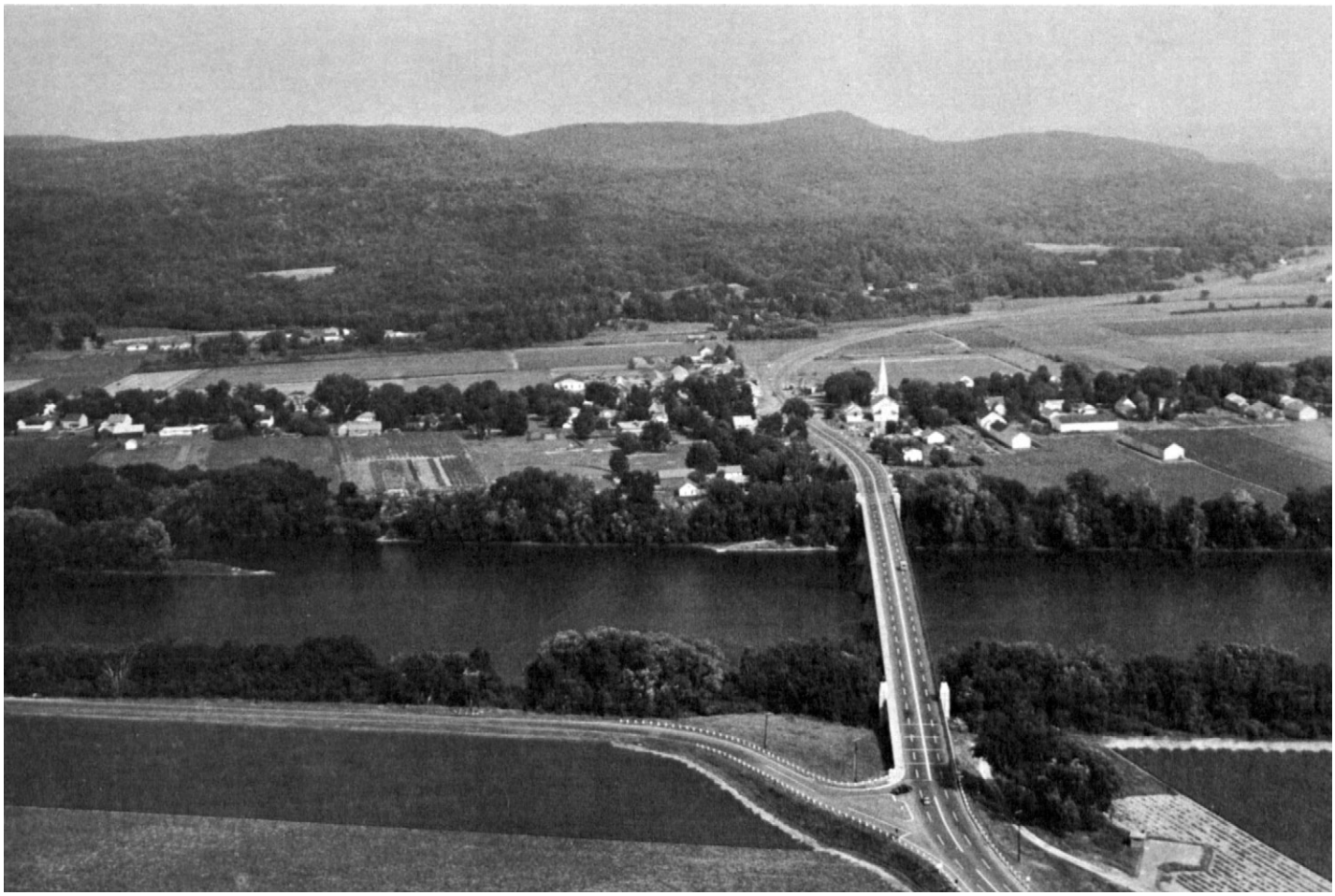
SOIL SURVEY

Franklin County Massachusetts



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
in cooperation with
Massachusetts Agricultural Experiment Station

Issued February 1967

Major fieldwork for this soil survey was done in the period 1947–1963. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Massachusetts Agricultural Experiment Station, as part of the technical assistance furnished to the Franklin County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Franklin County contains information that can be applied in managing farms and woodland; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, urban development, or recreation.

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It indicates the pages where the soils are described, and also the pages for the capability units, woodland groups, or any other groups in which the soils have been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. 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 in the soil descriptions and in the discussions of the interpretative groupings.

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

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

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, schools, and athletic fields in the section "Use of Soils for Urban Development."

Engineers and builders will find under "Use of Soils for Engineering Purposes," tables that give engineering descriptions of the soils and name soil features that affect engineering practices and structures.

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

Students, teachers, and others will find information about soils and their management in various parts of the text.

Newcomers in Franklin 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 section "Additional Facts About the County."

Cover picture: A view from Mount Sugarloaf. Cropland and the village of Sunderland are along the Connecticut River. Mount Toby is in the background.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued February 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF FRANKLIN COUNTY, MASSACHUSETTS

REPORT BY JOHN R. MOTT AND DONALD C. FULLER, SOIL CONSERVATION SERVICE; SOILS SURVEYED BY F. A. FILIOS, D. C. FULLER, AND C. F. HOTZ, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

FRANKLIN COUNTY is in the northwestern part of Massachusetts bordering Vermont and New Hampshire (fig. 1). It has a land area of 452,480 acres or 707 square miles.

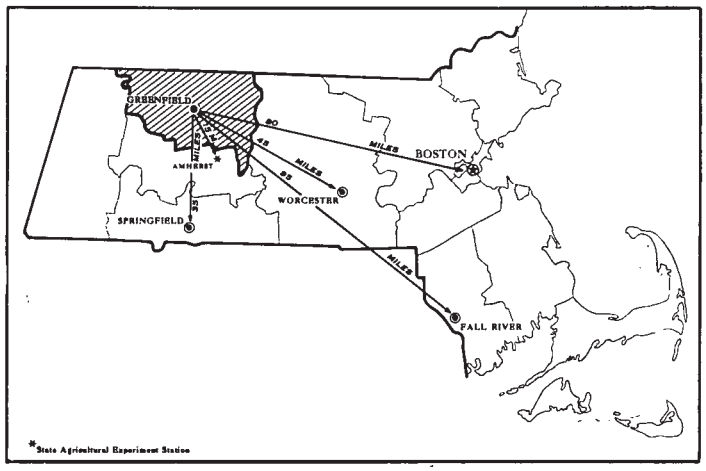

Figure 1.—**Location of Franklin County in Massachusetts.**

Greenfield, with a population of 55,573 in 1955, is the county seat and the most important town. It is the major trading center of the county. It also is an important industrial center. Industrial products include machine tools, taps and dies, and sterling silverware.

The county was organized in 1811 and included territory that was formerly part of Hampshire County.

According to the 1959 Census of Agriculture, about 33 percent of Franklin County is in farms, but only about 10.5 percent is cropland. The rest is forest, brushy pasture, urban areas, or idle land.

The dominant crops are hay, corn, market vegetables, tobacco, and potatoes. Hay and corn are grown mainly as feed for dairy cattle. Dairy products are the most valuable source of farm income. Income from the sales of these products amounted to about half the total value of all farm products sold in 1959.

How the Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Franklin County, where they are located, and how they can be used.

They 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 steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; 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 roots of plants.

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. For efficient use of this report, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Agawam and Gloucester, 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 go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Because of differences in texture, soil types are designated within most soil series. All the soils having a surface layer of the same texture belong to one soil type. Fine sandy loam and sandy loam are two soil types in the Merrimac series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Agawam fine sandy loam, 0 to 3 percent slopes, is one of several phases of Agawam fine sandy loam, a soil type that ranges from level to moderately steep.

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 greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. 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 type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, and so small in size, that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Limerick-Saco silt loams. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Riverwash, and are called land types rather than soils.

Soils of two or more series may be mapped in one unit if they are so nearly alike in slope, stoniness, or some other dominant characteristic that mapping them separately would add little information to the soil survey. This kind of mapping unit is called an undifferentiated group. In Franklin County, Holyoke and Sunderland soils have been mapped in undifferentiated groups. They occur together without regularity in pattern and proportion. At least one of the soils of each group occurs in every delineated area, but not all of the soils occur in all areas.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are 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.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups. 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 at the back of this report shows, in color, the general soil areas, or soil associations, in Franklin County. A soil association is a geographic area in which soils occur in a distinctive proportion and pattern. A soil association normally consists of one or more major soils and at least one minor soil; it is named for the major soils.

The soils in any one soil association likely differ in slope, depth, stoniness, drainage, and other characteristics, but their pattern of occurrence is distinctive and reasonably uniform.

A general soil map does not show individual soils and therefore is not detailed enough for use in planning management of a particular farm or field. Such a map 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 areas that are suitable for a certain kind of farming or other land use.

The soils of Franklin County are in 12 soil associations, which are described on the following pages.

1. Lyman-Berkshire-Peru association

Shallow and deep, well drained and moderately well drained soils that have a reddish subsoil and are in the Berkshire Hills

Forested, steep, stony and rocky hills and high plateaus are prominent features of this association. The elevation, the highest in the county, ranges from 1,200 to 2,800 feet above sea level. The association is in the extreme western part of the county and occupies about 11 percent of its area.

The soils in this association have a fine sandy loam or loam texture, and they retain water. The Lyman soils, which are the most extensive, are shallow to bedrock and are generally steep. The Berkshire soils are also steep and are well drained, but they are deeper than the Lyman soils. The Peru soils are extensive on the more gentle slopes. They have a hard layer in the subsoil and have many wet spots caused by seepage from higher areas.

The rough, stony terrain and the relatively short growing season have contributed to the decline of agriculture in this soil association. Most areas are forested, but some have been cleared and are used for hay or pasture, and there are still a few dairy farms. Maple products are commonly produced and sold to supplement farm income. State parks and ski areas recently have been established in this heavily wooded and scenic section.

2. Westminster-Marlow, dark subsoil-Peru association

Shallow and deep, well drained and moderately well drained soils that have an olive subsoil and are in the Berkshire Hills

Forested, rocky hills, high plateaus, and narrow, steep-sided stream valleys are prominent features of this association. It is in the western part of the county at an eleva-

tion that ranges from 1,200 to 1,800 feet above sea level. This association occupies about 8 percent of the county.

The soils in this association have formed in olive-colored glacial till. The characteristics of the till are evident in the fine sandy loam and loam textures and the dull colors of the major soils in the association.

The Westminster soils are shallow to bedrock and generally are steep. In some places, they contain small amounts of limestone. The deep, well-drained Marlow soils that have a dark subsoil are less stony than the Westminster and are on the plateaus and ridgetops. The Marlow soils have a hard layer and in places contain small amounts of partly disintegrated limestone. The Peru soils are moderately well drained and are on the lower parts of the slopes. They have a hard layer in the subsoil that restricts the vertical movement of water. Seepage from higher areas flows on top of the hard layer and causes wet spots where the hard layer is close to the surface. Small areas of steep, stony, well-drained Berkshire soils that have a dark subsoil are also in this association.

The relatively short growing season with cool temperature and abundant rainfall ordinarily would favor dairy farming in this association. The number of farms has decreased, however, largely because of the rough terrain and the distance from population centers. Potato farming is carried on to some extent, especially on the broad, gently sloping ridgetops in the town of Hawley. Maple products and Christmas trees supplement the income of small dairy farms. State parks and privately owned recreation areas recently have been developed in this area.

3. Merrimac-Ondawa association

Well-drained and somewhat excessively drained sandy and gravelly soils in the Berkshire Hills and foothills

This soil association is on terraces and flood plains in narrow, steep-sided valleys along the major, fast-flowing mountain streams. The elevation ranges from 500 to 1,000 feet above sea level. This association is in the western part of the county and occupies about 3 percent of its area. The soils of this association have formed in deep deposits of water-sorted sand and gravel.

The Merrimac soils are well drained to somewhat excessively drained. These soils are on terraces and are underlain by layers of sand and gravel. In most places the gravel consists mainly of granite, gneiss, and quartzite but includes some schist. In some places, however, the gravel consists mainly of dark-gray schist, gneiss, and phyllite but includes some siliceous limestone. In these places the soils have duller colors than normal Merrimac soils. The well-drained Ondawa soils are on flood plains. They are young soils and have not developed definite horizons. They have formed in deep sand deposits and in places are underlain by layers of gravel. Small areas of moderately well drained Sudbury and Podunk and poorly drained Walpole soils are scattered throughout this association. In a few places areas of Riverwash are near the Ondawa soils.

Dairying is the main type of agriculture in this association. Maple products are produced in limited quantity to supplement farm income. Farming is declining, however, in favor of recreation areas, parks, motels, and other tourist accommodations along major highways.

4. Westminster-Colrain-Buckland association

Shallow and deep, well drained and moderately well drained soils that have a dull-brown or olive subsoil and are in the foothills west of the Connecticut Valley

Forested, stony and rocky, rolling to steep hills and narrow valleys along fast-flowing streams are prominent features of this association. It is between the Berkshire Hills on the west and the Connecticut Valley on the east. The elevation ranges from 300 to 1,300 feet above sea level. The association occupies about 23 percent of the county area.

The soils in this association have formed in olive-colored fine sandy loam glacial till derived mainly from dark-gray mica schist and siliceous limestone. The Westminster soils are shallow, are generally steep, and have many rock ledges and outcrops. The bedrock is dark-gray schist interbedded with thin layers of limestone and many small veins of white quartzite. The Colrain soils are deep and well drained and are more gently sloping than the Westminster soils. The Buckland soils are moderately well drained and have a hard layer in the subsoil. Minor soils in the association are the well-drained Shelburne soils, the poorly drained Cabot soils, and the very poorly drained Cabot soils, black surface.

Dairy farms are prevalent, but there are also many apple orchards, and on many of the larger farms, the two types of farming are combined. Maple products and Christmas trees are produced in limited quantity for local markets.

5. Nassau-Bernardston-Dutchess association

Shallow and deep, well-drained silty soils that have an olive-gray subsoil and are in the north-central part of the county

Rolling to steep hills with rock outcrops characterize this association. It is in the north-central part of the county at an elevation ranging from 400 to 1,200 feet above sea level. The association occupies about 3 percent of the county.

The soils in this association have formed in silty, olive-gray glacial till that contains many small, dark-gray or black, flat chips of phyllite. These soils are not so stony as those in other upland sections of the county. The dark colors of the soils were derived from their parent material.

The Nassau soils are shallow to bedrock, are steeply sloping, and have many rock ledges and outcrops. The bedrock is very dark gray to black phyllite with some schist and slate. The Bernardston soils are well drained and are on the upper parts of the hills. They have a hard layer in the subsoil. The Dutchess soils are like the Bernardston soils but do not have a hard layer. Smaller areas of moderately well drained Pittstown soils are scattered throughout this association, and poorly drained Stissing soils are in the wet depressions.

Dairying is the major type of farming in this association.

6. Hollis-Charlton association

Shallow and deep, well-drained soils that have a yellowish-brown subsoil and are in the north-central part of the county

Rolling and steep, wooded hills characterize this association. The elevation ranges from 400 to 1,200 feet above sea

level. The association is in the north-central part of the county and occupies about 2 percent of its area.

The soils in this association have formed in stony, sandy glacial till derived mainly from schist and gneiss but partly from granite and quartzite.

The Hollis soils are somewhat excessively drained and are shallow. They are mostly on the steeper slopes and have many rock ledges and outcrops. In most places the bedrock is granite or gneiss. The Charlton soils are deep and well drained and are on the upper slopes and hilltops. Minor soils in this association are the moderately well drained Sutton, the poorly drained Ridgebury, and the very poorly drained Whitman. Small areas of deep, somewhat excessively drained Gloucester soils are scattered throughout the association.

Dairy farming is the main kind of agriculture, but much of the farmland has been used for rural homesites or suburban housing developments.

7. Hadley-Winooski-Limerick association

Well-drained to poorly drained silty soils on flood plains in the Connecticut Valley

This association is on broad, flat bottom lands, mainly along the Connecticut River. Small areas are along the Deerfield and Green Rivers. The association occupies about 2 percent of the county area. The elevation ranges from 130 to 150 feet above sea level.

The major soils in the association have formed in silty material and are free of stones. These soils are nearly level. The Hadley soils are well drained and are on small knolls and low terraces. The Winooski soils are moderately well drained and are more nearly level than the Hadley soils. The poorly drained Limerick soils are in depressions where surface drainage is impeded and water is ponded for long periods.

The soils in this association are the most productive in the county and are farmed intensively, especially the Hadley soils. The cash crops grown are shade tobacco, potatoes, onions, pickling cucumbers, carrots, and winter squash. These soils are more susceptible to accelerated wind and water erosion than other soils in the county. Consequently, gullies occur where uncontrolled runoff flows into major streams.

This soil association is near population centers. Some land has been used for suburban housing, and this use probably will increase.

8. Hinckley-Windsor-Merrimac association

Droughty and somewhat sandy and gravelly soils in the Connecticut Valley

Level to undulating terraces, separated by short steep escarpments, are prominent features of this soil association. The elevation ranges from 130 to 350 feet above sea level. The association is in the central part of the county parallel to the Connecticut River and occupies about 11 percent of the county.

The dominant soils have formed in deep sandy and gravelly deposits. The droughty Hinckley soils are most extensive in the association. They generally have gravel within a foot and a half of the surface and in places they have a gravelly surface layer. The somewhat droughty Merrimac soils are less extensive than the Hinckley. They are similar to the Hinckley soils, but their subsoil is fine sandy loam or sandy loam, and the gravel layers are generally about 2 feet from the surface. The droughty Windsor soils are on deep sand deposits. Also in this association are areas of well-drained Warwick and Agawam soils, moderately well drained Deerfield and Ninigret soils, and poorly drained Walpole, Wareham, and Saugatuck soils.

The soils in this association are used for dairying and for tobacco, cucumbers, potatoes, and other cash crops. They are also used for urban and suburban housing.

9. Holyoke-Sunderland-Cheshire association

Shallow and deep, well-drained soils that have a red subsoil and are on bedrock ridges in the Connecticut Valley

In this association are the dikes and ridges of red Triassic rocks that rise abruptly to a height of 400 to 1,000 feet above the valley floor. The elevation above sea level ranges from 150 feet at the base of the ridges to as much as 1,200 feet at the summit. The association occupies about 2 percent of the county.

The soils in this association have formed in glacial till of about the same composition as the bedrock. The Holyoke soils are shallow and have a brownish very fine sandy loam subsoil underlain by basalt or diabase bedrock, which is generally not more than 18 inches from the surface. The Sunderland soils are also shallow, but they have a reddish fine sandy loam subsoil underlain by red Triassic bedrock. The bedrock is not more than 2 feet from the surface. The Holyoke and Sunderland soils have many rock ledges or outcrops in most places. The Cheshire soils are well drained and are much like the Sunderland soils but are deeper; they have no bedrock within 3 feet of the surface.

Only the Cheshire soils are used for farming. Dairy farming is predominant. State and local parks occupy a large part of this association, which is mostly forested.

10. Hartland-Ninigret, silty substratum-Belgrade association

Well drained and moderately well drained silty and sandy soils in the Connecticut Valley

This association is on a high, undulating to gently rolling terrace dissected by streams. It is in the southwestern part of the Connecticut Valley and occupies about 1 percent of the county. The elevation ranges from 150 to 200 feet above sea level.

The well-drained Hartland and the moderately well drained Belgrade soils have formed in deep silty deposits. These soils are mostly in the northern half of the association. The moderately well drained Ninigret soils, silty substratum, are in the southern half. They have formed in sandy material that is underlain at a depth of about 2 feet by layers of silt and very fine sand. Also in this association are small areas of the well-drained Agawam, silty substratum, and the poorly drained Swanton and Raynham soils.

The major soils are farmed intensively. Dairying and truck farming are predominant. The general crops grown are silage corn and hay, and the cash crops are tobacco, squash, cucumbers, and potatoes.

Many suburban homes have been built in this association. The easy commuting distance from towns and the panoramic views of the Connecticut Valley make the land valuable for building sites.

11. Shapleigh-Essex-Gloucester association

Shallow and deep, well-drained soils in sandy glacial till in the uplands east of the Connecticut Valley

Forested, rolling, stony and rocky hills are prominent in this soil association. The elevation ranges mainly from 500 to 1,200 feet above sea level, but Mount Grace, in the town of Warwick, rises to an elevation of 1,617 feet. The association is in the eastern part of the county and occupies about 32 percent of its area.

The soils in this association have formed in stony, sandy, gray glacial till. Most of the soils are stony, and contain many large boulders.

The Shapleigh soils are shallow. They are on the steeper slopes and have many rock ledges or outcrops. The depth to bedrock is generally less than 18 inches, but in some places between the outcrops there are pockets of soil several feet deep. Many of the ledge outcrops are 10 to 50 feet apart. The well-drained Gloucester and Essex soils are on the upper parts of the hills. The two soils are similar, except that the Essex soils have a hard layer at a depth of about 24 inches. In places the Gloucester soils have a firm or very firm substratum at a depth of 30 to 60 inches. Also in this association are scattered areas of moderately well drained Scituate and poorly drained Ridgebury soils.

Most of this association has been farmed, and there are still a few small dairy farms; but farming has declined because the soils are droughty and rocky and have low fertility. Most areas are forested. Recently a large part of the association has been used as building sites for rural homes and summer camps.

12. Hinckley-Merrimac association

Droughty to somewhat droughty sandy and gravelly soils that are nearly level to gently sloping and are in the eastern part of the county

This soil association is on nearly level to gently sloping outwash plains and stream terraces, mostly in the east-central part of the county. The elevation ranges from 500 to 700 feet, and the association occupies about 2 percent of the county area.

