier crops can withstand lower temperatures.

The average time of the last spring freeze, at 32° F., ranges from early in May near Lake Champlain to probably early in June at the higher elevations in the Green Mountains. The first fall freeze may come as early as the first half of September in the eastern highlands but usually not until after October 1 near Lake Champlain.

TABLE 17.—*Probability of receiving at least the indicated amounts of precipitation in 1–, 2–, and 3–week periods*

[From data taken at Cornwall between 1926 and 1956. Dashes indicate data not calculated]

Data beginning period of—	Precipitation						
	0.10 inch	0.20 inch	0.40 inch	1.00 inch	2.00 inches	4.00 inches	8.00 inches
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
One week:							
January 10	83	73	51	12	1	0	0
February 21	86	76	53	13	1	0	0
April 5	80	71	54	22	5	0.1	0
May 17	83	76	61	28	7	.3	0
June 28	88	81	67	30	7	.4	0
August 9	80	72	57	29	9	.7	0
September 20	76	69	55	27	8	.6	0
November 1	83	75	60	27	7	.3	0
December 13	77	65	47	18	4	.1	0
Two weeks:							
January 3	----	97	88	46	10	.3	0
February 14	----	97	89	48	9	.1	0
March 29	----	91	81	50	18	2.0	0
May 10	----	95	88	61	28	4.0	0
June 21	----	98	94	69	28	3.0	0
August 2	----	94	88	61	27	4.0	.1
September 13	----	92	85	60	26	3.0	0
October 25	----	97	91	62	23	2.0	0
December 6	----	92	80	46	15	1.0	0
Three weeks:							
January 10	----	100	98	70	16	.2	0
March 1	----	100	99	81	34	2.0	0
April 12	----	100	98	79	36	3.0	0
May 24	----	98	95	77	48	14.0	.8
July 5	----	100	99	89	56	11.0	.1
August 16	----	100	98	86	52	11.0	.2
September 27	----	98	94	74	41	9.0	.2
November 8	----	98	97	80	42	6.0	0
December 12	----	99	97	78	36	4.0	0

The average length of the freeze-free season is 145 days at Cornwall and ranges from about 150 days along the shore of Lake Champlain to about 140 days for much of the western and central parts of the county. The season may be as short as 100 days in parts of the eastern highlands. The season may be a little longer in some urban and other protected areas and shorter in local, low frost pockets. Especially in low, boggy areas at higher elevations, frost may be a threat very late in spring and early in fall. In an occasional year frost may even threaten these areas in midsummer.

Precipitation

The annual precipitation for Addison County, including the water equivalent of the snowfall, ranges from about 32 inches in the extreme northwest and about 35 inches in the central and southwestern parts to more than 40 inches at the high elevations of the eastern part, where some of the higher ridges receive as much as 50 inches. Precipitation is distributed fairly evenly among the seasons. Summer, the wettest season, averages only about one-third more precipitation than winter, which is the driest season.

Tables 13 and 16 show monthly averages of precipitation as well as the minimum and maximum monthly amounts to be expected 1 year in 10. Table 13 also shows average monthly snowfall and data concerning snow cover.

Depth of snowfall ranges considerably from year to year, and in a given year it can vary markedly from place to place within the county. The average seasonal snowfall ranges from 60 to 65 inches in much of the county to well over 70 inches at the higher elevations in the east. A continuous snow cover of 1 inch or more for 1 month or longer occurs practically every winter in the eastern highlands. At lower elevations in the western and central parts of the county, from 10 to 20 percent of the winters may not have a continuous snow cover of this duration. At Cornwall, for those winters with a continuous snow cover of a month or more, the average duration is 72 days, with average beginning and ending dates December 28 and March 9. The earliest prolonged cover began on November 28, and the latest ended on April 7. The longest duration was 124 days in the winter of 1958–59.

The average maximum snow depth at Cornwall is 21 inches. The average date of the maximum depth is February 16. The maximum depth may be somewhat less near Lake Champlain but greater in the eastern highlands. The average date of the deepest cover is somewhat later in the highlands. Winters with the least snow accumulation have a maximum depth ranging from 5 to 10 inches. In winters with the deepest accumulation, the maximum generally ranges from 30 to 45 inches, but it may be greater at some of the higher elevations.

For Cornwall, the frequency of specified amounts of snowfall in one day is as follows: Four inches or more occurs 3 to 13 times per season and averages eight times; 8 inches or more occurs up to three times per season, the average being one time; 10 inches or more occurs one time per season in about three seasons out of ten.

Table 17 shows the percent of probability of occurrence for various amounts of precipitation at Cornwall for periods of 1, 2, and 3 weeks. For example, the chance of receiving 1.0 inch or more of precipitation during the 2 weeks, May 10 through May 23, is 61 percent. Also, the chance of receiving little or no rain, less than 0.10 inch, in the week of August 9 through 15, is 100 minus 80, or only 20 percent. Probabilities of more than one are rounded to the nearest whole number.

Storms

Thunderstorms occur on an average of 15 to 20 days a year, though the number varies markedly from year to year. Thunderstorms are most frequent from May through August. Most of the storms do little or no damage; instead, they bring beneficial rain. The heavy rains that accompany the more severe thunderstorms cause soil erosion, injure plants, and may do more damage than the associated lightning. Spring and summer thunderstorms are accompanied by hail about once or twice a year at any given location, but the stones seldom cause extensive crop or property damage. In exceptional cases, hail may cause heavy local damage.