The soils in this association have formed in deep deposits of sand and gravel. The Hinckley soils have a loamy sand subsoil underlain by gravel at a depth of about 18 inches. In places they have a gravelly surface layer. The Merrimac soils are similar to the Hinckley but have a fine sandy loam or sandy loam subsoil, and the gravelly layer is generally about 24 inches from the surface. Also in this soil association are small areas of moderately well drained Sudbury soils.

Most of the association is used for housing or forestry. The agriculture is limited to a few dairy farms and truck farms that sell their produce locally.

Use and Management of the Soils

This section of the report contains information about the use and management of the soils for crops and pasture, woodland, wildlife habitats, engineering, and urban development.

Use of Soils for Crops and Pasture

In this subsection the soils are grouped into capability units according to their suitability for crops and pasture. The system of capability grouping is first explained and outlined; then each capability unit is described. In the capability unit descriptions, the soil characteristics that are important to agriculture are discussed, suitable crops or other uses are suggested, and the main requirements of good management are given. At the end of this subsection estimated yields are given for all the soils under two levels of management.

Capability groups of soils

The capability classification is a grouping of soils that shows, in a general way, how suitable they are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated 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* means that water in or on the soil will interfere 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 country, indicates 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 or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils 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 of soils for making many statements about their management.

Capability units are generally identified by numbers assigned locally, for example, I–5, or IIIe–2. These numbers are part of a state-wide system. All the capability units in the system are not applicable to Franklin County; therefore, the numbering of the units is not consecutive in this report.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change

the slope, depth, or other characteristics of the soil and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I. Soils that have few limitations that restrict their use.
- (No subclass)
  - Capability unit I–5. Deep, well-drained, nearly level sandy soils over silt, sand, or sand and gravel in uplands and on terraces.
  - Capability unit I–6. Deep, well-drained, nearly level soils in lacustrine deposits and in moderately coarse and medium-textured recent river and stream deposits.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe. Soils subject to moderate erosion if they are not protected.
  - Capability unit IIe–2. Deep, well-drained, undulating or gently sloping soils that are in uplands and have a compact layer, or fragipan, at a depth of about 2 feet, that has moderately slow or slow permeability.
  - Capability unit IIe–3. Deep, well-drained, undulating or gently sloping soils in glacial till in uplands.
  - Capability unit IIe–4. Deep, well-drained, undulating or gently sloping silty soils in lacustrine deposits.
  - Capability unit IIe–5. Deep, well-drained, undulating or gently sloping sandy soils on terraces.
  - Capability unit IIe–6. Deep, well-drained, undulating or gently sloping soils in medium-textured, recent river and stream deposits.
  - Capability unit IIe–7. Well-drained to somewhat excessively drained, undulating or gently sloping, shallow soils.
- Subclass IIw. Soils that have moderate limitations because of excess water.
  - Capability unit IIw–2. Nearly level to gently sloping, moderately well drained soils that are in uplands and have a compact layer, or fragipan, that has moderately slow or slow permeability.
  - Capability unit IIw–3. Deep, moderately well drained, undulating or gently sloping soils in glacial till in uplands.
  - Capability unit IIw–4. Nearly level to gently sloping, moderately well drained silty soils in lacustrine deposits.
  - Capability unit IIw–5. Nearly level to gently sloping, moderately well drained soils in sandy and gravelly deposits.
  - Capability unit IIw–6. Nearly level, moderately well drained soils that are on flood plains and are subject to occasional flooding.
  - Capability unit IIw–61. Nearly level, well-drained soils that are on flood plains and are subject to occasional flooding.
- Subclass IIs. Soils that have moderate limitations of moisture-holding capacity.
  - Capability unit IIs–8. Nearly level to gently sloping, well-drained to somewhat excessively drained sandy soils on terraces and in uplands.

Class III. Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
  - Capability unit IIIe–2. Deep, well-drained, moderately sloping or rolling soils that have a compact layer, or fragipan, that has moderately slow or slow permeability.
  - Capability unit IIIe–3. Deep, well-drained to somewhat excessively drained, moderately sloping or rolling soils in glacial till in uplands or on terraces.
  - Capability unit IIIe–4. Deep, well-drained, moderately sloping or rolling silty soils in lacustrine deposits.
  - Capability unit IIIe–5. Deep, well-drained, moderately sloping or rolling sandy soils underlain by deposits of silt, sand, or sand and gravel.
  - Capability unit IIIe–7. Shallow, well-drained to excessively drained, moderately sloping to rolling, shallow soils.
  - Capability unit IIIe–22. Deep, moderately well drained, moderately sloping to rolling soils that have, in most places, a compact layer that has moderately slow or slow permeability.
- Subclass IIIw. Soils that have severe limitations because of excess water.
  - Capability unit IIIw–2. Deep, poorly drained, level to gently sloping soils that have a compact layer, or fragipan, that has moderately slow or slow permeability.
  - Capability unit IIIw–5. Deep, poorly drained, level to gently sloping, acid soils in stratified deposits of silt, clay, sand, or gravel.
  - Capability unit IIIw–6. Deep, poorly drained, nearly level soils on flood plains.
  - Capability unit IIIw–9. Deep, moderately well-drained, nearly level, coarse-textured sandy soils.
- Subclass IIIs. Soils that have severe limitations of moisture-holding capacity.
  - Capability unit IIIs–6. Deep, excessively drained, nearly level soils on coarse, sandy flood plains.
  - Capability unit IIIs–9. Excessively drained, nearly level to gently sloping, coarse-textured sandy or gravelly soils on terraces.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
- Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.
  - Capability unit IVe–2. Deep, well-drained, moderately steep or hilly soils that are on uplands and have a compact layer, or fragipan, that has moderately slow or slow permeability.
  - Capability unit IVe–5. Deep, well-drained,

moderately steep to steep sandy soils underlain by stratified deposits of sand or sand and gravel.

Capability unit IVe–7. Well-drained to somewhat excessively drained, moderately steep or hilly, shallow soils.

Capability unit IVe–8. Deep, well-drained to somewhat excessively drained, moderately steep soils in glacial till in uplands and on outwash terraces.

Capability unit IVe–22. Deep, moderately well-drained, moderately steep or hilly soils that have a compact layer, or fragipan, that has moderately slow or slow permeability.

Subclass IVw. Soils that have very severe limitations because of excess water.

Capability unit IVw–4. Poorly drained, nearly level to gently sloping silty and clayey soils.

Subclass IVs. Soils that have very severe limitations because of low moisture-holding capacity.

Capability unit IVs–9. Excessively drained, nearly level to moderately sloping sandy and gravelly soils.

Class V. Soils that are not likely to erode but have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass Vw. Soils too wet for cultivation; drainage or protection not feasible.

Capability unit Vw–2. Nearly level to depressional, very poorly drained soils that have a slowly permeable, compact layer.

Capability unit Vw–5. Nearly level, very poorly drained glaciofluvial soils.

Capability unit Vw–9. Poorly drained sandy soils with a cemented subsoil that has moderately slow permeability.

Subclass Vs. Soils generally unsuitable for cultivation because of stoniness.

Capability unit Vs–22. Deep, moderately well-drained, nearly level very stony soils that have a slowly permeable, compact layer, or fragipan.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use mainly to pasture, woodland, or wildlife food and cover.

Subclass VIe. Soils severely limited, chiefly by risk of erosion, if protective cover is not maintained.

Capability unit VIe–4. Deep, well-drained, moderately steep or steep, moderately to severely eroded silty soils in lacustrine deposits.

Subclass VIw. Soils that are severely limited by wetness and are unsuitable for cultivation.

Capability unit VIw–4. Very poorly drained soils in stratified silt and clay in depressions.

Capability unit VIw–6. Very poorly drained, frequently flooded soils on flood plains.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by low moisture-holding capacity, by stones, or other features.

Capability unit VIs–2. Gently sloping to moderately steep, well-drained, very stony soils that have a compact layer, or fragipan, that has moderately slow to slow permeability.

Capability unit VIs–3. Gently sloping to moderately steep, deep, well-drained to somewhat excessively drained very stony soils in glacial till in uplands.

Capability unit VIs–7. Gently sloping to moderately steep, somewhat excessively to excessively drained, very rocky, shallow soils.

Capability unit VIs–9. Excessively drained, moderately steep to steep, coarse-textured soils on terraces.

Capability unit VIs–22. Gently sloping to moderately steep, moderately well-drained, very stony soils that are in uplands and have, in most places, a compact layer, or fragipan, that has moderately slow or slow permeability.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIw. Soils very severely limited by excess water.

Capability unit VIIw–1. Very poorly drained peat and muck.

Subclass VIIs. Soils very severely limited by stones or low moisture-holding capacity.

Capability unit VIIs–2. Nearly level to very steep, extremely stony soils and steep or very steep, very stony soils in uplands.

Capability unit VIIs–7. Gently sloping to very steep, well-drained to excessively drained, extremely rocky, shallow soils.

Capability unit VIIs–9. Gently sloping to steep, excessively drained sandy soils.

Capability unit VIIs–23. Poorly drained, level to sloping very stony and extremely stony soils.

Capability unit VIIs–24. Very poorly drained, nearly level to gently sloping very stony and extremely stony soils.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

Subclass VIIIs. Rock or soil materials that have little potential for production of vegetation.

Capability unit VIIIs–2. Barren stream deposits of sand, gravel, and cobbles subject to flooding and alteration during periods of normal high water.

Management by capability units

This section contains a description of each capability unit and a list of the soils in it. In addition, suggestions are given concerning the use and management of the soils in each unit.

The soils in each unit are similar in many respects. Distinctive characteristics that affect the use and management of particular soils are given with the descriptions of some units. All soils in the county are low to very low in natural fertility, and they 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.

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Recommendations on crop varieties and perennial forage seed mixtures can be obtained from publications of the Agricultural Extension Service, College of Agriculture, University of Massachusetts, at Amherst. The Agricultural Extension Service and the Soil Conservation Service can help interpret the recommendations for soils on a specific farm. They can also give technical advice on land preparation, cropping systems, diversions, drainage, woodland management, pasture management, and other phases of farming.

CAPABILITY UNIT I-5

This unit consists of deep, well-drained sandy soils. The Agawam, Merrimac, and Warwick soils formed in stratified, water-sorted material, and the Gloucester soil formed in loose glacial till. These soils are nearly level and slightly eroded. They are underlain by silt, sand, or sand and gravel at a depth of 20 to 30 inches. Stones and boulders occur below the surface layer of the Gloucester soil, and in places this soil may have a few stones and boulders on the surface.

Most of these soils have moderately rapid to rapid permeability. The Agawam fine sandy loam, silty substratum, and most areas of the Gloucester fine sandy loam have a slowly permeable substratum. All of the soils have a moderate to high moisture-holding capacity, contain a small amount of organic matter, and are extremely acid to slightly acid.

The soils in this unit are—

Agawam fine sandy loam, 0 to 3 percent slopes.
Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes.
Gloucester fine sandy loam, 0 to 3 percent slopes.
Merrimac fine sandy loam, 0 to 3 percent slopes.
Warwick gravelly fine sandy loam, 0 to 3 percent slopes.
Warwick gravelly loam, 0 to 3 percent slopes.

These soils are well suited to the crops generally grown in the area, and some are especially suitable for tobacco and potatoes. Most of the acreage has been cleared and is used for cultivated crops or for hay and pasture.

These soils can be used intensively with a minimum risk of erosion, but careful management is needed to maintain organic matter, plant nutrients, and soil reaction at suitable levels. In all but the Gloucester soil, a plowsole commonly develops with intensive cultivation. This compacted layer can be broken by subsoiling, deep plowing, and growing winter cover crops and deep-rooted grasses and legumes.

A suitable cropping system for the Agawam soils consists of 2 years of a row crop and 1 year of green manure. A winter cover crop should follow the first year of the row crop. A suitable system for the other soils consists of continuous row cropping and a winter cover crop each year. Crops respond favorably to lime and fertilizer applied according to needs indicated by soil tests. Several small applications of fertilizer are more effective than one large one. This practice reduces loss of plant nutrients, which leach away fairly readily.

CAPABILITY UNIT I-6

This unit consists of deep, well-drained soils that are nearly level and slightly eroded. The Hartland soil formed in lake-deposited materials. The others formed in recent river and stream deposits, but they are on high bottom lands and are seldom flooded.

The Hartland soil has moderately slow permeability in the substratum and has a high moisture-holding capacity. The other soils are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. The content of organic matter is low or moderately low in all of these soils, and they are very strongly acid to slightly acid.

The soils in this unit are—

Hadley silt loam, 0 to 3 percent slopes.
Hadley very fine sandy loam, 0 to 3 percent slopes.
Hartland silt loam, 0 to 3 percent slopes.
Ondawa fine sandy loam.

The soils are suitable for crops generally grown in the county. The Hadley and Ondawa soils are especially desirable for tobacco (fig. 2), potatoes, and truck crops. Most of the acreage is used for cultivated crops, although some of it is used for hay and pasture.

The soils in this unit can be used intensively with a minimum risk of erosion, but careful management is needed to maintain organic matter and tilth. A plowsole commonly develops if the soils are cultivated intensively. This compacted layer can be broken by subsoiling, deep plowing, and growing winter cover crops. Varying the depth of plowing helps to prevent the development of a plowsole.

A suitable cropping system for the Hadley and Hartland soils consists of 2 years of a row crop and 1 year of green manure. A winter cover crop should follow the first year of the row crop. A suitable system for the Ondawa soil consists of continuous row cropping and a winter cover crop each year. Fertilization is needed to obtain good yields. Crops respond favorably to lime and fertilizer applied in amounts determined by soil tests.

CAPABILITY UNIT IIe-2

This unit consists of deep, well-drained soils that developed in compact glacial till. These soils are gently sloping and moderately eroded. They have a compact layer, or fragipan, at a depth of 18 to 30 inches that restricts movement of water and growth of roots. Stones and boulders occur below the surface.

These soils are moderately to rapidly permeable above the fragipan and have a moderate to high moisture-holding capacity. The permeability is moderately slow or slow in the fragipan. They are slightly acid to very strongly acid, except for the Shelburne soil, which is slightly acid to neutral. Their content of organic matter is low to moderate.

The soils in this unit are—

Bernardston channery silt loam, 3 to 8 percent slopes.
Broadbrook very fine sandy loam, 3 to 8 percent slopes.
Essex fine sandy loam, 3 to 8 percent slopes.
Marlow loam, 3 to 8 percent slopes.
Marlow loam, dark subsoil, 3 to 8 percent slopes.
Shelburne loam, 3 to 8 percent slopes.

These soils are suited to most of the crops grown in the county, and they are especially well suited to hay, silage corn, apples, and potatoes. Alfalfa grows well but is subject to heaving in winter and early in spring. Crops, grasses, and legumes are seldom damaged by lack of moisture during the growing season.

These soils are susceptible to erosion and, where used intensively, they need protection by such conservation

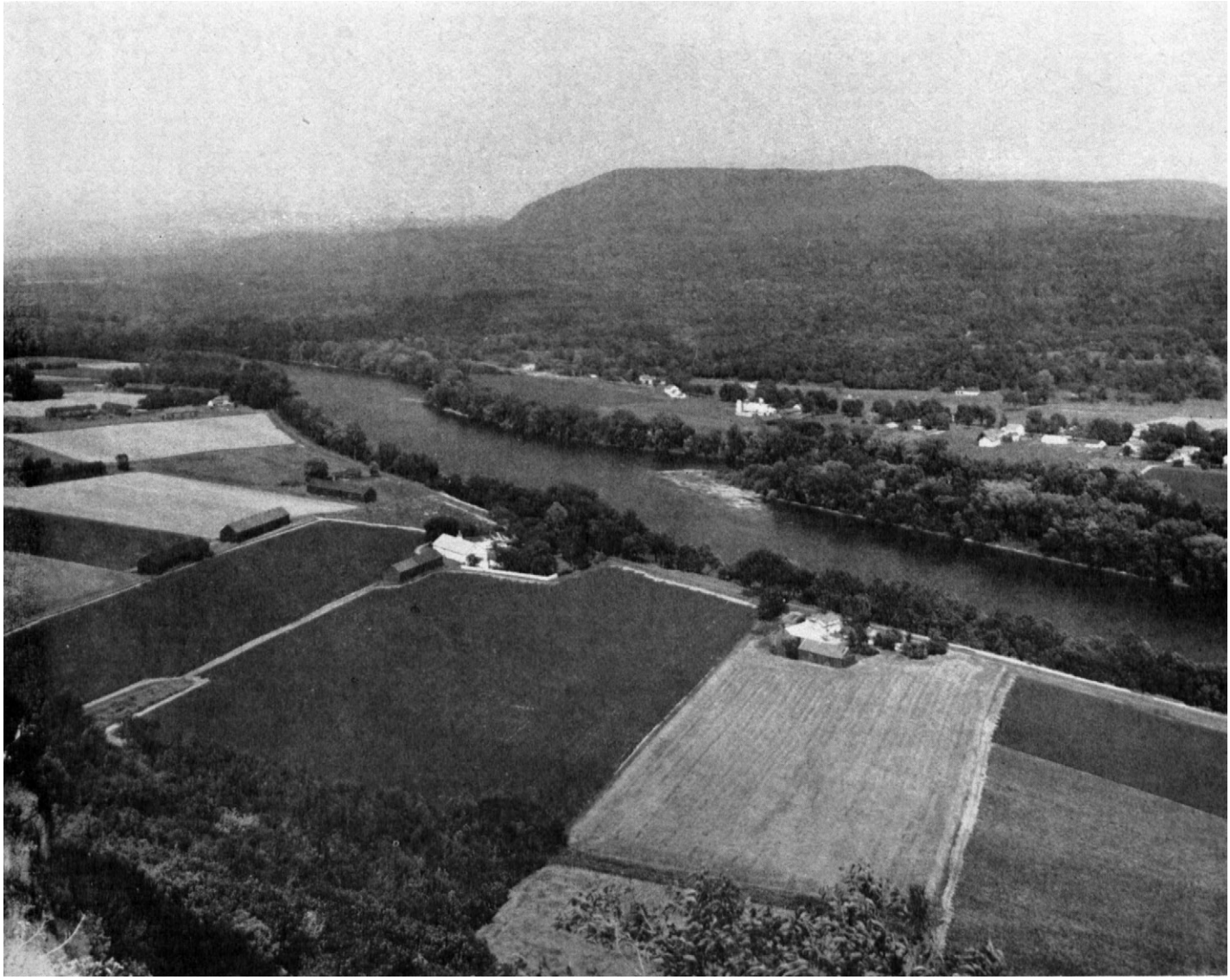

Figure 2.—**Tobacco farms on Hadley soils on the Connecticut River bottom land.**

measures as contour cultivation, diversion, stripcropping, and the use of grass waterways.

A suitable cropping system for the Broadbrook soil consists of 2 years of a row crop and 4 years of grass or grass-legume. The row crop should be in contour strips alternating with strips of grass or grass-legume. For the other soils a suitable cropping system consists of 2 years of a row crop and 2 years of grass or grass-legume. The row crop should be on the contour. For all the soils in this unit a winter cover crop should follow the first year of the row crop. These practices help to control runoff and to maintain organic matter and good tilth. Crops respond favorably to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT IIe-3

This unit consists of deep, well-drained soils that developed in glacial till. These soils are gently sloping and moderately eroded. The surface layer contains small rock fragments, cobbles, and a few stones. Stones and boulders are also below the surface layer.

These soils are moderately to rapidly permeable and have moderate to high moisture-holding capacity. Most of the Berkshire, Charlton, and Gloucester soils have a firm substratum below a depth of 30 inches that has moderately slow to slow permeability. The Colrain soil contains leached limestone and is very strongly to slightly acid in the solum, but may be neutral in the substratum. The other soils are mainly very strongly acid to strongly acid. The content of organic matter is low except in the Berkshire soils; it is relatively high in those soils.

The soils in this unit are—

Berkshire fine sandy loam, 3 to 8 percent slopes.
Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Charlton fine sandy loam, 3 to 8 percent slopes.
Cheshire fine sandy loam, 3 to 8 percent slopes.
Colrain fine sandy loam, 3 to 8 percent slopes.
Dutchess silt loam, 3 to 8 percent slopes.
Gloucester fine sandy loam, 3 to 8 percent slopes.

These soils are suited to most of the crops grown in the county, especially to hay, corn, and potatoes. They are suitable for intensive use if conservation practices are used to control the loss of soil and to maintain organic matter and good tilth. The practices most needed to control erosion are contour cultivation and, on long slopes, the use of diversions or stripcropping and grass waterways.

A typical cropping system that is suitable for these soils consists of 2 years of a row crop and 1 year of green manure. A winter cover crop should follow the first year of the row crop. The row crop should be on the contour. Fertilization is necessary for good yields. Crops respond favorably to lime and fertilizer applied according to needs determined by soil tests.

CAPABILITY UNIT IIe-4

This unit consists of deep, well-drained soils that developed in lake-deposited material. These soils are gently sloping and moderately eroded.

The soils have a high moisture-holding capacity. They are very strongly to medium acid, and their content of organic matter is low. They have moderate permeability in the solum but moderately slow to slow permeability in the substratum.

The soils in this unit are—

Hartland silt loam, 3 to 8 percent slopes.
Suffield silt loam, 3 to 8 percent slopes.

These soils are suited to most of the crops grown in the county. The risk of erosion is high on unprotected slopes. Some areas are suitable for stripcropping and cultivation across the slope; others are too irregular for these practices. Grass waterways and diversions are practical and desirable in places.

A suitable cropping system consists of 2 years of a row crop, 4 years of hay, and a winter cover crop following the first year of the row crop. The row crop should be on the contour. A winter cover crop following a row crop helps to control erosion, add organic matter, and maintain good tilth. These soils need to be worked within a fairly narrow range of moisture content to avoid puddling and compaction. They have higher natural fertility than most of the soils in the county, but crops respond favorably to additions of lime, fertilizer, and organic matter.

CAPABILITY UNIT IIe-5

This unit consists of deep, well-drained and somewhat excessively drained sandy soils that developed in stratified, water-sorted material. These soils are gently sloping and moderately eroded. They are underlain by silt, sand, or sand and gravel at a depth of 20 to 30 inches.

These soils have moderately rapid or rapid permeability. Agawam fine sandy loam, silty substratum, has moderately slow or slow permeability in the substratum. All these soils have a low to moderate moisture-holding capacity, a low content of organic matter, and a very strongly acid to slightly acid reaction.

The soils in this unit are—

Agawam fine sandy loam, 3 to 8 percent slopes.
Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes.
Merrimac fine sandy loam, 3 to 8 percent slopes.
Warwick gravelly fine sandy loam, 3 to 8 percent slopes.
Warwick gravelly loam, 3 to 8 percent slopes.

These soils are well suited to most of the crops grown in the county, and some of them are especially desirable for tobacco, potatoes, and truck crops. They are susceptible to water erosion, however, because of their slope. Also, crop yields are limited by lack of moisture during a dry growing season. Cropping systems, stripcropping, contouring, and seeding are desirable conservation practices for these soils. A suitable cropping system for the Agawam soils consists of 2 years of a row crop, 2 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be on the contour. A suitable cropping system for the other soils consists of continuous row cropping and a winter cover crop each year. Crops respond favorably to lime and fertilizer applied according to needs determined by soil tests.

CAPABILITY UNIT IIe-6

This unit consists of deep, well-drained soils that developed in recent river deposits. These soils are on high bottom lands and are seldom flooded. They are gently sloping and moderately eroded.

These soils are moderately permeable and have a high moisture-holding capacity. They are very strongly acid, to medium acid, and their content of organic matter is low.

The soils in this capability unit are—

Hadley silt loam, 3 to 8 percent slopes.
Hadley very fine sandy loam, 3 to 8 percent slopes.

These soils are suitable for all the crops grown in the county. They are especially well suited to tobacco, potatoes, and truck crops.

These soils can be cultivated intensively but are subject to erosion because of slope. Conservation practices needed to control erosion include the use of cropping systems, contouring, and seeding.

A suitable cropping system consists of 2 years of a row crop, 3 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be on the contour. Crops respond to lime and fertilizer applied according to the results of soil tests.

CAPABILITY UNIT IIe-7

This unit consists of shallow, well-drained to somewhat excessively drained soils that developed in thin glacial deposits over bedrock. These soils are gently sloping and slightly eroded. Bedrock lies generally within 2 feet of the surface, but there are a few deeper pockets of soil and a few rock outcrops.

These soils are moderately to rapidly permeable, and their moisture-holding capacity is low because they are shallow. The content of organic matter is also low, except in the Westminster soil; it is relatively high in this soil. The Westminster soil also contains leached limestone and may be slightly acid; the others are extremely acid to medium acid.

The soils in this capability unit are—

Hollis fine sandy loam, 3 to 8 percent slopes.
Shapleigh fine sandy loam, 3 to 8 percent slopes.
Westminster loam, 3 to 8 percent slopes.

These soils are suited to hay, pasture, silage corn, and most truck crops. Potatoes and tobacco generally are not grown in the areas where these soils occur.

Because the soils are gently sloping, they are subject to erosion. Conservation practices such as stripcropping,

contouring, seeding, and the use of cropping systems are needed to control erosion.

If row crops are grown on these soils, the cropping system should consist of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. The row crop should be on the contour. In most years irrigation is required for row crops. Crops respond favorably to lime and fertilizer applied in the amounts indicated by soil tests.

CAPABILITY UNIT IIw-2

This unit consists of deep, moderately well-drained soils that developed in compact glacial till. These soils are nearly level to gently sloping and are slightly to moderately eroded. At a depth of 18 to 30 inches, they have a compact layer, or fragipan, that restricts vertical movement of water and growth of roots.

These soils are moderately to rapidly permeable and have a high to moderate moisture-holding capacity above the fragipan. The fragipan, however, has moderately slow or slow permeability and has a low moisture-holding capacity. The Peru soils contain a relatively large amount of organic matter, whereas the other soils contain only a small amount. Except for the Buckland soils, which contain leached limestone and are mainly medium to slightly acid, the soils are very strongly acid to medium acid.

The soils in this unit are—

Buckland fine sandy loam, 0 to 3 percent slopes.
Buckland fine sandy loam, 3 to 8 percent slopes.
Peru loam, 0 to 3 percent slopes.
Peru loam, 3 to 8 percent slopes.
Pittstown silt loam, 3 to 8 percent slopes.
Scituate fine sandy loam, 0 to 3 percent slopes.
Scituate fine sandy loam, 3 to 8 percent slopes.

These soils are saturated until late in spring because the fragipan restricts drainage. Without artificial drainage they are suitable for hay and pasture and are used mainly for this purpose. Drained areas are suitable for silage corn, potatoes, vegetables, alfalfa, and other crops. The nearly level areas of these soils are not subject to water erosion. Conservation practices, particularly the use of cropping systems, graded rows, and seeding, are needed on the gently sloping areas. Drainage is needed on all the soils in this unit.

After drainage a suitable cropping system for (a) the nearly level soils consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop; and for (b) the gently sloping soils, 2 years of a row crop, 2 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows on the gently sloping soils. Crops respond favorably to lime and fertilizer applied according to the results of soil tests.

CAPABILITY UNIT IIw-3

Sutton fine sandy loam, 3 to 8 percent slopes, is the only soil in this unit. It is a deep, moderately well drained soil that developed in moderately coarse textured glacial till. The soil is gently sloping and moderately eroded.

This soil has moderate or moderately rapid permeability, but its internal drainage is restricted by a seasonally high water table or excess seepage. In many places, the substratum is firm or very firm and has moderately slow or slow permeability. The soil has a high moisture-holding capacity. Mottling at a depth of 14 to 20 inches indicates that the lower subsoil is saturated during wet seasons. The soil contains only a small amount of organic matter and is very strongly acid to medium acid.

A high water table or excess seepage keeps this soil wet, and it cannot be worked until late in spring. Without artificial drainage, it is used mainly for hay and pasture. Drained areas are suitable for silage corn, potatoes, vegetables, alfalfa, and other crops. Because of the slope of this soil, cultivation and seeding should be done in graded rows wherever practical. Diversions and grass waterways are needed on the longer slopes. Organic matter and good tilth should be maintained.

After drainage, a suitable cropping system consists of 2 years of a row crop, 2 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows. Crops respond favorably to lime and fertilizer applied according to the results of soil tests.

CAPABILITY UNIT IIw-4

This unit consists of deep, moderately well drained soils that developed in lake deposits of silt and very fine sand or silt and clay. Most areas of these soils are nearly level to gently sloping, but a few areas are moderately sloping. The soils are slightly to moderately eroded.

The Belgrade and the Buxton soils are medium textured and have moderate or moderately slow permeability in the solum, but they have moderately slow or slow permeability in the substratum. All soils in this unit have a high moisture-holding capacity and are somewhat difficult to work. Drainage is a problem on the more nearly level areas, and erosion is a severe hazard on the slopes. These soils contain a small amount of organic matter and are strongly acid to slightly acid.

The soils in this unit are—

Belgrade silt loam, 0 to 3 percent slopes.
Belgrade silt loam, 3 to 8 percent slopes.
Buxton silt loam, 0 to 3 percent slopes.
Buxton silt loam, 3 to 10 percent slopes.

These soils are saturated until late in the spring; consequently, tillage is delayed. The soils are best suited to hay and pasture, although silage corn and vegetables have been grown on them. Drainage is needed for best yields of crops.

After drainage, a suitable cropping system consists of 2 years of a row crop, 3 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows on the gently sloping soils. Other practices that are desirable if practical are seeding, grass waterways, and diversions.

These soils should be worked within a fairly narrow range of moisture content to avoid puddling and compaction. Pastures should not be grazed when wet, because trampling packs the soil and cuts the sod. If the soils in this unit are drained, crops grown on them respond well to lime and fertilizer applied according to needs determined by soil tests. Because of their silty texture and slowly permeable substratum, these soils are best drained by diverting runoff from surrounding uplands, by using field ditches for surface drainage on the nearly level areas, and by smoothing, grading, or bedding the fields.

CAPABILITY UNIT IIw-5

This unit consists of deep, moderately well drained soils that developed in stratified, water-sorted deposits. These soils are nearly level to gently sloping and are slightly to moderately eroded. They are underlain by sand, sand and gravel, or layers of silt and very fine sand. They have a fluctuating high water table that is within 2 feet of the surface during spring and late in fall.

These soils have moderately rapid to rapid permeability and a high to moderate moisture-holding capacity. The Ninigret silty substratum soils have moderately slow or slow permeability in the substratum. The content of organic matter is low in all of the soils, and they are medium to very strongly acid.

The soils in this unit are—

Ninigret fine sandy loam, 0 to 3 percent slopes.
Ninigret fine sandy loam, 3 to 10 percent slopes.
Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes.
Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes.
Sudbury fine sandy loam, 0 to 3 percent slopes.
Sudbury fine sandy loam, 3 to 8 percent slopes.

The high water table keeps these soils saturated during spring and fall and during prolonged rainy periods and thus interferes with drainage. This limits their use, especially early in spring, unless they can be drained. Without artificial drainage, these soils are suitable for hay and pasture. If drained, they can also be used for vegetables, tobacco, potatoes, silage corn, and other crops generally grown in the area.

Cultivation of sloping fields should be in graded rows wherever practical. Diversions and grass waterways are needed in places. Plowing these soils when they are too wet hastens the development of a plowsole. Cultivated areas must be carefully managed to maintain organic matter and good tilth.

A desirable cropping system for the Sudbury soils, if they are drained, consists of continuous row cropping and a winter cover crop each year. After drainage, a suitable cropping system for the Ninigret soils consists of (a) 2 years of a row crop and 2 years of grass or grass-legume on the nearly level areas and (b) 2 years of a row crop in graded rows and 1 year of green manure on the gently sloping areas. The first year of the row crop should be followed by a winter cover crop. Fertilization is necessary for good yields. Lime and fertilizer should be applied according to the results of soil tests.

CAPABILITY UNIT IIw-6

This unit consists of deep, moderately well drained soils that developed in material recently deposited by rivers and smaller streams. These soils occur on nearly level flood plains. They are slightly eroded and are subject to occasional flooding.

These soils are moderately to rapidly permeable, but internal soil drainage is restricted by a high water table. They have a moderate to high moisture-holding capacity. Their content of organic matter is low, and they are strongly acid to slightly acid.

The soils in this unit are—

Podunk fine sandy loam.
Winooski very fine sandy loam.

The high water table and occasional flooding prevent these soils from being worked until late in the spring. They are used mainly for hay and pasture, silage corn, field tobacco, potatoes, sweet corn, and late truck crops. Drainage is needed for best yields of crops.

Land grading and field ditches are effective in removing excess water from these soils. After drainage, a suitable cropping system for the Podunk soil consists of continuous row cropping and a winter cover crop each year; and for the Winooski soil, 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT IIw-61

Hadley very fine sandy loam, overflow, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep and well drained. It developed in recent river deposits on nearly level flood plains and is flooded occasionally.

The soil is moderately permeable and has a high moisture-holding capacity. The content of organic matter is low, and the soil is very strongly acid to medium acid.

Crops are damaged occasionally by the flooding, most of which occurs early in spring. Therefore, the soil is used mainly for hay, pasture, and corn, but it is well suited to truck crops if the flooding hazard is taken into account.

Tilling and planting are delayed occasionally by flood waters or the hazard of flooding. Streambanks should be protected in some places to control erosion. The supply of moisture for plants is generally adequate during the growing season. Good management is necessary to keep the fertility, organic matter, and soil reaction at the required levels for maximum yields.

A suitable cropping system consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT IIs-8

This unit consists of deep, somewhat excessively drained soils that developed in coarse glacial till or stratified, water-sorted sand and gravel. These soils are nearly level to gently sloping and are slightly to moderately eroded. They are underlain by coarse material at a depth of 18 to 24 inches.

These soils have moderately rapid to rapid permeability, have a low to moderate moisture-holding capacity, and are droughty. In most places the substratum of the Gloucester soil has moderately slow or slow permeability. Their content of organic matter is low, and they are extremely acid to medium acid.

The soils in this unit are—

Gloucester sandy loam, 3 to 8 percent slopes.
Merrimac sandy loam, 0 to 3 percent slopes.
Merrimac sandy loam, 3 to 8 percent slopes.

These soils are used mainly for hay and pasture, but if irrigated, they are well suited to tobacco, early vegetables, sweet corn, silage corn, alfalfa, potatoes, and other crops commonly grown in the area. Although the soils are somewhat droughty, they warm early in the spring and are easy to work. Crops grown on them are very responsive to fertilization.

The soils can be farmed intensively if conservation practices are used on sloping areas to control erosion. Among these are use of contour cultivation, diversions, and grass

waterways. Good management is necessary to increase organic matter and maintain good tilth.

A suitable cropping system consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. On the gently sloping areas of these soils, the row crop should be on the contour. Good yields can be expected from these soils if they are irrigated and if lime and fertilizer are applied frequently in amounts indicated by soil tests.

CAPABILITY UNIT IIIe-2

This unit consists of deep, well-drained soils that developed in compact glacial till. These soils are moderately sloping and are moderately eroded. They have a compact layer, or fragipan, at a depth of 18 to 30 inches.

These soils are moderately to rapidly permeable and most of them have a high moisture-holding capacity above the fragipan. The fragipan has moderately slow to slow permeability, has a low moisture-holding capacity, and restricts root growth. All except the Marlow soils contain only a small amount of organic matter; the Marlow soils contain a relatively large amount. Except for the Shelburne soils, which contain leached limestone and are strongly acid to neutral, these soils are very strongly acid to slightly acid.

The soils in this unit are—

Bernardston channery silt loam, 8 to 15 percent slopes.
Broadbrook very fine sandy loam, 8 to 15 percent slopes.
Essex fine sandy loam, 8 to 15 percent slopes.
Marlow loam, 8 to 15 percent slopes.
Marlow loam, dark subsoil, 8 to 15 percent slopes.
Shelburne loam, 8 to 15 percent slopes.

These soils are suitable for hay, pasture, orchards, and woodland. Small acreages are used for silage corn, potatoes, and other crops. The risk of erosion limits the use of these soils for cultivated crops. Supporting conservation practices that are needed include the use of contour stripcrops, diversions, and grass waterways. Good yields of grasses, legumes, and crops can be obtained if the soils are limed and fertilized according to needs determined by soil tests.

If diversions and strips on diversion grades are used on the Broadbrook soil, a suitable cropping system consists of 1 year of a row crop and 4 years of grass or grass-legume. The row crop should be in strips alternating with strips of grass or grass-legume. A suitable cropping system for the other soils consists of 2 years of a row crop, 3 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in contour strips alternating with strips of grass or grass-legume.

CAPABILITY UNIT IIIe-3

This unit consists of deep, well-drained to somewhat excessively drained soils that formed in glacial till or outwash. These soils are moderately sloping and moderately eroded. The Gloucester and Merrimac sandy loams are underlain by sand or sand and gravel at a depth of 18 to 24 inches.

The Gloucester and Merrimac sandy loams have moderately rapid to rapid permeability and low to moderate moisture-holding capacity. The other soils are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. Most of the Berkshire, Charlton, and Gloucester soils have a firm substratum below 30 inches that has moderately slow to slow permeability. All except the Berkshire soils have a small supply of organic matter; the Berkshire soils have a relatively large supply. The Colrain soil contains leached limestone and is mainly medium to slightly acid; the other soils are mainly very strongly acid to strongly acid.

The soils in this unit are—

Berkshire fine sandy loam, 8 to 15 percent slopes.
Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes.
Charlton fine sandy loam, 8 to 20 percent slopes.
Cheshire fine sandy loam, 8 to 15 percent slopes.
Colrain fine sandy loam, 8 to 15 percent slopes.
Dutchess silt loam, 8 to 15 percent slopes.
Gloucester fine sandy loam, 8 to 15 percent slopes.
Gloucester sandy loam, 8 to 15 percent slopes.
Merrimac sandy loam, 8 to 15 percent slopes.

The Gloucester and Merrimac sandy loams are suited to most of the crops grown in the county, but they are droughty. Without irrigation they are better suited to pasture and woodland than to row crops. The other soils are used mostly for hay or pasture, but they are also suitable for silage corn, orchards, woodland, and most truck crops grown in the county. If heavily limed and fertilized, they are suitable for alfalfa.

Because of the slopes, moderately intensive conservation practices are needed to control erosion. These practices include the use of (1) a cropping system, (2) winter cover crops, (3) contour stripcropping if practical, (4) strip reseeding, and (5) grass waterways and diversions. A suitable cropping system consists of 2 years of a row crop, 2 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in contour strips alternating with the grass or grass-legume.

Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT IIIe-4

This unit consists of deep, well-drained soils that developed in glacial lake deposits. These soils are moderately sloping and moderately to severely eroded. They are moderately fine textured and subject to severe erosion.

These soils are moderately permeable in the solum but have moderately slow or slow permeability in the substratum. Both of these soils have a high moisture-holding capacity. Their content of organic matter is low, and they are strongly acid to medium acid.

The soils in this unit are—

Hartland silt loam, 8 to 15 percent.
Suffield silt loam, 8 to 15 percent slopes, eroded.

These soils are suited to most of the crops grown in the area. Because of their fine texture, these soils remain wet fairly late in spring, and they puddle if worked when wet. Also, they are moderately sloping and subject to severe erosion; therefore, moderately intensive conservation practices are needed. Some of these practices are the use of (1) a cropping system, (2) contour stripcropping, (3) contour strip seeding, (4) grass waterways and spot drainage in some place, and (5) diversions.

With diversions and contour stripcropping, a suitable cropping system consists of 1 year of a row crop and 4 years of grass or grass-legume. The row crop should be

in contour strips alternating with strips of grass or grass-legume.

Crops respond to lime and fertilizer applied in amounts determined by soil tests.

CAPABILITY UNIT IIIe-5

This unit consists of deep, well-drained soils that developed in water-sorted or wind-blown deposits 20 to 30 inches thick. These soils are underlain by silt, sand, or sand and gravel. They are moderately sloping and moderately eroded; a few are on moderately steep slopes.

These soils have moderately rapid to rapid permeability and have a moderate to low moisture-holding capacity. The Agawam, silty substratum has moderately slow to slow permeability in the substratum. The content of organic matter is low in these soils, and they are very strongly acid to slightly acid.

The soils in this unit are—

Agawam fine sandy loam, 8 to 15 percent slopes.
Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes.
Merrimac fine sandy loam, 8 to 15 percent slopes.
Warwick gravelly fine sandy loam, 8 to 15 percent slopes.
Warwick gravelly loam, 8 to 15 percent slopes.

These soils are suited to most of the crops grown in the county, but they are used mainly for hay, pasture, and woodland. If properly limed and fertilized, these soils are suitable for alfalfa.

Because of the slopes, moderately intensive conservation practices are needed if the soils are cultivated. These practices include the use of (1) a cropping system, (2) winter cover crops, (3) contour stripcropping, (4) contour strip seeding, (5) grass waterways, and (6) diversions.

A suitable cropping system for the Agawam soils consists of 1 year of a row crop and 3 years of grass or grass-legume. A suitable system for the Merrimac and Warwick soils consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. For all the soils in this unit, the row crop should be in contour strips alternating with strips of grass or grass-legume.

Crops respond favorably to lime and fertilizer applied according to needs determined by soil tests.

CAPABILITY UNIT IIIe-7

This unit consists of shallow, well-drained to excessively drained soils that developed in thin glacial deposits over bedrock. These soils are moderately sloping and moderately eroded. They are broken by a few bedrock outcrops. The depth to bedrock is generally less than 20 inches but is more than 3 feet in places.

These soils are moderately to rapidly permeable and have a low moisture-holding capacity because they are shallow. The content of organic matter is low except in the Westminster soil. It is relatively high in the Westminster soil. This soil also contains some leached limestone and may be slightly acid, whereas the other soils are extremely acid to medium acid.

The soils in this unit are—

Hollis fine sandy loam, 8 to 15 percent slopes.
Shapleigh fine sandy loam, 8 to 15 percent slopes.
Westminster loam, 8 to 15 percent slopes.

These soils are suited to most of the crops grown in the county, but they are droughty because of shallowness. They are better suited to hay and pasture or woodland than to row crops. Irrigation is needed to obtain good yields of crops.

If row crops are grown, moderately intensive conservation practices are necessary to control erosion. These practices include the use of (1) a cropping system, (2) winter cover crops, (3) contour stripcropping, (4) strip reseeding, and (5) diversions.

Regular additions of lime, fertilizer, and organic matter are required for satisfactory yields.

A suitable cropping system consists of 2 years of a row crop, 3 years of grass or grass-legume, and a winter cover crop following the first year of the row crop. The row crop should be in contour strips alternating with strips of grass or grass-legume.

CAPABILITY UNIT IIIe-22

This unit consists of deep, moderately well drained soils that developed in glacial till. These soils are moderately sloping and moderately eroded; a few are on moderately steep slopes. Most of them have a compact layer at a depth of 18 to 30 inches that limits the movement and storage of water and the growth of roots.

These soils have a moderately to rapidly permeable solum but have moderately slow to slow permeability in the substratum. They have a high to moderate moisture-holding capacity above the compact layer. The content of organic matter is low, except in the Peru soil. It is relatively high in this soil. The Buckland soil contains leached limestone and is mainly medium acid to slightly acid; the others are very strongly acid to medium acid.