Hurricanes affect Addison County only once in about 20 years. Strong winds and heavy rains from coastal storms, or northeasters, are more frequent, but their effects are minimized because the county is sheltered by the Green Mountains. Tornadoes are very seldom reported, but they may occur.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., 401 and 617 pp., illus. Washington, D.C.

(2) ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.
1955. OFFICIAL METHODS OF ANALYSIS. Ed. 8, 1008 pp., illus.

(3) BALDWIN, M., KELLOGG, C. E., and THORP, J.
1938. SOIL CLASSIFICATION. U. S. Dept. Agr. Ybk.: 979–1001 pp., illus.

(4) CHAPMAN, DONALD H.
1941–42. LATE-GLACIAL AND POST-GLACIAL HISTORY OF THE CHAMPLAIN VALLEY. Report of the State Geologist on the Mineral Industries and Geology of Vermont. 23d series: 49–83.

(5) FENNEMAN, NEVIN M.
1938. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London.

(6) FLINT, RICHARD F.
1947. GLACIAL GEOLOGY AND THE PLEISTOCENE EPOCH. 589 pp., illus. New York and London.

(7) FROTHINGHAM, E. H.
1914. WHITE PINE UNDER FOREST MANAGEMENT. U.S. Dept. Agr. Bul. No. 13, 70 pp., illus.

(8) HENDRICKS, STERLING B. and ALEXANDER, LYLE T.
1939. MINERALS PRESENT IN SOIL COLLOIDS: I. DESCRIPTIONS AND METHODS FOR IDENTIFICATION. Soil Sci. 48: 257–271.

(9) KILMER, VICTOR J.
1960. THE ESTIMATION OF FREE IRON OXIDES IN SOILS. Soil Sci. Soc. Amer. Proc. 24: 420–421.

(10) ——— and ALEXANDER, L. T.
1949. METHODS OF MAKING MECHANICAL ANALYSES OF SOILS. Soil Sci., 68: 15–24.
(11) ——— and MULLINS, J. F.
1954. IMPROVED STIRRING AND PIPETTING APPARATUS FOR MECHANICAL ANALYSIS OF SOILS. Soil Sci. 77: 437–441.
(12) OLMSTEAD, L. B., ALEXANDER, L. T., and MIDDLETON, H. E.
1930. A PIPETTE METHOD OF MECHANICAL ANALYSIS OF SOILS BASED ON IMPROVED DISPERSION PROCEDURE. U.S. Dept. Agr. Tech. Bul. 170, 22 pp., illus.
(13) PEECH, MICHAEL, ALEXANDER, L. T., DEAN, L. A., and REED, J. FIELDING.
1947. METHODS OF SOIL ANALYSIS FOR SOIL-FERTILITY INVESTIGATIONS. U.S. Dept. Agr. Cir. 757. 25 pp.
(14) PORTLAND CEMENT ASSOCIATION.
1956. PCA SOIL PRIMER. 86 pp., illus. Chicago.
(15) RICHARDS, L. A., Ed.
1954. DIAGNOSIS AND IMPROVEMENT OF SALINE AND ALKALI SOILS. U.S. Dept. Agr. Handbook 60. 160 pp., illus.
(16) SAUER, CARL O.
1957. THE END OF THE ICE AGE AND ITS WITNESSES. Geog. Rev. 47: 29–43.
(17) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Sci. 137: 1027–1034.
(18) STOBBE, P. C. and WRIGHT, J. R.
1959. MODERN CONCEPTS OF THE GENESIS OF PODZOLS. Soil Sci. Soc. Amer. Proc. 23: 161–164.
(19) THORP, JAMES and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67: 117–126.
(20) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.
(21) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplement issued in March, 1967 and in September, 1968]
(22) ———
1968. SOIL SURVEY LABORATORY DATA AND DESCRIPTIONS FOR SOME SOILS OF NEW ENGLAND STATES. Soil Survey Investigations Report No. 20: 290–293.
(23) WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS.
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. No. 3–357, 2v. and appendix, 44 pp., illus.

Glossary

Acidity. See Reaction, soil.

Alluvial soil. Soil formed in recently deposited material and showing little or no modification of the original material.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams or rivers.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available moisture capacity. The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous. Containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Cobblestones. Rounded fragments of rock, 3 to 10 inches in diameter.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage, internal soil. The downward movement of water through the soil. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Terms are *none, very slow, slow, medium, rapid,* and *very rapid.*

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Glacial drift (geology). Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gley soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major soil horizons:

O horizon. The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon. The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; by prismatic or blocky structure; by redder or stronger colors; or by some combination of these characteristics. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. The weathered rock material immediately beneath the solum. This layer, commonly called the soil parent material, is presumed to be like that from which the

overlying horizons were formed in most soils. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter, C.

R layer. Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod, which is a mass of soil brought about by digging or other disturbance.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour", soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		pH
Extremely acid	below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rocky. Enough bedrock exposed to interfere with tillage but not to make intertilled crops impracticable.

Rocky, extremely. Enough rock outcrops to make use of all machinery impracticable.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stony. Containing enough stones to interfere with tillage but not to make intertilled crops impracticable.

Stony, extremely. Containing enough stones to make use of all machinery impracticable.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till, glacial. See glacial till.

Topsoil (engineering). Soil material containing organic matter and suitable as a surfacing for shoulders and slopes.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

U.S. GOVERNMENT PRINTING OFFICE : 1971 O - 383-179

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