The soils in this unit are—

Buckland fine sandy loam, 8 to 15 percent slopes.
Peru loam, 8 to 15 percent slopes.
Scituate fine sandy loam, 8 to 15 percent slopes.
Sutton fine sandy loam, 8 to 20 percent slopes.

These soils are saturated until late in the spring and are best suited to hay and pasture. They are also suited to silage corn, potatoes, late vegetables, and small fruits. If these soils are drained, they are suited to most of the crops grown in the county.

After drainage, a suitable cropping system consists of 2 years of a row crop and 3 years of grass or grass-legume. A winter cover crop should follow the first year of the row crop. The row crop should be in graded strips alternating with strips of grass or grass-legume.

On these sloping soils moderately intensive conservation practices are necessary to control erosion. These practices include the use of (1) a cropping system, (2) winter cover crops, (3) grass waterways, and (4) diversions.

Crops grown on these soils are responsive to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT IIIw-2

This unit consists of deep, poorly drained soils that are level to gently sloping and slightly eroded. The Cabot soils formed in compact glacial till containing leached limestone. The Ridgebury and Stissing soils formed in compact, acid glacial till. All of these soils have a compact layer, or fragipan, at a depth of 12 to 30 inches that restricts the movement of water and the growth of roots.

Figure 3.—**Balsam fir planted for Christmas trees on Cabot soil.**

These soils are saturated 7 to 9 months every year, and some areas are ponded in very wet seasons. Above the compact layer they are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. The permeability is moderately slow or slow in the compact layer. The content of organic matter is moderate to high. The Cabot soils are medium acid to neutral; the others are very strongly to medium acid.

The soils in this unit are—

Cabot fine sandy loam, 0 to 3 percent slopes.
Cabot fine sandy loam, 3 to 8 percent slopes.
Ridgebury fine sandy loam, 0 to 3 percent slopes.
Ridgebury fine sandy loam, 3 to 8 percent slopes.
Stissing silt loam, 0 to 8 percent slopes.

Wetness limits the use of these soils. Undrained areas are mainly in pasture or woodland (fig. 3) or are idle. Drained areas can be used for hay and improved pasture and for moisture-tolerant row crops.

The soils are somewhat difficult to drain, however, because of the compact layer and possibly the lack of suitable outlets. Tile drains generally are not satisfactory, but shallow surface ditches or open ditches with protected banks can be used. Land smoothing in places will eliminate low wet spots and improve surface drainge. Even if surface drainage is improved, the internal movement of water is restricted by the compact layer.

Other good management practices include (1) liming and fertilizing according to needs determined by soil tests, (2) planting moisture-tolerant grasses and legumes, (3) keeping animals and machinery off the fields while the soils are saturated with water, and (4) use of a cropping system.

After these soils are drained, the nearly level areas are suitable for continuous row cropping if a winter cover crop is grown each year. The gently sloping areas are suitable for 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows on the gently sloping areas.

CAPABILITY UNIT IIIw-5

This unit consists of deep, poorly drained soils that developed in stratified, water-sorted material. These soils are underlain at a depth of 15 to 36 inches by silt, clay,

sand, or sand and gravel. They are nearly level to gently sloping and are slightly eroded.

Because of a high water table, these soils are wet for 7 to 9 months of the year. The Raynham soil has moderately slow to slow permeability below the surface layer and has a high moisture-holding capacity. The Walpole and Wareham soils have moderately rapid to rapid permeability and moderate to high moisture-holding capacity. The Swanton soils have a slowly permeable substratum and a moderate to high moisture-holding capacity. All of the soils contain a moderate amount of organic matter and are very strongly acid to slightly acid.

The soils in this unit are—

Raynham silt loam, 0 to 3 percent slopes.
Swanton very fine sandy loam, 0 to 3 percent slopes.
Swanton very fine sandy loam, 3 to 8 percent slopes.
Walpole and Wareham fine sandy loams, 0 to 3 percent slopes.
Walpole and Wareham fine sandy loams, 3 to 8 percent slopes.

The high water table limits the use of these soils. Undrained areas are mainly in native pasture or woodland, or they are idle. If artificially drained and protected from runoff and seepage, these soils can be used for row crops, hay, and improved pasture.

If outlets are available, the soils can be drained by ditches with protected banks or by tile drains. Land smoothing in places will eliminate low wet spots and improve surface drainage. In addition to drainage, other desirable management practices include (1) planting adapted species, (2) applying lime and fertilizer according to needs determined by soil tests, (3) using a suitable cropping system, (4) keeping machinery and animals off fields during wet periods, (5) planting water-tolerant grasses and legumes for pasture or hay, and (6) using graded rows.

The Swanton soils are underlain by silt and clay, and the Raynham by silty material. Consequently, these soils are somewhat more difficult to drain than the sandy and gravelly Walpole and Wareham soils.

If these soils are drained, the Raynham soils are suitable for a cropping system that consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop; the nearly level areas of the Swanton, Walpole, and Wareham soils are suitable for continuous row cropping and a winter cover crop each year; the gently sloping areas of the Swanton soils are suitable for 2 years of a row crop, 2 years of grass or grass-legume, and a winter cover crop following the first year of the row crop; and the gently sloping areas of the Walpole and Wareham soils are suitable for 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows on the gently sloping areas of the soils in this unit.

CAPABILITY UNIT IIIw-6

This unit consists of deep, poorly drained soils that developed in medium-textured and moderately coarse material recently deposited by rivers and streams. They are in nearly level areas or in depressions and are wet 7 to 9 months of the year because of a high-water table.

The permeability is moderate for the Limerick soil and moderately rapid to rapid for the Rumney soil, but the high-water table restricts internal drainage. These soils have a high moisture-holding capacity. Their content of organic matter is moderate. The reaction normally ranges from medium to slightly acid.

The soils in this unit are—

Limerick silt loam.
Rumney fine sandy loam.

The high-water table and the occasional to frequent flooding severely limit the use of these soils. Undrained and unprotected areas are mainly in native pasture or brushy woodland. If they are drained and protected from flooding, these soils can be used for hay and improved pasture and for row crops.

The soils can be drained by ditches with protected banks or by tile drains if suitable outlets are available. Other desirable practices are the application of lime and fertilizer according to soil tests, the planting of adapted species of grasses and legumes, and keeping machinery and animals off of wet fields.

Unimproved native pastures produce forage of poor quality but can be grazed during dry periods in the summer and fall.

If these soils are drained and protected from flooding, the Limerick soil is suitable for a cropping system that consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop, and the Rumney soil is suitable for continuous row cropping and a winter cover crop each year.

CAPABILITY UNIT IIIw-9

Deerfield loamy fine sand, 0 to 3 percent slopes, is the only soil in this unit. It is a deep, moderately well drained, coarse-textured soil that developed in sand deposited by water or wind. This soil is nearly level and slightly eroded. It is rapidly permeable and has a low moisture-holding capacity. The content of organic matter is low, and the soil is medium to very strongly acid, but may be slightly acid in the C and lower B horizons.

A high-water table keeps this soil saturated until late in the spring. Nevertheless, because of its coarse sandy texture and low moisture-holding capacity, the soil is usually droughtly during the summer.

This soil is suitable for hay and pasture without artificial drainage. If the soil is drained, it can also be used for early truck crops, tobacco, silage corn, and potatoes.

Irrigation generally is necessary to obtain good yields of crops on this soil. If the soil is irrigated, crops respond well to lime and fertilizer applied in amounts indicated by soil tests. Frequent applications are necessary, because lime and fertilizer leach out rapidly. Green-manure crops can be used to increase the organic matter and thereby increase the soil's capacity to retain moisture and plant nutrients. This practice also improves soil tilth.

A suitable cropping system after drainage includes continuous row crops followed each year by a winter cover crop.

CAPABILITY UNIT IIIs-6

Suncook loamy sand is the only soil in this unit. It is a deep, excessively-drained soil that developed in sand recently deposited by rivers and streams. This soil is nearly level and slightly eroded.

Suncook loamy sand is rapidly permeable. It has a low moisture-holding capacity and is therefore droughty. The content of organic matter is also very low, and the soil is strongly to very strongly acid.

This droughty soil warms early in the spring, although most areas are subject to flooding. Much of the acreage is in scrubby forest or is idle. Because the soil is droughty, is subject to flooding, and has low natural fertility, it is not suitable for cultivated crops, hay, and pasture unless it is managed intensively. Such management includes irrigation, application of lime and fertilizer, additions of organic matter, and protection from flooding. If these practices are applied, the soil is suitable for vegetables, tobacco, and other crops, as well as for pasture and alfalfa.

A suitable cropping system includes 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. Because of rapid leaching, lime and fertilizer must be applied frequently, in amounts indicated by soil tests.

CAPABILITY UNIT IIIs-9

This unit consists of excessively drained, coarse-textured soils that developed in deep sand deposited by water or wind or in layered sand and gravel. These soils are nearly level to gently sloping and are slightly to moderately eroded.

These soils are rapidly permeable. They have a low moisture-holding capacity and are droughty. They are medium to very strongly acid.

The soils in this unit are—

Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes.
Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes.
Hinckley sandy loam, 0 to 3 percent slopes.
Hinckley sandy loam, 3 to 8 percent slopes.
Windsor loamy fine sand, 0 to 3 percent slopes.
Windsor loamy fine sand, 3 to 8 percent slopes.

Most of the acreage is in woodland or is idle. Because of droughtiness and very low natural fertility, these soils have limited suitability for crops, hay, and pasture. They warm early in the spring, however, and crops grown on them respond to fertilizer when the moisture is adequate. For these reasons, the soils in this capability unit are used for tobacco (fig. 4) and for sweet corn and other truck crops. Alfalfa grows fairly well if properly limed and fertilized.

If these soils are used for cultivated crops, careful management is needed to improve and maintain fertility and organic matter. Cultivated crops require heavy fertilization and irrigation.

A good cropping system for the nearly level Hinckley soils consists of 2 years of a row crop and 1 year of green manure on the nearly level areas, and for the gently sloping areas, 2 years of a row crop and 2 years of grass or grass-legume. A winter cover crop should follow the first year of the row crop. On the gently sloping areas of the Hinckley soils, the row crop should be on the contour.

A suitable cropping system for the Windsor soils consists of continuous row cropping and a winter cover crop each year. The row crop should be on the contour on the gently sloping areas of these soils. Fertilizer and lime leach out rapidly and should be applied in amounts indicated by soil tests.

CAPABILITY UNIT IVe-2

This unit consists of deep, well-drained soils that developed in compact glacial till. These soils have moderately steep slopes and are moderately eroded. A compact layer, or fragipan, occurs at a depth of 16 to 30 inches. This layer restricts water movement and root growth. Stones and boulders also occur below the surface.

These soils are moderately to rapidly permeable and most of them have a high moisture-holding capacity above the fragipan. The compact layer has moderately slow to slow permeability and has a low moisture-holding capacity. These soils are very strongly to slightly acid, except the Shelburne soil may range to a neutral reaction. Their content of organic matter is low to moderate, except it is relatively high in the Marlow soils.

The soils in this unit are—

Bernardston channery silt loam, 15 to 25 percent slopes.
Broadbrook very fine sandy loam, 15 to 25 percent slopes.
Essex fine sandy loam, 15 to 25 percent slopes.
Marlow loam, 15 to 25 percent slopes.
Marlow loam, dark subsoil, 15 to 25 percent slopes.
Shelburne loam, 15 to 25 percent slopes.

These soils are best suited to hay, pasture, orchards, or woodland. When an old hayfield or pasture is to be renovated, corn or some other row crop can be planted for a year or two and followed by a winter cover crop. This kills the old sod and helps to prepare the seedbed.

Machinery is difficult to use on these soils because of the moderately steep slopes. The slopes also increase the hazard of erosion. If row crops are grown, intensive conservation practices are required to control erosion. These practices include the use of (1) a cropping system, (2) stripcropping, (3) strip reseeding, (4) grass waterways, and (5) diversions. Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

With diversions and strips on diversion grades, a suitable cropping system for these soils, except Broadbrook, includes 1 year of row crop and 3 years of grass or grass-legume. The row crop should be in strips with alternate strips in grass or grass-legume. The Broadbrook soil is not suited to row crops on these moderately steep slopes. It is best suited to grass or grass-legume and should be reseeded in strips and tilled on the contour.

CAPABILITY UNIT IVe-5

This unit consists of deep, well-drained soils that developed in water-sorted or wind-blown deposits 20 to 30 inches thick. These soils are underlain by sand or stratified sand and gravel. They are moderately steep to steep and are moderately eroded.

These soils have moderately rapid to rapid permeability and have a low to moderate moisture-holding capacity. Their content of organic matter is low. They are slightly acid to very strongly acid.

The soils in this unit are—

Agawam fine sandy loam, 15 to 25 percent slopes.
Merrimac fine sandy loam, 15 to 25 percent slopes.
Warwick gravelly fine sandy loam, 15 to 40 percent slopes.

Because of the moderately steep slopes in most places, these soils are highly susceptible to erosion and generally are suitable only for hay, pasture, or woodland.

If row crops are grown, intensive conservation practices are required to control erosion. These practices include the use of (1) a cropping system, (2) diversions and grass waterways, (3) stripcropping, and (4) strip reseeding.

A good cropping system consists of 1 year of a row crop and 4 years of grass or grass-legume. If row crops are grown on the Agawam soil, diversions and strips on diver-

Figure 4.—**Shade tobacco growing on Windsor soil.**

sion grades are required to control erosion, whereas only contour strips are required on the Merrimac and Warwick soils. The row crop should be in strips alternating with strips of grass or grass-legume.

Some areas of the Warwick soil have slopes greater than 25 percent. Such areas are not suitable for row crops and are best used for pasture, woodland, or wildlife habitats. Crops grown on these soils respond well to lime and fertilizer applied in amounts indicated by soil tests. Frequent applications are required because of the rapid leaching. Several small applications of fertilizer are more effective than one large one.

CAPABILITY UNIT IVe-7

Westminster loam, 15 to 25 percent slopes, is the only soil in this unit. It is a shallow, well drained to somewhat excessively drained soil that developed in thin glacial deposits on bedrock. This soil is moderately steep and moderately eroded. The depth to bedrock is generally less than 20 inches but is more than 3 feet in some places, and in a few places outcrops occur.

This soil has moderate to moderately rapid permeability and a low moisture-holding capacity because it is shallow. The content of organic matter is relatively high. The soil is generally very strongly acid to strongly acid, but in places it is slightly acid to medium acid.

Droughtiness, moderately steep slopes, and the hazard of severe erosion make this soil best suited to hay, pasture, or woodland. Hay and pasture crops respond well to lime and fertilizer applied in amounts indicated by soil tests.

If row crops are to be grown, a good cropping system consists of 1 year of a row crop and 4 years of grass or grass-legume. Diversions and strips on diversion grades should be used, however, and the row crop should be in strips alternating with strips of grass or grass-legume.

Other practices include the use of grass waterways and strip reseeding.

It may be somewhat difficult to apply some of the conservation practices on this soil because it is shallow and has occasional bedrock exposures.

CAPABILITY UNIT IVe-8

This unit consists of deep, well-drained to somewhat excessively drained soils that developed in glacial till or outwash. These soils are moderately steep and moderately eroded; a few of them are steep. The Gloucester and Merrimac sandy loams are underlain by sandy till or stratified sand and gravel at a depth of about 24 inches.

The Gloucester and Merrimac soils have moderately rapid to rapid permeability and a low to moderate moisture-holding capacity. The other soils are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. Most of the Berkshire and Gloucester soils have a firm substratum below 30 inches that has moderately slow or slow permeability. The supply of organic matter is low in all of these soils except the Berkshire; it is relatively high in the Berkshire soils. The Colrain soil contains leached limestone and is mainly medium to slightly acid; the other soils are mainly very strongly to strongly acid.

The soils in this unit are—

Berkshire fine sandy loam, 15 to 25 percent slopes.
Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes.
Cheshire fine sandy loam, 15 to 25 percent slopes.
Colrain fine sandy loam, 15 to 25 percent slopes.
Dutchess silt loam, 15 to 25 percent slopes.
Gloucester fine sandy loam, 15 to 25 percent slopes.
Gloucester sandy loam, 15 to 25 percent slopes.
Merrimac sandy loam, 15 to 35 percent slopes.

Because of the moderately steep slopes and the hazard of severe erosion, these soils are best suited to hay, pasture, orchards, or woodland. Corn or some other row crop can be planted in the process of renovating a hayfield or pasture.

Intensive conservation practices are needed to control erosion. They include stripcropping, strip reseeding, use of grass waterways, and use of diversions. Areas used for hay and pasture should be reseeded in strips. If moisture is sufficient, crops respond to lime and fertilizer applied frequently in amounts indicated by soil tests. Organic matter, added regularly in the form of manure or crop residue, helps to maintain good tilth.

If diversions and strips on diversion grades are used, a suitable cropping system consists of 1 year of a row crop and 3 years of grass or grass-legume. The row crop should be in strips alternating with strips of grass or grass-legume.

CAPABILITY UNIT IVe-22

Buckland fine sandy loam, 15 to 25 percent slopes, is the only soil in this unit. This soil is deep and moderately well drained. It developed in compact glacial till containing fragments of siliceous limestone. This soil is moderately steep and moderately eroded. It has a compact layer, or fragipan, at a depth of 18 to 30 inches. This layer restricts the downward movement of water and keeps the soil above the hardpan saturated until late in the spring. Eventually, this excess water drains away by moving laterally along the surface of the hardpan. Stones and some boulders occur below the surface soil and in places a few are on the surface.

The content of organic matter is low, and this soil is mainly medium to slightly acid.

This soil remains saturated until late in the spring, and in this condition it is highly susceptible to erosion. It is best suited to hay, pasture, or woodland. The soil can be used in a cropping system if it is drained and if erosion is controlled by grass waterways, stripcrops, and diversions. Operating power machinery on the contour of these slopes is difficult and may be impractical.

Crops grown on this soil are responsive to lime and fertilizer applied in amounts indicated by soil tests.

If the soil is drained and protected by diversions and by strips on diversion grades, it is suitable for a cropping system that consists of 1 year of a row crop and 4 years of grass or grass-legume. The row crop should be in strips alternating with strips of grass or grass-legume.

CAPABILITY UNIT IVw-4

This unit consists of poorly drained, silty soils that developed in deep deposits of silt and clay. These soils are nearly level to gently sloping and are saturated 7 to 9 months of the year. They are wet because they receive runoff from higher surrounding soils and because they have a fine-textured underlying material that is slowly permeable.

These soils contain much organic matter and are strongly acid to slightly acid.

The soils in this unit are—

Scantic silt loam, 0 to 3 percent slopes.
Scantic silt loam, 3 to 8 percent slopes.

These soils are not suitable for cultivated crops unless they are drained. They are suitable, however, for water-tolerant legumes and grasses if they are limed and fertilized and otherwise well managed. Pastures should not be grazed when wet, because trampling puddles and compacts the soil and punctures the sod. Rushes, sedges, and weeds tend to crowd out desirable grasses and legumes in unimproved or neglected pastures.

These soils are difficult to drain because the subsoil is fine textured and slowly permeable. Drainage with tile or open ditches is usually not satisfactory. Levelling, grading, or bedding are the most practical means of removing surface water from these soils.

After drainage, the nearly level areas are suitable for continuous row cropping and a winter cover crop each year; and the gently sloping areas are suitable for 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. The row crop should be in graded rows on the gently sloping areas.

CAPABILITY UNIT IVs-9

This unit consists of excessively drained, coarse-textured soils that developed in deep deposits of sand or stratified sand and gravel. These soils are nearly level to moderately sloping and are slightly and moderately eroded.

The soils are rapidly permeable and have a low to very low moisture-holding capacity. Their content of organic matter is very low, and they are very strongly acid to medium acid.

The soils in this unit are—

Carver loamy coarse sand, 0 to 3 percent slopes.
Carver loamy coarse sand, 3 to 8 percent slopes.
Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes.
Hinckley sandy loam, 8 to 15 percent slopes.
Windsor loamy fine sand, 8 to 15 percent slopes.

These soils dry out early in the spring and are droughty. Most areas are in scrubby forest or are idle, but improved areas are used for hay, pasture, silage corn, early vegetables, and other speciality crops. If these soils are irrigated, crops respond well to lime and fertilizer, and the soils can be used for tobacco and other crops commonly grown in the county.

Unprotected slopes are subject to wind and water erosion. Cultivated fields that are sloping should be worked on the contour or in strips and protected by grass waterways and diversions.

Plant nutrients leach out rapidly, and organic matter is quickly depleted in these soils. Therefore, commercial fertilizer and manure or crop residue are needed frequently to improve yields. Lime and fertilizer should be applied in amounts indicated by soil tests.

A suitable cropping system for the Carver soils consists of continuous row cropping and a winter cover crop each year. The row crop should be on the contour in the gently sloping areas. A good system for the Hinckley and Windsor soils consists of 2 years of a row crop, 1 year of green manure, and a winter cover crop following the first year of the row crop. The row crop should be in contour strips alternating with strips of green manure.

CAPABILITY UNIT Vw-2

This unit consists of very poorly drained soils developed in glacial till. They occur in areas that are nearly level to depressional. In many places they have a compact layer at a depth of 10 to 24 inches.

These soils have moderate or moderately rapid permeability above the compact layer and slow or moderately slow permeability in the compact layer. They have a high moisture-holding capacity and contain a large amount of organic matter. The Cabot soil is slightly acid to neutral and the Whitman soil is very strongly acid to medium acid.

The soils in this unit are—

Cabot loam, black surface, 0 to 3 percent slopes.
Whitman fine sandy loam, 0 to 3 percent slopes.

Excess water very severely limits the use of these soils for cultivated crops. Most areas are in woodland, but some areas have been cleared and drained for use as pasture or hayfields.

The soils can be drained by ditches that have protected banks and suitable outlets. They are difficult to drain, however, because suitable outlets are usually not available. Tile drainage does not work well in these soils. Care must be taken to plant moisture-tolerant species, apply lime and fertilizer as needed, and keep machinery and animals off wet fields.

CAPABILITY UNIT Vw-5

Scarboro fine sandy loam, brownish subsoil variant, is the only soil in this unit. It is a very poorly drained, coarse-textured soil that developed in deep deposits of stratified sand or sand and gravel. This soil occurs in depressions or low flat areas and is saturated most of the year by a high water table.

The soil is rapidly permeable below the surface layer and has a low moisture-holding capacity. The content of organic matter is high, and the soil is very strongly acid to medium acid.

Excess water limits the use of this soil to unimproved pasture or woodland. This soil is difficult to drain because suitable outlets are generally not available. If a suitable outlet can be found, this soil can be drained by ditches with protected banks or by tile, and then seeded and treated for improved pasture. Small areas that are drained and otherwise well managed are suitable for specialty crops. Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT Vw-9

Saugatuck loamy sand, the only soil in this unit, is a deep, poorly drained soil that developed in deep sand deposits. It has a very hard, cemented layer at a depth of about 10 to 20 inches. This soil occurs in low, flat areas or depressions that are kept wet 7 months or more every year by a high water table. The soil is rapidly permeable, except for the cemented layer, which has moderately slow permeability. The moisture-holding capacity is low. The content of organic matter is usually low, and the soil is extremely acid to strongly acid.

The high water table limits the use of this soil. It occurs in small to large, scattered areas that are difficult to drain because they lack suitable outlets. Drained areas are used for hay, improved pasture, and some silage corn. Without artificial drainage this soil is best suited to unimproved pasture, woodland, and wildlife habitats.

Good management of drained areas consists of planting moisture-tolerant species, applying lime and fertilizer in amounts indicated by soil tests, and keeping machinery and animals off of wet fields.

CAPABILITY UNIT Vs-22

Scituate very stony fine sandy loam, 0 to 3 percent slopes, is the only soil in this unit. It is a deep, very stony, moderately well-drained soil that developed in compact glacial till. It has a hard layer, or fragipan, at a depth of 18 to 30 inches. The soil is usually saturated from late in the fall to late in the spring and during other rainy periods. Many stones and boulders are on the surface and throughout the soil.

Permeability is moderately rapid to rapid above the fragipan but slow to moderately slow in the fragipan layer. The soil has a high moisture-holding capacity. It contains a moderate amount of organic matter and is strongly acid to medium acid.

Although some of this soil is used for unimproved pasture, stoniness and excessive moisture limit its use mainly to woodland.

CAPABILITY UNIT VIe-4

This unit consists of deep, well-drained soils that developed in glacial lake deposits. These soils are moderately steep to steep and moderately to severely eroded. They are moderately fine textured and subject to severe erosion.

Because of their texture, these soils are moderately permeable in the solum but have moderately slow to slow permeability in the substratum. They have a high moisture-

holding capacity. Their supply of organic matter is low, and they are strongly acid.

The soils in this unit are—

Hartland silt loam, 15 to 35 percent slopes.
Suffield silt loam, 15 to 35 percent slopes, eroded.

These soils are best suited to hay, pasture, or woods. If the soils are reseeded to improve the forage, they should be reseeded in strips and the waterways left in sod to control erosion. Crops respond to lime and fertilizer applied in amounts indicated by soil tests.

CAPABILITY UNIT VIw-4

Biddeford silt loam is the only soil in this unit. It is a very poorly drained soil that developed in deep deposits of silt and clay. It occurs in depressions or low, flat areas, and excess water stands on or near the surface most of the year. The soil is saturated because it receives runoff from higher surrounding soils, has a high water table, or has a fine-textured underlying layer that is slowly permeable. The content of organic matter is high, and the soil is very strongly acid to slightly acid.

The excess water severely limits the use of this soil. Most areas are in forest and in brushy, unimproved pasture or are idle. The soil is best suited to woodland, unimproved pasture, and wildlife habitats.

Draining this soil for cultivated crops is not generally practical because of the slow permeability and the lack of suitable drainage outlets. Some areas can be drained by open ditches and made suitable for improved pasture. Lime and fertilizer should be applied in amounts indicated by soil tests.

CAPABILITY UNIT VIw-6

This unit consists of poorly drained and very poorly drained soils that formed in silty alluvium. In places silt and sand have been deposited by recent floods. These soils are wet most of the year and are subject to very frequent flooding.

The soils are moderately permeable, but in places the substratum may be rapidly permeable. They contain much organic matter and are very strongly acid to slightly acid.

The soils in this unit are—

Limerick-Saco silt loams.
Saco silt loam.

Flooding and wetness limit the use of these soils mainly to unimproved pasture, brushy woodland, and wildlife habitats.

Drainage generally is not practical because the soils are flooded frequently and lack suitable outlets. Some small areas have been sufficiently drained and protected to be used for unimproved pasture. Pasture can be improved in some places by applying fertilizer and by clipping weeds.

CAPABILITY UNIT VIs-2

This unit consists of deep, well-drained soils that developed in compact glacial till. These soils are gently sloping to moderately steep and are slightly eroded. A compact layer, or fragipan, occurs at a depth of 16 to 30 inches. Many stones and boulders are on and below the surface.

These soils have moderate to rapid permeability above the fragipan, and most of them have a high moisture-holding capacity. The fragipan, however, has moderately slow to slow permeability and a low moisture-holding capacity. It restricts the vertical movement of water and the growth of roots. The Shelburne soils contain leached limestone and are neutral to strongly acid. The other soils are very strongly to slightly acid.

The soils in this unit are—

Bernardston very stony silt loam, 3 to 8 percent slopes.
Bernardston very stony silt loam, 8 to 15 percent slopes.
Bernardston very stony silt loam, 15 to 25 percent slopes.
Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes.
Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes.
Essex very stony fine sandy loam, 3 to 8 percent slopes.
Essex very stony fine sandy loam, 8 to 15 percent slopes.
Essex very stony fine sandy loam, 15 to 25 percent slopes.
Marlow very stony loam, 3 to 8 percent slopes.
Marlow very stony loam, 8 to 15 percent slopes.
Marlow very stony loam, 15 to 25 percent slopes.
Marlow very stony loam, dark subsoil, 3 to 8 percent slopes.
Marlow very stony loam, dark subsoil, 8 to 15 percent slopes.
Marlow very stony loam, dark subsoil, 15 to 25 percent slopes.
Shelburne very stony loam, 3 to 8 percent slopes.
Shelburne very stony loam, 8 to 15 percent slopes.
Shelburne very stony loam, 15 to 25 percent slopes.

Stoniness limits the use of these soils for row crops, but they are suitable for pasture, orchards, or woods. Areas that are used for improved pasture require management and regular additions of lime and fertilizer.

CAPABILITY UNIT VIs-3

This unit consists of deep, well-drained to somewhat excessively drained very stony soils that developed in glacial till. These soils are gently sloping to moderately steep and slightly eroded. There are many stones and boulders on the surface and below, especially in the Gloucester soils.

These soils are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. Most of the Gloucester, Berkshire, and Charlton soils have a compact layer, or fragipan, below a depth of 30 inches that has moderately slow or slow permeability. The Colrain soils contain leached limestone and are mainly medium to slightly acid. The other soils are mainly strongly acid to very strongly acid.

The soils in this unit are—

Berkshire very stony fine sandy loam, 3 to 8 percent slopes.
Berkshire very stony fine sandy loam, 8 to 15 percent slopes.
Berkshire very stony fine sandy loam, 15 to 25 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes.
Charlton very stony fine sandy loam, 3 to 15 percent slopes.
Charlton very stony fine sandy loam, 15 to 25 percent slopes.
Cheshire very stony fine sandy loam, 3 to 8 percent slopes.
Cheshire very stony fine sandy loam, 8 to 15 percent slopes.
Cheshire very stony fine sandy loam, 15 to 25 percent slopes.
Colrain very stony fine sandy loam, 3 to 8 percent slopes.
Colrain very stony fine sandy loam, 8 to 15 percent slopes.
Colrain very stony fine sandy loam, 15 to 25 percent slopes.
Dutchess very stony silt loam, 3 to 15 percent slopes.
Dutchess very stony silt loam, 15 to 25 percent slopes.
Gloucester very stony sandy loam, 3 to 8 percent slopes.
Gloucester very stony sandy loam, 8 to 15 percent slopes.
Gloucester very stony sandy loam, 15 to 25 percent slopes.

These soils are not used for row crops because stones and boulders prevent tillage. They are used mainly for unimproved pasture, orchards, and woodland. They produce good pasture if they are limed and fertilized according to needs determined by soil tests. Some of the less

sloping areas can be cleared of stones to provide additional acreage for crops or hay.

CAPABILITY UNIT VIs-7

This unit consists of very rocky, well-drained to droughty soils that have developed in thin deposits of glacial till over bedrock. These soils are gently sloping to moderately steep and are slightly eroded. The depth to bedrock generally is less than 20 inches but is more than 3 feet in some places. Many stones and boulders are on the surface, and bedrock outcrops are numerous.

These soils are moderately to rapidly permeable. They have a low moisture-holding capacity because they are shallow. The content of organic matter is low except in the Lyman and Westminster soils; the content is relatively high in those soils. The Westminster soils contain some leached limestone but, like the other soils in this group, they are mainly extremely acid to medium acid.

The soils in this unit are—

Hollis very rocky fine sandy loam, 3 to 15 percent slopes.
Hollis very rocky fine sandy loam, 15 to 25 percent slopes.
Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes.
Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes.
Lyman very rocky loam, 3 to 15 percent slopes.
Lyman very rocky loam, 15 to 25 percent slopes.
Nassau very rocky silt loam, 3 to 15 percent slopes.
Nassau very rocky silt loam, 15 to 25 percent slopes.
Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes.
Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes.
Westminster very rocky loam, 3 to 15 percent slopes.
Westminster very rocky loam, 15 to 25 percent slopes.

These soils are best suited to unimproved pasture, wildlife habitats, and woodland. Most of the acreage is woodland.

CAPABILITY UNIT VIs-9

This unit consists of excessively drained, coarse-textured soils that developed in deep, stratified deposits of sand and gravel. These soils are moderately steep to steep and moderately eroded.

The soils are rapidly permeable and have a low moisture-holding capacity. Their content of organic matter is very low, and they are medium acid to very strongly acid.

The soils in this unit are—

Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes.
Hinckley sandy loam, 15 to 35 percent slopes.

Moderately steep to steep slopes and droughtiness limit the use of these soils for crops. Most areas are woodland or are idle. The soils are best suited to woodland or to wildlife habitats. Woodland areas should be managed to encourage the growth of desirable, adapted species.

CAPABILITY UNIT VIs-22

This unit consists of deep, very stony, moderately well drained soils that developed in glacial till. These soils are gently sloping to moderately steep and are slightly eroded. They are saturated with water in the spring and late in the fall because they receive runoff and seepage water from adjoining soils or have a high water table, and their natural drainage, except for the Sutton soils, is impeded by a compact layer, or fragipan, within 30 inches of the surface. The compact layer is below 30 inches in the Sutton soils. The soils in this unit are very stony and bouldery on the surface and in the horizons below.

These soils have moderate to rapid permeability in the solum and moderately slow to slow permeability in the substratum. They have a moderate to high moisture-holding capacity. The content of organic matter is low except in the Peru soils; it is relatively high in those soils. The Buckland soils contain leached limestone and are mainly medium to slightly acid; the others are mainly very strongly acid to medium acid.

The soils in this unit are—

Buckland very stony fine sandy loam, 3 to 8 percent slopes.
Buckland very stony fine sandy loam, 8 to 15 percent slopes.
Buckland very stony fine sandy loam, 15 to 25 percent slopes.
Peru very stony loam, 3 to 8 percent slopes.
Peru very stony loam, 8 to 15 percent slopes.
Peru very stony loam, 15 to 25 percent slopes.
Scituate very stony fine sandy loam, 3 to 8 percent slopes.
Scituate very stony fine sandy loam, 8 to 15 percent slopes.
Sutton very stony fine sandy loam, 3 to 8 percent slopes.
Sutton very stony fine sandy loam, 8 to 15 percent slopes.

The combination of surface stones, boulders, and wetness limits the use of these soils to improved pasture and woodland. In some of the more nearly flat, less stony areas, pastures can be improved by the use of lime and fertilizer.

CAPABILITY UNIT VIIw-1

This unit consists of very poorly drained organic soils or bog soils. They are saturated or flooded most of the time.

The soils in this unit are—

Muck.
Muck, shallow.
Peat.

These soils are best suited as wildlife habitats.

CAPABILITY UNIT VIIs-2

This unit consists of nearly level to very steep, extremely stony, well drained and moderately well drained soils that developed in loose to compact glacial till. They have a moderately to rapidly permeable solum and a moderate to high moisture-holding capacity.

The soils in this unit are—

Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes.
Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes.
Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes.
Bernardston very stony silt loam, 25 to 55 percent slopes.
Buckland extremely stony fine sandy loam, 3 to 8 percent slopes.
Buckland extremely stony fine sandy loam, 8 to 25 percent slopes.
Charlton extremely stony fine sandy loam, 3 to 8 percent slopes.
Charlton extremely stony fine sandy loam, 8 to 25 percent slopes.
Charlton extremely stony fine sandy loam, 25 to 45 percent slopes.
Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes.
Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes.

Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes.
Colrain extremely stony fine sandy loam, 3 to 8 percent slopes.
Colrain extremely stony fine sandy loam, 8 to 25 percent slopes.
Colrain extremely stony fine sandy loam, 25 to 50 percent slopes.
Dutchess extremely stony silt loam, 8 to 25 percent slopes.
Dutchess extremely stony silt loam, 25 to 55 percent slopes.
Essex extremely stony fine sandy loam, 3 to 8 percent slopes.
Essex extremely stony fine sandy loam, 8 to 25 percent slopes.
Essex extremely stony fine sandy loam, 25 to 45 percent slopes.
Gloucester extremely stony sandy loam, 3 to 8 percent slopes.
Gloucester extremely stony sandy loam, 8 to 25 percent slopes.
Gloucester extremely stony sandy loam, 25 to 45 percent slopes.
Marlow extremely stony loam, 3 to 8 percent slopes.
Marlow extremely stony loam, 8 to 35 percent slopes.
Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes.
Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes.
Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes.
Peru extremely stony loam, 0 to 8 percent slopes.
Peru extremely stony loam, 8 to 25 percent slopes.
Scituate extremely stony fine sandy loam, 0 to 8 percent slopes.
Scituate extremely stony fine sandy loam, 8 to 25 percent slopes.
Shelburne extremely stony loam, 3 to 8 percent slopes.
Shelburne extremely stony loam, 8 to 25 percent slopes.
Shelburne extremely stony loam, 25 to 50 percent slopes.
Sutton extremely stony fine sandy loam, 0 to 8 percent slopes.
Sutton extremely stony fine sandy loam, 8 to 25 percent slopes.

These soils comprise 21 percent of the total acreage in the county. They are severely limited in use by stoniness. Some are further limited by steep slopes, and others by excess moisture. Most of these soils are in cutover forest. Small scattered areas have been cleared and are used for unimproved pasture of low carrying capacity, or they are idle. These soils are best suited as wildlife habitats and woodland.

CAPABILITY UNIT VIIs-7

This unit consists of extremely rocky, well drained to excessively drained soils that developed in thin deposits of glacial till over bedrock. These soils are gently sloping to very steep and are slightly eroded. They are also droughty because of shallowness. Bedrock is generally less than 20 inches from the surface but is at a depth of 3 feet or more in places. Bedrock outcrops are generally 30 feet apart or less.

These soils are moderately to rapidly permeable. They are mainly extremely acid to medium acid.

The soils in this unit are—

Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes.
Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes.
Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes.
Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes.
Lyman extremely rocky loam, 3 to 25 percent slopes.
Lyman extremely rocky loam, 25 to 80 percent slopes.
Nassau extremely rocky silt loam, 3 to 25 percent slopes.
Nassau extremely rocky silt loam, 25 to 75 percent slopes.
Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes.
Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes.
Westminster extremely rocky loam, 3 to 25 percent slopes.
Westminster extremely rocky loam, 25 to 75 percent slopes.

The soils in this unit comprise approximately 30 percent of the total acreage of Franklin County.

Extreme rockiness limits the use of these soils to woodland (fig. 5), wildlife habitats, or recreation. Woodland should be managed to encourage desirable species by weeding, selective cutting, and interplanting. Improved wildlife habitats can be the byproducts of good woodland management. Most of the acreage is woodland.

CAPABILITY UNIT VIIs-9

This unit consists of excessively drained, coarse-textured soils that developed in deep sand deposits. They are gently sloping to steep and are moderately or severely eroded.

These soils are rapidly permeable and have a low to very low moisture-holding capacity. Their content of organic matter is very low, and they are very strongly acid to medium acid.

The soils in this unit are—

Carver loamy coarse sand, 8 to 15 percent slopes.
Carver loamy coarse sand, 15 to 25 percent slopes.
Windsor loamy fine sand, 15 to 35 percent slopes.
Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes.

Droughtiness severely limits the use of these soils for agriculture. The Carver soils are further limited by their coarse texture. The Windsor soils are subject to severe wind erosion unless they are protected by vegetation. The soils in this unit are best used as woodland and wildlife areas.

CAPABILITY UNIT VIIs-23

This unit consists of poorly drained, very stony and extremely stony soils that developed in compact glacial till. These soils are slightly eroded. Most areas are level to gently sloping, but a few are moderately sloping. These soils have a compact layer, or fragipan, at a depth of 12 to 30 inches that restricts soil drainage. They have many stones and boulders on the surface, and they are saturated for 7 to 9 months each year.

Above the fragipan the soils are moderately to rapidly permeable and have a moderate to high moisture-holding capacity. The permeability is moderately slow or slow in the fragipan. They contain a moderate to large amount of organic matter. The Cabot soil is medium acid to neutral; the other soils are very strongly to medium acid.

The soils in this unit are—

Cabot extremely stony fine sandy loam, 0 to 10 percent slopes.
Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes.
Stissing very stony silt loam, 3 to 8 percent slopes.

Most of these soils are in cutover woodland. Some of them have been cleared, or partly cleared, and are used for unimproved pasture or are idle. The unimproved pastures of native grasses provide fair grazing, especially in dry seasons. These soils are not suited to crops or improved pasture, as they are wet and stony. The most practical uses are for woodland, unimproved pasture, or wildlife.

CAPABILITY UNIT VIIs-24

The soils in this unit are very poorly drained and are very stony or extremely stony. These soils developed in compact glacial till. They are in nearly level to gently sloping depressions and are saturated most of the year. In many places they have a compact layer at a depth of 10 to 24 inches.

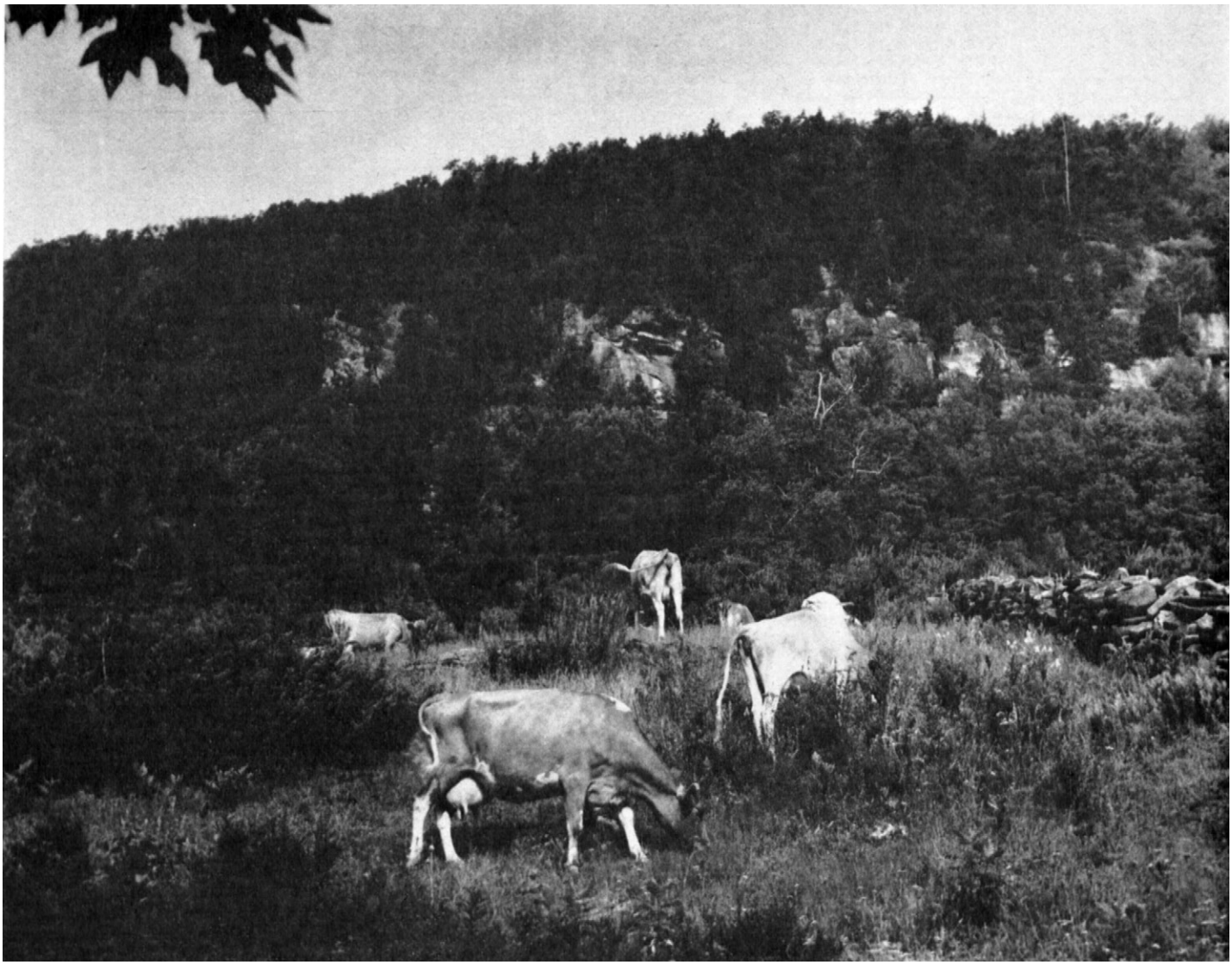

Figure 5.—**Woodland and unimproved pasture on extremely rocky Shapleigh soil.**

These soils are moderately to slowly permeable and have a high moisture-holding capacity. They contain a large amount of organic matter. The Cabot soils are slightly acid to neutral; the Whitman soil is very strongly to medium acid.

The soils in this unit are—

Cabot very stony loam, black surface, 0 to 3 percent slopes.
Cabot very stony loam, black surface, 3 to 8 percent slopes.
Whitman extremely stony fine sandy loam, 0 to 3 percent slopes.

Most areas of these soils are in cutover woodland. Some small areas have been cleared or partly cleared and are used for unimproved pasture or are idle. The unimproved pastures provide fair grazing, especially in dry seasons. These soils are not suited to crops or improved pasture, as they are stony and very wet. The most practical use is for wildlife habitats.

CAPABILITY UNIT VIIIs-2

This unit consists of Riverwash, a land type composed of sand and gravel deposited by streams. It consists essentially of barren land that is exposed along streams when the water is low and is subject to shifting when the water is normal or high. Riverwash has no agricultural value and only limited value for recreation and for wildlife habitats. It occurs in many small areas, and the total area is only about 150 acres.

Estimated yields

In table 1 are listed the estimated average annual yields per acre of the principal crops grown in Franklin County. The yields are given for each soil under two levels of management.

These yields are the averages that can be expected over several years. Those in any one year may be affected by many factors, including weather, insects, and plant diseases. Several years of improved management may be required before higher yields are obtained consistently.

Estimates of yields are given only for the soils that are normally used for the principal crops. Many soils cannot be used for crops because of poor natural drain-

age, stoniness and rockiness, a short growing season, or some other adverse condition. No estimates are given in table 1 for such soils.

Estimated yields in columns *A* are obtained under a low level of management. Under such management, one or more of the practices required to obtain yields in columns *B* are not carried out. The practices at the *B* level of management are explained in the following paragraph.

Yields in columns *B* are those expected under a moderately high level of management. These estimates are based on yields obtained by farmers in the county and on yields reported from experimental plots on some of the soils. The yields of crops in columns *B* are obtained by (1) applying lime, manure, and commercial fertilizer in adequate amounts; (2) using cropping systems and crop residue properly; (3) draining and irrigating if necessary; (4) controlling runoff and erosion; (5) controlling weeds, insects, and plant diseases; (6) preparing seedbeds properly; and (7) selecting suitable crops and varieties. Pasture is improved by (1) fertilizing and liming, (2) controlling brush and weeds, and (3) seeding desirable forage mixtures.

Use of Soils for Woodland

This subsection contains a discussion of the extent and importance of woodland in the county, the forest types that occur, and the effects of soils and land use on forest types. Following this is an explanation of how soil-woodland interpretations are made. The third part of this subsection contains information about the growth and yields of the major forest types. In the last part the soils are placed in woodland suitability groups, each group is described, and the problems of management are discussed.

Table 2 summarizes information about the woodland suitability groups. In table 3 are growth and volume data for the major forest types and species, which are northern hardwoods, upland oaks, white pine, red pine, and red spruce.

Woodland in the county

Approximately 76 percent of Franklin County is covered by forests, a total of about 350,000 acres. This area is about 10 percent of the forested land in the State. According to a 1958 inventory of soil and water conservation needs, the area of forest land in the county is increasing and probably will reach 360,000 acres by 1975.

Soils influence the development and management of woodland, for they affect the growth as well as the distribution of tree species and forest types. The management of woodland, the construction of woodland roads, the management of woodland areas for recreation, and the protection of watersheds are all dependent in some degree on a knowledge of the properties and conditions of soils.

The distribution of forest types.—The distribution of tree species and forest types in the county reflects the kinds of soils, the site conditions, and the land-use history. Three natural forest vegetation zones occur within the county (*21*)[2]: (a) The Spruce-Fir-Northern Hardwoods Zone is on the upper parts of the western highlands, where the predominant species are red spruce, balsam fir, sugar maple, yellow birch, white birch, beech, hemlock, and white pine. Spruce and fir are abundant only at the highest elevations. (b) The Northern Hardwoods-Hemlock-White Pine Zone is at intermediate elevations in the western part of the county and includes a variety of species. The most important ones are white pine, hemlock, sugar maple, yellow birch, white birch, red maple, beech, white ash, red oak, and black birch. (c) The transition Hardwoods-White Pine-Hemlock Zone is in the Connecticut River valley and the eastern highlands. Here, white pine, hemlock, red oak, white oak, black oak, red maple, white ash, and gray birch are the most important species.

The effect of soils on forest types.—Individual forest types are influenced by soils within the three major forest vegetation zones in the county. White pine grows well on the coarse-textured sandy soils of the valley terraces. Pitch pine also grows on the coarser soils, especially on the extremely droughty sites where fires are common. On finer textured soils the stands are mostly mixed. They consist of a small proportion of white pine and a large proportion of oaks, red maple, and northern hardwoods, the latter particularly in the western part. At high elevations spruce, fir, and hemlock grow on many of the coarse-textured soils and are mixed with northern hardwoods on the fine-textured soils. In poorly drained areas red maple and, in some places, elm or willow are dominant. Tamarack and spruce grow in bog areas.

The effects of land use on forest types.—The way in which soils are used and the stage of succession (vegetative development following disturbance) also strongly affect forest types. At the peak of land clearing before the Civil War, about two-thirds of the county area was farmland. Slow abandonment has taken place since that time and continues even now. About three-fourths of the land is now in forest. Definite trends of succession occur on these old fields, depending on soil conditions. Most old fields have seeded to white pine or a mixture of white pine and gray birch.

On sandy soils these old field stands, at maturity, consisted mostly of white pine. Most stands have been cut several times and are still primarily in pine because of weak competition from hardwoods. But the more tolerant oaks, other hardwoods, and hemlock invade slowly, and if undisturbed, the eventual plant community would be a mixed stand that would include some white pine.

On loams and fine sandy loams, the growth of old field white pine is usually the first stage of succession after abandonment. After harvesting, vigorous growth of shade-tolerant hardwoods and hemlock tends to prevent regeneration of the pine. In less common situations where aspen or cherry are the pioneer species instead of white pine, these also are replaced by hardwoods and hemlock. At high elevations red spruce may act as the old field pioneer species. It is shade tolerant and can regenerate in some areas more successfully than white pine. The eventual plant community on these soils would probably be a hardwood-hemlock type with an admixture of pine and spruce.

[1] This subsection was prepared by STEPHEN J. ZAYACH, State soil scientist, Soil Conservation Service, and DONALD L. MADER, associate professor, Department of Forestry and Wildlife Management, University of Massachusetts.

[2] Italic numbers in parentheses refer to Literature Cited, p. 202.

TABLE 1.—*Estimated average acre yields of*

[Yields in columns *A* are those expected under a low level of management; those in columns *B*,

Soil [1]	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Agawam fine sandy loam, 0 to 3 percent slopes	1, 700	2, 200	1, 100	1, 500	250	450	300	450	200	250	175	275
Agawam fine sandy loam, 3 to 8 percent slopes	1, 650	2, 150	1, 000	1, 450	225	450	225	450	200	250	175	275
Agawam fine sandy loam, 8 to 15 percent slopes	1, 600	2, 100	1, 000	1, 400	225	400	225	400	------	------	150	225
Agawam fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes	1, 800	2, 300	1, 200	1, 600	250	550	350	600	200	300	175	300
Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes	1, 800	2, 300	1, 200	1, 600	250	550	350	600	200	300	175	300
Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes	------	------	------	------	250	550	------	------	------	------	150	250
Belgrade silt loam, 0 to 3 percent slopes	1, 600	2, 000	------	------	------	------	250	450	------	------	------	------
Belgrade silt loam, 3 to 8 percent slopes	1, 500	1, 900	------	------	------	------	225	400	------	------	------	------
Berkshire fine sandy loam, 3 to 8 percent slopes	------	------	------	------	250	550	------	------	------	------	------	------
Berkshire fine sandy loam, 8 to 15 percent slopes	------	------	------	------	250	550	------	------	------	------	------	------
Berkshire fine sandy loam, 15 to 25 percent slopes	------	------	------	------	200	500	------	------	------	------	------	------
Berkshire very stony fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire very stony fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire very stony fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Bernardston channery silt loam, 3 to 8 percent slopes	------	------	------	------	200	400	------	------	------	------	175	275
Bernardston channery silt loam, 8 to 15 percent slopes	------	------	------	------	175	300	------	------	------	------	175	275
Bernardston channery silt loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Bernardston very stony silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Bernardston very stony silt loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Bernardston very stony silt loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Biddeford silt loam	------	------	------	------	------	------	------	------	------	------	------	------
Broadbrook very fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Broadbrook very fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Broadbrook very fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------

See footnotes at end of table.

principal crops under two levels of management

under a moderately high level of management. Absence of yields indicates crop is not usually grown on the soil]

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
200	300	50	80	8	12	------	------	10	15	2.5	5.0	1.5	3.5	75	200	40	90
200	300	50	80	8	12	------	------	10	15	2.5	5.0	1.5	3.5	75	200	40	90
175	250	40	75	------	------	------	------	8	13	2.0	4.5	1.0	3.0	70	150	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	80
225	325	50	90	10	14	------	------	12	18	2.5	5.0	2.5	4.5	80	230	45	95
225	325	------	------	10	14	------	------	12	18	2.5	5.0	2.5	4.5	80	230	45	95
200	300	------	------	------	------	------	------	11	15	2.0	4.0	2.0	4.0	80	230	45	95
------	------	------	------	------	------	------	------	11	16	2.5	4.5	2.0	3.5	60	225	40	90
------	------	------	------	------	------	------	------	10	15	2.5	4.5	2.0	3.5	60	225	40	90
------	------	------	------	------	------	------	------	8	12	2.5	5.0	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	8	12	2.5	5.0	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	------	------	------	------	2.0	3.5	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	------	------	------	------	8	12	2.5	4.5	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	8	12	2.5	4.5	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	------	------	------	------	2.0	3.5	70	200	40	95
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
175	275	------	------	------	------	------	------	9	14	2.5	4.5	2.5	4.5	80	230	40	90
175	275	------	------	------	------	------	------	9	14	2.5	4.5	2.5	4.5	80	230	40	90
------	------	------	------	------	------	------	------	------	------	------	------	2.5	4.0	80	230	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	220	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	220	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	60	180	30	70
150	250	------	------	------	------	------	------	10	15	3.0	5.0	2.0	3.5	75	225	45	95
150	250	------	------	------	------	------	------	10	13	3.0	5.0	2.0	3.5	75	225	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90

TABLE 1.—*Estimated average acre yields of principal*

Soil	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Buckland fine sandy loam, 0 to 3 percent slopes	----	----	----	----	----	----	----	----	----	----	125	250
Buckland fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	125	250
Buckland fine sandy loam, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Buckland fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Buckland very stony fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Buckland very stony fine sandy loam, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Buckland very stony fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Buxton silt loam, 0 to 3 percent slopes	----	----	----	----	----	----	200	400	----	----	----	----
Buxton silt loam, 3 to 10 percent slopes	----	----	----	----	----	----	200	400	----	----	----	----
Cabot fine sandy loam, 0 to 3 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cabot fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cabot loam, black surface, 0 to 3 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cabot very stony loam, black surface, 0 to 3 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cabot very stony loam, black surface, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Carver loamy coarse sand, 0 to 3 percent slopes	1,600	1,900	----	----	----	----	----	----	----	----	----	----
Carver loamy coarse sand, 3 to 8 percent slopes	1,600	1,900	----	----	----	----	----	----	----	----	----	----
Carver loamy coarse sand, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Carver loamy coarse sand, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Charlton fine sandy loam, 3 to 8 percent slopes	----	----	----	----	250	450	300	500	----	----	125	250
Charlton fine sandy loam, 8 to 20 percent slopes	----	----	----	----	250	450	300	500	----	----	125	250
Charlton very stony fine sandy loam, 3 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Charlton very stony fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cheshire fine sandy loam, 3 to 8 percent slopes	----	----	----	----	250	450	300	500	----	----	175	275
Cheshire fine sandy loam, 8 to 15 percent slopes	----	----	----	----	200	400	----	----	----	----	175	275
Cheshire fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cheshire very stony fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cheshire very stony fine sandy loam, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cheshire very stony fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Colrain fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	150	275
Colrain fine sandy loam, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Colrain fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Colrain very stony fine sandy loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Colrain very stony fine sandy loam, 8 to 15 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Colrain very stony fine sandy loam, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----

See footnotes at end of table.

crops under two levels of management—Continued

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
------	------	------	------	------	------	------	------	7	10	2.5	4.5	2.5	5.0	80	250	45	95
------	------	------	------	------	------	------	------	7	10	2.5	4.5	2.5	5.0	80	250	45	95
------	------	------	------	------	------	------	------	7	9	2.5	4.0	2.5	4.5	80	225	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	80	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	225	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	225	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	80
------	------	------	------	------	------	------	------	9	14	------	------	2.5	4.5	80	250	45	95
------	------	------	------	------	------	------	------	9	14	------	------	2.5	4.5	80	250	45	95
------	------	------	------	------	------	------	------	------	------	------	------	2.0	3.5	75	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	2.0	3.0	75	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	1.5	3.0	70	180	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	30	60	------	------	------	------	------	------	------	------	.5	2.0	------	200	20	55
------	------	30	60	------	------	------	------	------	------	------	------	.5	2.0	------	200	20	55
------	------	------	------	------	------	------	------	------	------	------	------	.5	1.5	------	200	20	55
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	20	55
150	275	------	------	------	------	300	500	10	15	2.5	5.0	2.0	4.0	75	225	40	95
150	275	------	------	------	------	300	500	10	15	2.5	5.0	2.0	4.0	75	225	40	95
------	------	------	------	------	------	300	500	------	------	------	------	2.0	4.0	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	7	12	300	500	10	15	2.5	4.5	1.5	3.5	75	225	45	95
175	275	------	------	------	------	250	450	10	15	2.5	4.5	1.5	3.5	75	225	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	225	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
175	275	------	------	------	------	300	500	9	14	2.5	5.0	2.5	4.5	80	225	45	95
------	------	------	------	------	------	300	500	9	14	2.5	5.0	2.5	4.5	80	225	40	95
------	------	------	------	------	------	300	500	------	------	2.0	4.5	2.0	4.0	80	225	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	210	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	80

TABLE 1.—*Estimated average acre yields of principal*

Soil [1]	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Deerfield loamy fine sand, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Dutchess silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Dutchess silt loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Dutchess silt loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Dutchess very stony silt loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Dutchess very stony silt loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Essex fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	175	275
Essex fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	175	275
Essex fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Essex very stony fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Essex very stony fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Essex very stony fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Gloucester fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	175	275
Gloucester fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	175	275
Gloucester fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Gloucester fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Gloucester sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	100	200
Gloucester sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	100	200
Gloucester sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Gloucester very stony sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Gloucester very stony sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Gloucester very stony sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hadley silt loam, 0 to 3 percent slopes	1, 800	2, 400	1, 200	1, 600	250	550	350	600	200	300	175	300
Hadley silt loam, 3 to 8 percent slopes	1, 800	2, 400	1, 200	1, 600	250	550	350	600	200	300	175	300
Hadley very fine sandy loam, 0 to 3 percent slopes	1, 800	2, 400	1, 200	1, 600	250	550	350	600	200	300	175	300
Hadley very fine sandy loam, 3 to 8 percent slopes	------	------	------	------	250	550	350	600	200	300	175	300
Hadley very fine sandy loam, overflow, 0 to 3 percent slopes	------	------	------	------	250	500	300	550	------	------	150	275
Hartland silt loam, 0 to 3 percent slopes	1, 800	2, 200	1, 200	1, 600	250	500	300	550	200	300	175	300
Hartland silt loam, 3 to 8 percent slopes	1, 800	2, 200	1, 200	1, 600	250	500	300	550	200	300	175	300
Hartland silt loam, 8 to 15 percent slopes	------	------	------	------	200	500	------	------	------	------	150	275
Hartland silt loam, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes	1, 600	1, 800	1, 000	1, 200	------	------	150	250	------	------	------	------
Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes	1, 600	1, 800	1, 000	1, 200	------	------	150	250	------	------	------	------
Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hinckley sandy loam, 0 to 3 percent slopes	------	------	800	1, 000	------	------	150	250	------	------	------	------
Hinckley sandy loam, 3 to 8 percent slopes	------	------	800	1, 000	------	------	100	200	------	------	------	------
Hinckley sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------

See footnotes at end of table.

crops under two levels of management—Continued

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
------	------	------	------	------	------	------	------	8	12	2.0	3.5	2.5	4.5	80	250	40	90
150	250	------	------	------	------	275	450	8	12	2.5	4.5	2.5	3.5	70	210	40	90
150	250	------	------	------	------	275	450	8	12	2.5	4.5	2.5	3.5	70	210	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	275	450	------	------	------	------	------	------	65	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
150	275	------	------	8	12	300	500	9	14	2.5	4.5	2.0	4.0	75	225	45	95
150	275	------	------	8	12	300	500	9	14	2.5	4.5	2.0	4.0	75	225	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	205	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
150	275	------	------	8	12	300	500	9	14	2.5	4.5	2.0	4.0	75	225	45	95
150	275	------	------	8	12	300	500	9	14	2.5	4.5	2.0	4.0	75	225	45	95
150	250	------	------	------	------	300	500	8	12	2.0	4.0	2.0	4.0	75	225	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
100	200	------	------	------	------	------	------	8	12	2.0	4.0	1.5	3.0	70	200	30	80
100	200	------	------	------	------	------	------	8	12	2.0	4.0	1.5	3.0	70	200	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	205	30	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	75	200	30	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
250	350	50	90	10	14	------	------	12	18	2.5	5.0	2.5	4.5	80	250	45	100
250	350	50	90	10	14	------	------	12	18	2.5	5.0	2.5	4.5	80	250	45	100
250	350	60	100	9.5	13.5	------	------	12	18	3.0	5.5	2.5	4.0	80	225	40	95
250	350	60	100	9.5	13.5	------	------	12	18	3.0	5.5	2.5	4.0	80	225	40	95
225	325	------	------	------	------	------	------	10	15	2.5	4.5	2.5	4.0	75	220	40	90
250	350	50	90	10	14	------	------	12	18	3.0	4.0	3.0	4.0	80	225	45	100
250	350	50	90	10	14	------	------	12	18	3.0	4.0	3.0	4.0	80	225	45	100
250	350	------	------	------	------	------	------	10	15	2.5	3.5	2.5	3.5	80	225	45	100
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	100
------	------	------	------	------	------	------	------	7	12	2.0	3.5	1.5	3.0	50	150	30	80
------	------	------	------	------	------	------	------	7	12	2.0	3.5	1.5	3.0	50	150	30	80
------	------	------	------	------	------	------	------	7	12	2.0	3.0	1.5	3.0	50	150	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	30	50	------	------	------	------	5	8	1.5	3.0	1.5	2.5	50	150	25	70
------	------	------	------	------	------	------	------	5	8	1.5	3.0	1.5	2.5	50	150	25	70
------	------	------	------	------	------	------	------	------	------	1.5	2.5	1.0	2.0	50	125	25	70

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TABLE 1.—*Estimated average acre yields of principal*

Soil [1]	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Hinckley sandy loam, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hollis fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hollis fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hollis very rocky fine sandy loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Hollis very rocky fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Limerick silt loam	------	------	------	------	------	------	------	------	------	------	------	------
Limerick-Saco silt loams [5]	------	------	------	------	------	------	------	------	------	------	------	------
Lyman very rocky loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Lyman very rocky loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow loam, 3 to 8 percent slopes	------	------	------	------	250	450	------	------	------	------	------	------
Marlow loam, 8 to 15 percent slopes	------	------	------	------	250	450	------	------	------	------	------	------
Marlow loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow loam, dark subsoil, 3 to 8 percent slopes	------	------	------	------	250	550	------	------	------	------	------	------
Marlow loam, dark subsoil, 8 to 15 percent slopes	------	------	------	------	200	500	------	------	------	------	------	------
Marlow loam, dark subsoil, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, dark subsoil, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, dark subsoil, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Marlow very stony loam, dark subsoil, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Merrimac fine sandy loam, 0 to 3 percent slopes	1, 400	2, 000	1, 100	1, 400	------	------	275	425	200	250	150	250
Merrimac fine sandy loam, 3 to 8 percent slopes	1, 400	2, 000	1, 100	1, 400	------	------	250	400	175	200	125	200
Merrimac fine sandy loam, 8 to 15 percent slopes	1, 300	1, 900	1, 000	1, 200	------	------	------	------	------	------	125	200
Merrimac fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Merrimac sandy loam, 0 to 3 percent slopes	------	------	900	1, 100	------	------	175	350	------	------	125	225
Merrimac sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	125	225
Merrimac sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	100	200
Merrimac sandy loam, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Nassau very rocky silt loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Nassau very rocky silt loam, 15 to 25 per- slopes	------	------	------	------	------	------	------	------	------	------	------	------
Ninigret fine sandy loam, 0 to 3 percent slopes	1, 400	2, 000	1, 100	1, 300	------	------	------	------	200	250	125	250
Ninigret fine sandy loam, 3 to 10 percent slopes	1, 400	2, 000	1, 100	1, 300	------	------	------	------	200	250	125	250
Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes	1, 500	2, 000	1, 200	1, 500	200	400	200	400	200	250	150	250
Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes	1, 400	1, 900	1, 200	1, 400	200	400	200	400	200	250	150	250

See footnotes at end of table.

crops under two levels of management—Continued

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	25	70
------	------	------	------	------	------	------	------	------	------	------	------	1.0	2.5	60	180	35	85
------	------	------	------	------	------	------	------	------	------	------	------	1.0	2.5	60	180	35	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	25	70
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	25	70
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	25	70
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	25	90
------	------	------	------	8	13	------	------	------	------	------	------	2.0	4.0	75	200	40	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	35	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	8	12	2.5	5	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	8	12	2.5	5	2.0	4.0	75	225	40	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	8	12	2.5	5	2.5	4.5	75	225	40	95
------	------	------	------	------	------	------	------	8	12	2.5	5	2.5	4.5	75	225	40	95
------	------	------	------	------	------	------	------	------	------	------	------	1.5	2.5	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	200	40	90
175	275	45	75	9	12	300	500	10	15	2.5	4.5	1.5	3.5	75	300	40	90
175	250	45	75	------	------	300	500	10	15	2.5	4.5	1.5	3.5	75	200	40	90
175	250	------	------	------	------	275	450	10	15	2.0	4.0	1.5	3.0	75	175	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
100	200	35	60	6	10	------	------	8	12	2.0	3.5	2.0	3.0	60	170	30	80
100	200	------	------	------	------	------	------	8	12	2.0	3.5	2.0	3.0	60	170	30	80
100	175	------	------	------	------	------	------	7	11	1.5	3.0	1.5	2.5	50	150	30	75
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	70
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
225	325	------	------	10	14	------	------	10	15	2.0	4.0	2.5	4.5	80	250	45	95
225	325	------	------	------	------	------	------	10	15	2.0	4.0	2.5	4.5	80	250	45	95
150	250	------	------	10	14	------	------	8	12	2.5	4.5	2.5	4.5	80	250	45	100
150	250	------	------	10	14	------	------	8	12	2.5	4.5	2.5	4.5	80	250	45	100

TABLE 1.—*Estimated average acre yields of principal*

Soil [1]	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Ondawa fine sandy loam	------	------	------	------	250	500	300	550	150	300	150	250
Peru loam, 0 to 3 percent slopes	------	------	------	------	200	400	------	------	------	------	150	250
Peru loam, 3 to 8 percent slopes	------	------	------	------	200	400	------	------	------	------	150	250
Peru loam, 8 to 15 percent slopes	------	------	------	------	200	400	------	------	------	------	150	250
Peru very stony loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Peru very stony loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Peru very stony loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Pittstown silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	125	250
Podunk fine sandy loam	------	------	------	------	250	450	300	450	200	250	125	250
Raynham silt loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Ridgebury fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Ridgebury fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Rumney fine sandy loam	------	------	------	------	------	------	------	------	------	------	------	------
Saco silt loam	------	------	------	------	------	------	------	------	------	------	------	------
Saugatuck loamy sand	------	------	------	------	------	------	------	------	------	------	------	------
Scantic silt loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Scantic silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Scarboro fine sandy loam, brownish subsoil variant	------	------	------	------	------	------	------	------	------	------	------	------
Scituate fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	125	250
Scituate fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	125	250
Scituate fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	125	250
Scituate very stony fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Scituate very stony fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Scituate very stony fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shapleigh fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shapleigh fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne very stony loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne very stony loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Shelburne very stony loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Stissing silt loam, 0 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Stissing very stony silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Sudbury fine sandy loam, 0 to 3 percent slopes	1, 400	2, 000	1, 100	1, 300	------	------	300	450	200	250	125	250
Sudbury fine sandy loam, 3 to 8 percent slopes	1, 400	2, 000	1, 100	1, 300	------	------	300	450	200	250	125	250
Suffield silt loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	175	300
Suffield silt loam, 8 to 15 percent slopes, eroded	------	------	------	------	------	------	------	------	------	------	150	250

See footnotes at end of table.

crops under two levels of management—Continued

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
200	300	50	80	8	12	------	------	11	16	2.5	5.0	2.0	4.0	70	200	35	85
200	300	------	------	------	------	------	------	10	15	2.5	4.5	2.0	4.5	85	250	50	95
200	300	------	------	------	------	------	------	10	15	2.5	4.0	2.0	4.5	85	250	50	95
200	300	------	------	------	------	------	------	8	12	2.5	4.0	2.0	4.0	85	250	50	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	80	225	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	10	14	2.0	4.0	2.5	5.0	80	250	40	95
225	325	30	80	10	14	------	------	7	10	2.5	4.5	2.5	4.5	80	250	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	1.0	3.0	150	200	30	75
------	------	------	------	------	------	------	------	------	------	------	------	1.0	3.0	150	200	30	75
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	75
------	------	------	------	8	12	------	------	------	------	------	------	2.0	4.0	70	200	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	80
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	150	30	80
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	150	30	80
------	------	------	------	------	------	------	------	------	------	------	------	2.0	4.0	70	150	30	80
------	------	------	------	------	------	------	------	------	------	------	------	------	------	70	150	30	80
225	300	------	------	8	14	200	400	10	15	1.5	3.5	1.5	4.0	150	200	40	90
225	300	------	------	8	14	200	400	10	15	1.5	3.5	1.5	4.0	150	200	40	90
225	300	------	------	------	------	200	400	8	12	1.5	3.0	1.0	3.0	150	200	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	1.0	2.5	60	180	35	85
------	------	------	------	------	------	------	------	------	------	------	------	1.0	2.5	60	180	35	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	35	85
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	35	85
------	------	------	------	------	------	325	550	14	18	2.5	5.0	2.5	4.0	80	225	45	95
------	------	------	------	------	------	325	550	12	15	2.5	4.5	2.5	4.0	80	225	45	95
------	------	------	------	------	------	325	550	------	------	------	------	------	------	------	------	45	95
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	90
------	------	------	------	------	------	------	------	------	------	------	------	1.0	3.0	150	200	30	75
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	75
225	325	------	------	10	14	------	------	10	15	2.0	4.0	2.5	4.5	80	250	45	95
225	325	------	------	10	14	------	------	10	15	2.0	4.0	2.5	4.5	80	250	45	95
225	325	------	------	------	------	------	------	10	15	2.5	4.0	2.5	4.0	85	250	45	100
200	300	------	------	------	------	------	------	10	15	2.5	4.0	2.5	------	------	------	------	------

TABLE 1.—*Estimated average acre yields of principal*

Soil [1]	Open-grown tobacco (K-varieties)		Shade tobacco		Potatoes		Cucumbers		Onion sets		Sweet corn	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Cwt.*	*Cwt.*	*Bu.*[3]	*Bu.*[3]
Suffield silt loam, 15 to 35 percent slopes, eroded	------	------	------	------	------	------	------	------	------	------	------	------
Suncook loamy sand	------	------	------	------	150	250	150	300	100	200	100	200
Sutton fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	125	250
Sutton fine sandy loam, 8 to 20 percent slopes	------	------	------	------	------	------	------	------	------	------	100	200
Sutton very stony fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Sutton very stony fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Swanton very fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Swanton very fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Walpole and Wareham fine sandy loams, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Walpole and Wareham fine sandy loams, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Warwick gravelly fine sandy loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Warwick gravelly fine sandy loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Warwick gravelly fine sandy loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	125	200
Warwick gravelly fine sandy loam, 15 to 40 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Warwick gravelly loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Warwick gravelly loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	150	250
Warwick gravelly loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	125	200
Westminster loam, 3 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Westminster loam, 8 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Westminster loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	------	------
Westminster very rocky loam, 3 to 15 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Westminster very rocky loam, 15 to 25 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Whitman fine sandy loam, 0 to 3 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Whitman extremely stony fine sandy loam, 0 to 3 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Windsor loamy fine sand, 0 to 3 percent slopes.	1, 800	2, 200	1, 100	1, 500	------	------	------	------	------	------	------	------
Windsor loamy fine sand, 3 to 8 percent slopes.	1, 800	2, 200	1, 100	1, 500	------	------	------	------	------	------	------	------
Windsor loamy fine sand, 8 to 15 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Windsor loamy fine sand, 15 to 35 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes.	------	------	------	------	------	------	------	------	------	------	------	------
Winooski very fine sandy loam	1, 700	2, 300	1, 200	1, 700	250	500	350	550	200	250	175	300

[1] Soil and land types not suitable for crops or pasture are not included.
[2] 180-day grazing season.
[3] A bushel equals 5 dozen ears.

crops under two levels of management—Continued

Butternut squash		Asparagus		Cabbage		Apples		Corn (silage)		Hay				Pasture [2]			
										Alfalfa-brome		Timothy-clover		Improved		Native	
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*24-lb. boxes*	*24-lb. boxes*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]	*Cow-acre-days* [4]
																45	100
100	200	40	70	6	9			6	12	2.0	4.0	1.5	2.5	50	190	25	70
						300	500	10	15	2.0	4.0	2.5	4.5	80	225	40	95
						300	500	10	15	2.0	4.0	2.0	4.0	80	200	40	95
																40	90
																40	90
												2.0	4.0	70	200	30	80
												2.0	4.0	70	200	30	80
												1.5	4.0	70	200	35	85
												1.5	4.0	70	200	35	85
150	250							9	14	2.5	4.5	2.0	3.0	70	200	35	85
150	250							9	14	2.5	4.5	2.0	3.0	70	200	35	85
125	200							8	12	2.5	4.0	2.0	3.0	70	190	35	85
																35	85
150	250							10	15	2.5	4.5	2.0	3.5	70	200	40	90
150	250							10	15	2.5	4.5	2.0	3.5	70	200		
125	200							8	12	2.0	4.0	2.0	3.5	70	200		
												2.0	3.0	70	200	30	85
												2.0	3.0			30	85
												2.0	3.0			30	85
																30	85
																30	85
														60	170	25	80
																20	70
		30	60					8	12	2.5	4.0	.5	2.0	150	200	30	60
		30	60					8	12	2.5	4.0	.5	2.0	150	200	30	60
								7	10	2.5	3.5	.5	1.5	150	200	30	60
																30	60
																20	40
225	325	55	90					11	16	2.5	5.0	2.0	4.5	80	225	45	90

[4] The term cow-acre-days is used to express the carrying capacity or grazing value of pasture. It is the number of days of grazing that 1 acre will provide for 1 animal unit in a year without injury to the sod. One animal unit is a cow, steer, or horse or 5 sheep.

[5] Yields are for the Limerick part of the complex. See Saco silt loam for the Saco part.

TABLE 2.—*Woodland suitability groups of soils, their estimated potential productivity, and the ratings of major limitations and hazards affecting management* [1]

[Absence of site index range indicates that the trees generally do not grow on these soils]

Woodland suitability groups, soil series, and mapping unit symbols	Estimated potential soil productivity—site index range [2]					Limitations on—		Hazards of—	
	Northern hardwoods	Upland oaks	White pine	Red pine	Red spruce	Equipment	Woodland roads	Windthrow	Seedling mortality [3]
Group 1: Belgrade (BaA, BaB); Berkshire (BbB, BbC, BbD, BcB, BcC, BcD); Berkshire, dark subsoil (BeB, BeC, BeD, BfB, BfC, BfD); Buckland (BuA, BuB, BuC, BuD, BvB, BvC, BvD); Colrain (CsB, CsC, CsD, CvB, CvC, CvD); Peru (PbA, PbB, PbC, PcB, PcC, PcD); Pittstown (PnB); Winooski (Ww).	58 or more.	65 or more.	70 or more.	70 or more.	57 or more.	Slight; moderate on slopes of 15 to 25 percent.	Moderate; slight on Berkshire and Colrain soils.	Slight	Slight.
Group 2: Berkshire (BdB, BdD, BdF); Berkshire, dark subsoil (BgB, BgD, BgF); Buckland (BwB, BwC); Colrain (CxB, CxD, CxF); Peru (PeB, PeC).	58 or more.	65 or more.	70 or more.	60 or more.	57 or more.	Severe	Severe	Slight	Slight.
Group 3: Bernardston (BhB, BhC, BhD, BmB, BmC, BmD); Broadbrook (BsB, BsC, BsD, BtC, BtD); Buxton (BxA, BxB); Dutchess (DuB, DuC, DuD, DvC, DvD); Hadley (HaA, HaB, HbA, HbB, HcA); Hartland (HdA, HdB, HdC, HdD); Marlow (MaB, MaC, MaD, MbB, MbC, MbD); Marlow, dark subsoil (MdB, MdC, MdD, MeB, MeC, MeD); Ninigret (NfA, NfB); Ninigret, silty substratum (NgA, NgB); Podunk (Po); Shelburne (SnB, SnC, SnD, SoB, SoC, SoD); Suffield (SuB, SuC2, SuE2); Sutton (SwB, SwC, SxB, SxC).	52 to 57	55 or more.	60 to 69	60 or more.	52 to 56	Slight; moderate on slopes of 15 to 25 percent.	Slight to moderate.	Slight	Slight.
Group 4: Bernardston (BmF); Charlton (CnB, CnD, CnE); Cheshire (CrB, CrD, CrE); Dutchess (DxD, DxF); Essex (ExB, ExC, ExE); Gloucester (GxB, GxC, GxE); Marlow (McB, McD); Marlow, dark subsoil (MfB, MfD, MfE); Scituate (SgB, SgC); Shelburne (SpB, SpD, SpF); Sutton (SyB, SyC).	52 to 57	55 or more.	60 to 69	60 or more.	52 to 56	Severe	Severe	Slight	Slight.

See footnotes at end of table.

TABLE 2.—*Woodland suitability groups of soils, their estimated potential productivity, and the ratings of major limitations and hazards affecting management* [1]—Continued

Woodland suitability groups, soil series, and mapping unit symbols	Estimated potential soil productivity—site index range [2]					Limitations on—		Hazards of—	
	Northern hardwoods	Upland oaks	White pine	Red pine	Red spruce	Equipment	Woodland roads	Windthrow	Seedling mortality [3]
Group 5: Agawam (AfA, AfB, AfC, AfD); Merrimac (MgA, MgB, MgC, MgD, MmA, MmB, MmC, MmE); Ondawa (Of); Warwick (WfA, WfB, WfC, WfD, WgA, WgB, WgC).	52 to 57	45 to 64	60 to 69	50 to 69	----------	Slight; moderate on slopes of 15 to 25 percent.	Slight	Slight	Slight.
Group 6: Agawam, silty substratum (AgA, AgB, AgC); Charlton (CkB, CkC, CmC, CmD); Cheshire (CoB, CoC, CoD, CpB, CpC, CpD); Deerfield (DfA); Essex (EfB, EfC, EfD, EvB, EvC, EvD); Gloucester (GfA, GfB, GfC, GfD, GmB, GmC, GmD, GvB, GvC, GvD); Scituate (SeA, SeB, SeC, SfA, SfB, SfC); Sudbury (StA, StB).	52 to 57	55 to 64	50 to 69	60 to 69	----------	Slight; moderate on slopes of 15 to 25 percent.	Slight to moderate.	Slight	Slight.
Group 7: Cabot (CaA, CaB, CbB); Limerick (Lk); Limerick-Saco (Ls);[4] Raynham (RaA); Ridgebury (RdA, RdB, RgB); Rumney (Ru); Stissing (SrB, SsB); Swanton (SzA, SzB); Walpole and Wareham (WaA, WaB).	46 to 51	55 to 64	60 to 69	70 or more.	52 to 56	Severe	Severe	Severe	Severe.
Group 8: Hinckley (HgA, HgB, HgC, HgD, HkA, HkB, HkC, HkD); Suncook (Sv); Windsor (WuA, WuB, WuC, WuE, WvB).	46 to 51	45 to 54	50 to 59	50 to 69	----------	Slight; moderate on slopes of 15 to 25 percent.	Slight	Slight	Moderate.
Group 9: Saugatuck (Sb); Scantic (ScA, ScB).	46 to 51	45 to 54	50 to 59	50 to 59	----------	Severe	Severe	Severe	Severe.
Group 10: Hollis (HmB, HmC, HnC, HnD); Holyoke and Sunderland (HvC, HvD); Lyman (LvC, LvD); Nassau (NaC, NaD); Shapleigh (ShB, ShC, SkC, SkD); Westminster (WmB, WmC, WmD, WnC, WnD).	52 to 57	54 or less.	50 to 59	50 to 59	46 to 51	Moderate	Moderate	Moderate	Moderate.

See footnotes at end of table.

TABLE 2.—*Woodland suitability groups of soils, their estimated potential productivity, and the ratings of major limitations and hazards affecting management* [1]—Continued

Woodland suitability groups, soil series, and mapping unit symbols	Estimated potential soil productivity—site index range [2]					Limitations on—		Hazards of—	
	Northern hardwoods	Upland oaks	White pine	Red pine	Red spruce	Equipment	Woodland roads	Windthrow	Seedling mortality [3]
Group 11 Hollis (HoD, HoF); Holyoke and Sunderland (HxD, HxF); Lyman (LxC, LxF); Nassau (NeC, NeF); Shapleigh (SmC, SmF); Westminister (WrD, WrF).	46 to 51	44 or less.	49 or less.	49 or less.	45 or less.	Severe	Severe	Severe	Severe.
Group 12 Carver (CeA, CeB, CeC, CeD).	45 or less.	44 or less.	49 or less.	49 or less.	----------	Slight; moderate on slopes of 15 to 25 percent.	Slight	Slight	Severe.
Group 13 Biddeford (Bn); Cabot, black surface (CcA, CdA, CdB); Limerick-Saco (Ls)[4]; Muck (Ms, Mu); Peat (Pa); Saco (Sa); Scarboro (Sd); Whitman (WsA, WtA).	45 or less.	Not suitable.	50 to 59	Not suitalbe.	51 or less.	Severe	Severe	Severe	Severe.

[1] Riverwash is not suitable for woodland and is not rated in this table.
[2] The site index is at 50 years of age for all tree species.
[3] This rating concerns only planted trees.
[4] Ratings for the Limerick part are in group 7, and those for the Saco part are in group 13.

Logging practices have influenced the composition of many forest stands. Many stands have an abnormally high percentage of hardwood trees, because sources of seed for softwood trees have been removed by the selective cutting of pine and hemlock. Also, many stands are inferior as a result of high-grading, that is, removing good trees and leaving inferior ones. These stands cannot be managed profitably until they are stocked with desirable individual trees. Such an improvement is expensive and accentuates the need for site evaluation guides so that management can be concentrated on the most productive sites.

In many areas hardwood stands were clear cut for cordwood or charcoal, and this heavy cutting favored the growth of many even-aged stands of less shade-tolerant, better hardwoods that included ash, cherry, basswood, birch, and shade-tolerant maple. Large acreages of these stands are nearly ready to be harvested and, if well managed, will be a valuable resource.

Thus, because of past land use, the present forest types are somewhat different from those that normally would have developed in the county.

Soil-woodland interpretations

Soil-woodland interpretations are made by rating the soils according to their productivity and according to the main limitations and hazards that affect their use for woodland. The factors rated are potential soil productivity, limitations on use of equipment, limitations on construction of woodland roads, windthrow hazard, and seedling mortality of planted trees. These factors are the basis for woodland suitability groupings, and they are defined here in the order in which they occur in table 2.

Potential soil productivity is the yield of a single tree species or forest type that can be expected on a given kind of soil under a specified level of management. In this report the level of management is assumed to be for unmanaged, fully stocked stands, and potential soil productivity is expressed as site index. Site index, the most commonly accepted method of measuring the capacity of a soil to produce trees, is the average height of the dominant and codominant trees in a fully stocked stand at the age of 50 years.

In table 2 ratings of potential productivity are based on field measurements of site indexes in existing forest stands on different kinds of soil. Field measurements were made of 120 separate stands representing upland oaks, white pine, and red pine growing on soils of 79 different soil series throughout Massachusetts. The descriptions and locations of study plots are on file in the State Office of the Soil Conservation Service, Amherst, Mass.

TABLE 3.—*Expected average growth and volume per acre of unmanaged, fully stocked stands at 50 years of age*

Forest type or species	Site index	Cords		Board feet (International ¼-inch rule)	
		Annual growth	Total volume	Annual growth	Total volume
Northern hardwoods	60	0.62	31	60	3,000
	55	.53	27	46	2,300
	49	.44	22	32	1,600
	43	.37	18	(1)	(1)
Upland oaks	70	.70	35	200	10,000
	60	.50	25	125	6,250
	50	.40	20	65	3,250
	40	.20	10	30	1,500
White pine	75	1.96	98	740	37,000
	65	1.56	78	560	28,000
	55	1.16	58	360	18,000
	45	.76	38	180	9,000
Red pine	75	2.56	128	1,020	51,000
	65	1.98	99	760	38,000
	55	1.40	70	460	23,000
	45	1.08	54	340	17,000
Red spruce	59	.76	38	234	11,700
	54	.65	33	198	9,900
	48	.48	24	116	5,800
	43	.36	18	40	2,000

[1] Generally not worth managing for lumber.

Similar data from other New England States and New York were used to augment these field measurements and to supply information on site indexes for northern hardwoods and red spruce.

The site index curves that were used to obtain the average site index ratings for each measured plot were from the following sources: Northern hardwoods—site index curves for sugar maple, prepared by the Vermont Forest Service, based on 53 tree measurements (*4*); upland oaks—site index curves for red oak group in Massachusetts, an unpublished study prepared in 1961 by the University of Massachusetts, Department of Forestry and Wildlife Management, based on 71 plots and measurements of 325 trees; white pine—site index curves for eastern white pine (*7*); red pine—site index curves for red pine based on an unpublished study of 49 red pine plantation plots by the University of Massachusetts, Department of Forestry and Wildlife Management and nearly identical with those in Technical Notes 484, issued by the Lake States Forest Experiment Station (*19*); red spruce—site index curves for red spruce prepared in an unpublished study by the Vermont Forest Service and Soil Conservation Service in 1959.

Equipment limitations (trafficability) are rated according to the degree that soils restrict the use of equipment in harvesting trees. Limitations are *slight* if there are no restrictions on the kind of equipment or on the time of the year that equipment can be used. Slopes are less than 15 percent, and the soils may be nonstony to very stony. Limitations are *moderate* where slopes are 15 to 25 percent or the soils are shallow to bedrock and have some rock outcrops. Equipment limitations are *severe* where slopes are greater than 25 percent, a high water table is at or near the surface for 7 or more months of the year, or the soils are extremely stony or rocky.

Woodland roads limitations are rated according to the degree that soil properties restrict or prohibit the construction of access roads. Limitations are *slight* if there are no problems in constructing woodland roads on the soils. The soils are well drained to excessively drained and are nonstony to very stony. Limitations are *moderate* on soils that are moderately well drained or shallow to bedrock and have some rock outcrops. Limitations are *severe* on soils that are extremely stony or rocky or have a high water table at or near the surface for 7 months or more of the year.

Windthrow hazard refers to windfirmness, or the danger of trees being blown over by wind. This hazard is affected by soil properties that control the development of root systems of trees. The ratings of this hazard are significant in planning the thinning, release cutting, and harvesting of stands and in determining a potential economic loss. The hazard is *slight* if trees are firmly and deeply rooted in the soils and are not blown over by normal wind. The hazard is *moderate* if the trees develop adequate root systems for stability, but some trees are expected to be blown down when the soils are excessively wet and the wind is high. On some of the shallow soils, the hazard is moderate. The windthrow hazard is *severe* if root development is not adequate to prevent trees from blowing over. Many trees are expected to be blown down when the soils are wet and the wind is moderate or high. The soils rated as severe have a high water table at or near the surface for 7 or more months of the year or are very shallow and have many rock outcrops.

Seedling mortality refers to the influence that soils have on the survival of planted seedlings and their ability to grow and establish adequate stands when plant competition, disease, rodents, and other environmental factors are assumed to be under control. Also assumed are proper planting methods and the use of healthy stock of satisfactory grade. Seedling mortality is *slight* if there are no special problems and losses would not exceed 25 percent of the planted stock. Normally, satisfactory restocking can be obtained by initial planting. The mortality is *moderate* if expected losses caused by soil influences are ordinarily between 25 and 50 percent. Some replanting is needed to fill in openings. Seedling mortality is generally moderate on soils that are droughty or are shallow to bedrock. The mortality is *severe* if losses of planted seedlings amount to more than 50 percent. Considerable replanting, special seedbed preparation, and superior planting techniques are needed to obtain adequate restocking. The soils rated as severe are excessively wet, extremely rocky and shallow, or extremely droughty.

Estimated growth and volume yields of major forest types

Table 3 is a guide for translating site indexes in table 2 into potential yields of cordwood and board feet per acre. The site indexes given in the two tables are for unmanaged, fully stocked stands at 50 years of age. In table 3 the yields of cordwood are from trees that are more than 4 to 5 inches in diameter at breast height (DBH) and are utilized to a 3- to 4-inch top. The board feet yields for conifers are from trees that are 9 inches DBH, and those for

hardwoods are from trees that are 11 inches DBH. Both are utilized to a 5- to 8-inch top.

The data for northern hardwoods are based on a study by the Vermont Forest Service (*4*). The figures for site index are for sugar maple.

The yield figures for upland oaks are for a composite of red, black, scarlet, white, and chestnut oaks and associated species. These data are in USDA Technical Bulletin No. 560 (*12*).

The yield data for white pine are from USDA Technical Bulletin No. 13 (*7*). Standard cord yields were obtained by converting cubic foot volume at a rate of 90 cubic feet per cord. Board feet were obtained by applying individual tree yields from Connecticut Agricultural Experiment Station Bulletin 514 (*10*) to tree numbers and sizes in USDA Technical Bulletin No. 13.

Yields for red pine are based on cubic foot volumes obtained by measuring various aged plots in plantations on a variety of soils. They are from an unpublished study by Donald L. Mader, University of Massachusetts, Department of Forestry and Wildlife Management. Cordwood yields were calculated by a converting factor of 90 cubic feet per cord. Board feet were calculated by multiplying the cubic foot volumes by the ratio of board foot to cubic foot volumes developed for white pine.

Yields for red spruce are based on an unpublished study by the Vermont Forest Service and Soil Conservation Service.

Woodland suitability groups

On the basis of soil productivity and limitations previously defined, the soils of Franklin County have been placed in 13 woodland suitability groups to simplify the presentation of information about woodland management.

A woodland suitability group is made up of soils that grow similar kinds of woodcrops, that require similar management to produce these woodcrops when the existing vegetative conditions are similar, and that have about the same potential productivity.

In each woodland suitability group that follows, the soils are listed and briefly described, the site indexes of suitable species of trees are given, and the limitations of the soils that affect management are rated.

WOODLAND SUITABILITY GROUP 1

This group consists mainly of moderately well drained and well drained, nonstony to very stony soils on uplands. These soils have formed in glacial till derived from acid material and limy material. Their slopes range from 0 to 25 percent.

Included in the group are some moderately well drained soils on terraces and flood plains. These soils formed in nonstony silty material and have slopes of 0 to 8 percent.

The moderately well drained soils in the uplands have a compact layer within a depth of 2½ feet, but generally at 1½ to 2 feet. The well-drained soils in uplands do not have a compact layer within a depth of 2½ feet but may have this layer below 3 or 4 feet. The compact layer has moderately slow to slow permeability. Stones are in all of the soils, and in places boulders are below the surface layer.

The soils in this group are—

Belgrade silt loam, 0 to 3 percent slopes.
Belgrade silt loam, 3 to 8 percent slopes.
Berkshire fine sandy loam, 3 to 8 percent slopes.
Berkshire fine sandy loam, 8 to 15 percent slopes.
Berkshire fine sandy loam, 15 to 25 percent slopes.
Berkshire very stony fine sandy loam, 3 to 8 percent slopes.
Berkshire very stony fine sandy loam, 8 to 15 percent slopes.
Berkshire very stony fine sandy loam, 15 to 25 percent slopes.
Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes.
Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes.
Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes.
Buckland fine sandy loam, 0 to 3 percent slopes.
Buckland fine sandy loam, 3 to 8 percent slopes.
Buckland fine sandy loam, 8 to 15 percent slopes.
Buckland fine sandy loam, 15 to 25 percent slopes.
Buckland very stony fine sandy loam, 3 to 8 percent slopes.
Buckland very stony fine sandy loam, 8 to 15 percent slopes.
Buckland very stony fine sandy loam, 15 to 25 percent slopes.
Colrain fine sandy loam, 3 to 8 percent slopes.
Colrain fine sandy loam, 8 to 15 percent slopes.
Colrain fine sandy loam, 15 to 25 percent slopes.
Colrain very stony fine sandy loam, 3 to 8 percent slopes.
Colrain very stony fine sandy loam, 8 to 15 percent slopes.
Colrain very stony fine sandy loam, 15 to 25 percent slopes.
Peru loam, 0 to 3 percent slopes.
Peru loam, 3 to 8 percent slopes.
Peru loam, 8 to 15 percent slopes.
Peru very stony loam, 3 to 8 percent slopes.
Peru very stony loam, 8 to 15 percent slopes.
Peru very stony loam, 15 to 25 percent slopes.
Pittstown silt loam, 3 to 8 percent slopes.
Winooski very fine sandy loam.

The soils of this group have a high moisture-holding capacity, and trees grow well on them. The site indexes are 58 or more for northern hardwoods; 65 or more for upland oaks; 70 or more for white pine, except on the Colrain soils where the index is 60 to 69; 70 or more for red pine, except on the Berkshire and Peru soils where the index is 60 to 69; and 57 or more for red spruce. Red spruce generally grows only on the Berkshire and Peru soils, which are in the western part of the county and at a higher elevation than the other soils.

All species of trees develop deep root systems and are windfirm on these soils. Hardwoods regenerate readily and the stands can be improved without difficulty, but regeneration is generally difficult for conifers. Site preparation and weeding are necessary for young conifers until there is no risk of overtopping by hardwoods.

The use of equipment is slightly limited on slopes of 0 to 15 percent and moderately limited on slopes of 15 to 25 percent. The construction of woodland roads is moderately limited on most of the soils but slightly limited on the well-drained Berkshire and Colrain soils. The hazards of windthrow and seedling mortality are slight for planted hardwoods and conifers.

WOODLAND SUITABILITY GROUP 2

In this group are moderately well drained soils that have a compact layer and well-drained soils that do not have a compact layer in the upper 3 feet. All are extremely stony and are in uplands. They formed in glacial till derived from acid material and limy material. Slopes range

from 0 to 65 percent, but most of the slopes are from 3 to 25 percent.

The moderately well drained soils have a compact layer within a depth of 2½ feet of the surface, generally at 1½ to 2 feet. The well-drained soils do not have a compact layer within a depth of 2½ feet but may have this layer below 3 or 4 feet. The compact layer has moderately slow to slow permeability. Stones are in all the soils in this group and in places boulders are below the surface layer.

The soils in this group are—

Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes.
Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes.
Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes.
Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes.
Buckland extremely stony fine sandy loam, 3 to 8 percent slopes.
Buckland extremely stony fine sandy loam, 8 to 25 percent slopes.
Colrain extremely stony fine sandy loam, 3 to 8 percent slopes.
Colrain extremely stony fine sandy loam, 8 to 25 percent slopes.
Colrain extremely stony fine sandy loam, 25 to 50 percent slopes.
Peru extremely stony loam, 0 to 8 percent slopes.
Peru extremely stony loam, 8 to 25 percent slopes.

These soils have a high water-holding capacity, and trees grow well on them. The site indexes are 58 or more for northern hardwoods; 65 or more for upland oaks; 70 or more for white pine, except on the Colrain soils where it is 60 to 69; 70 or more for red pine on the Buckland and Colrain soils and 60 to 69 on the other soils; and 57 or more for red spruce. Red spruce generally grows only on the Berkshire and Peru soils, which are in the western part of the county at higher elevations than the other soils.

On these soils all species of trees develop deep root systems and are windfirm. Hardwoods regenerate readily and the stands can be improved without difficulty, but regeneration is usually difficult for conifers. Site preparation and weeding are necessary for young conifers until there is no risk of overtopping by hardwoods.

The use of equipment and the construction of woodland roads are severely limited on these soils because they are extremely stony and some of them have slopes of 25 to 55 percent. For planted hardwoods and conifers, the hazards of windthrow and seedling mortality are slight.

WOODLAND SUITABILITY GROUP 3

This group consists mainly of well-drained loamy and silty soils that have a compact layer and are nonstony to very stony. These soils are in uplands. They formed in glacial till derived mostly from acid material. Their slopes range from 3 to 25 percent. They have a moderately slowly to slowly permeable compact layer that is generally at a depth of 1½ to 2 feet except in the Dutchess soils. The Dutchess soils may, in places, have a compact layer at a depth below 3 feet. All the soils that have formed in glacial till are well drained except the Sutton soils, which are moderately well drained and do not have a compact layer within 2½ feet of this surface.

Also included in this group are well drained and moderately well drained, nonstony, sandy, silty, and clayey soils on terraces and flood plains. Most of their slopes range from 0 to 15 percent, but a few are 15 to 35 percent.

The soils in this group are—

Bernardston channery silt loam, 3 to 8 percent slopes.
Bernardston channery silt loam, 8 to 15 percent slopes.
Bernardston channery silt loam, 15 to 25 percent slopes.
Bernardston very stony silt loam, 3 to 8 percent slopes.
Bernardston very stony silt loam, 8 to 15 percent slopes.
Bernardston very stony silt loam, 15 to 25 percent slopes.
Broadbrook very fine sandy loam, 3 to 8 percent slopes.
Broadbrook very fine sandy loam, 8 to 15 percent slopes.
Broadbrook very fine sandy loam, 15 to 25 percent slopes.
Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes.
Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes.
Buxton silt loam, 0 to 3 percent slopes.
Buxton silt loam, 3 to 10 percent slopes.
Dutchess silt loam, 3 to 8 percent slopes.
Dutchess silt loam, 8 to 15 percent slopes.
Dutchess silt loam, 15 to 25 percent slopes.
Dutchess very stony silt loam, 3 to 15 percent slopes.
Dutchess very stony silt loam, 15 to 25 percent slopes.
Hadley silt loam, 0 to 3 percent slopes.
Hadley silt loam, 3 to 8 percent slopes.
Hadley very fine sandy loam, 0 to 3 percent slopes.
Hadley very fine sandy loam, 3 to 8 percent slopes.
Hadley very fine sandy loam, overflow, 0 to 3 percent slopes.
Hartland silt loam, 0 to 3 percent slopes.
Hartland silt loam, 3 to 8 percent slopes.
Hartland silt loam, 8 to 15 percent slopes.
Hartland silt loam, 15 to 35 percent slopes.
Marlow loam, 3 to 8 percent slopes.
Marlow loam, 8 to 15 percent slopes.
Marlow loam, 15 to 25 percent slopes.
Marlow very stony loam, 3 to 8 percent slopes.
Marlow very stony loam, 8 to 15 percent slopes.
Marlow very stony loam, 15 to 25 percent slopes.
Marlow loam, dark subsoil, 3 to 8 percent slopes.
Marlow loam, dark subsoil, 8 to 15 percent slopes.
Marlow loam, dark subsoil, 15 to 25 percent slopes.
Marlow very stony loam, dark subsoil, 3 to 8 percent slopes.
Marlow very stony loam, dark subsoil, 8 to 15 percent slopes.
Marlow very stony loam, dark subsoil, 15 to 25 percent slopes.
Ninigret fine sandy loam, 0 to 3 percent slopes.
Ninigret fine sandy loam, 3 to 10 percent slopes.
Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes.
Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes.
Podunk fine sandy loam.
Shelburne loam, 3 to 8 percent slopes.
Shelburne loam, 8 to 15 percent slopes.
Shelburne loam, 15 to 25 percent slopes.
Shelburne very stony loam, 3 to 8 percent slopes.
Shelburne very stony loam, 8 to 15 percent slopes.
Shelburne very stony loam, 15 to 25 percent slopes.
Suffield silt loam, 3 to 8 percent slopes.
Suffield silt loam, 8 to 15 percent slopes, eroded.
Suffield silt loam, 15 to 35 percent slopes, eroded.
Sutton fine sandy loam, 3 to 8 percent slopes.
Sutton fine sandy loam, 8 to 20 percent slopes.
Sutton very stony fine sandy loam, 3 to 8 percent slopes.
Sutton very stony fine sandy loam, 8 to 15 percent slopes.

These soils have a high to moderate moisture-holding capacity, and trees grow well on them. The site indexes are 52 to 57 for northern hardwoods, except on the Marlow soils where it is 58 or more; 55 or more for upland oaks; 60 to 69 for white pine; and 60 to more than 70 for red pine. Red spruce generally grows only on the Marlow and Sutton soils, which are in the western part of the county. The site index for red spruce is 52 to 56 on the Marlow soils and 57 or more on the Sutton soils.

All species of trees develop deep rooting systems in the soils and are windfirm. Hardwoods regenerate and the stands can be improved without difficulty, but stand regeneration is usually difficult for conifers. Site preparation and subsequent weeding are necessary for young conifers until there is no danger of overtopping by hardwoods.

Since available moisture is adequate in the soils, seedling mortality of planted hardwoods or conifers is slight. The windthrow hazard is also slight. The equipment limitation is slight on soils that have slopes of 0 to 15 percent and moderate on those that have slopes of 15 to 25 percent. It is severe on a few areas of Hartland and Suffield soils that have slopes greater than 25 percent.

The limitation on construction of woodland roads is moderate on the moderately well drained Buxton, Ninigret, Podunk, and Sutton soils and the well-drained, silty and clayey Suffield soils. The limitation is slight on the other soils in this group.

WOODLAND SUITABILITY GROUP 4

In this group are extremely stony, well drained and moderately well drained soils, with or without a compact layer. The Bernardston soils, however, are very stony. The soils in this group are in uplands and formed in glacial till derived mainly from a variety of acid materials. The Shelburne soils formed in limy materials. The slopes range from 0 to 55 percent, but most of them are from 3 to 25 percent.

The well-drained Charlton, Cheshire, Dutchess, and Gloucester soils and the moderately well drained Sutton soils do not have a compact layer within 2½ feet of the surface, but such a layer may be present in places below 3 or 4 feet. The other soils in this group have a compact layer within 2½ feet of the surface, generally at a depth of 1½ to 2 feet. This layer has moderately slow to slow permeability. Stones are on the surface and in all of these soils, and in places boulders are below the surface.

The soils in this group are—

Bernardston very stony silt loam, 25 to 55 percent slopes.
Charlton extremely stony fine sandy loam, 3 to 8 percent slopes.
Charlton extremely stony fine sandy loam, 8 to 25 percent slopes.
Charlton extremely stony fine sandy loam, 25 to 45 percent slopes.
Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes.
Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes.
Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes.
Dutchess extremely stony silt loam, 8 to 25 percent slopes.
Dutchess extremely stony silt loam, 25 to 55 percent slopes.
Essex extremely stony fine sandy loam, 3 to 8 percent slopes.
Essex extremely stony fine sandy loam, 8 to 25 percent slopes.
Essex extremely stony fine sandy loam, 25 to 45 percent slopes.
Gloucester extremely stony sandy loam, 3 to 8 percent slopes.
Gloucester extremely stony sandy loam, 8 to 25 percent slopes.
Gloucester extremely stony sandy loam, 25 to 45 percent slopes.
Marlow extremely stony loam, 3 to 8 percent slopes.
Marlow extremely stony loam, 8 to 35 percent slopes.
Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes.
Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes.
Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes.
Scituate extremely stony fine sandy loam, 0 to 8 percent slopes.
Scituate extremely stony fine sandy loam, 8 to 25 percent slopes.
Shelburne extremely stony loam, 3 to 8 percent slopes.
Shelburne extremely stony loam, 8 to 25 percent slopes.
Shelburne extremely stony loam, 25 to 50 percent slopes.
Sutton extremely stony fine sandy loam, 0 to 8 percent slopes.
Sutton extremely stony fine sandy loam, 8 to 25 percent slopes

These soils have a high to moderate moisture-holding capacity, and trees grow well to fairly well on them. The site indexes are 46 to 51 for northern hardwoods on the Gloucester soils, 58 and more on the Marlow soils and 52 to 57 on the other soils; 45 to 54 for upland oaks on the Gloucester soils and 55 and more on the other soils; 50 to 59 for white pine on the Essex soils and 60 to 69 on the other soils; and 60 to more than 70 for red pine. Red spruce generally grows only on the Marlow and Sutton soils. The site index for red spruce is 52 to 56 on the Marlow soils and 57 or more on the Sutton soils.

All species of trees develop deep root systems in these soils and are windfirm. Hardwoods regenerate readily and the stands can be improved without difficulty, but regeneration is usually difficult for conifers. Site preparation and subsequent weeding are necessary for young conifers until there is no danger of overtopping by hardwoods.

The construction of woodland roads and use of equipment are severely limited on these soils because they are extremely stony. Also, some of the soils have slopes of 25 to 55 percent. The hazards of windthrow and seedling mortality are slight for planted hardwoods or conifers.

WOODLAND SUITABILITY GROUP 5

In this group are somewhat droughty, nonstony, sandy and gravelly soils on terraces and flood plains. These soils formed in deep sandy and gravelly deposits derived primarily from acid gneissic and granitic materials. Their slopes range mostly from 0 to 15 percent, but some slopes are as steep as 40 percent. These soils are rapidly to very rapidly permeable in the substratum. There are few stones or none below the surface layer.

The soils in this group are—

Agawam fine sandy loam, 0 to 3 percent slopes.
Agawam fine sandy loam, 3 to 8 percent slopes.
Agawam fine sandy loam, 8 to 15 percent slopes.
Agawam fine sandy loam, 15 to 25 percent slopes.
Merrimac fine sandy loam, 0 to 3 percent slopes.
Merrimac fine sandy loam, 3 to 8 percent slopes.
Merrimac fine sandy loam, 8 to 15 percent slopes.
Merrimac fine sandy loam, 15 to 25 percent slopes.
Merrimac sandy loam, 0 to 3 percent slopes.
Merrimac sandy loam, 3 to 8 percent slopes.
Merrimac sandy loam, 8 to 15 percent slopes.
Merrimac sandy loam, 15 to 35 percent slopes.
Ondawa fine sandy loam.
Warwick gravelly fine sandy loam, 0 to 3 percent slopes.
Warwick gravelly fine sandy loam, 3 to 8 percent slopes.
Warwick gravelly fine sandy loam, 8 to 15 percent slopes.
Warwick gravelly fine sandy loam, 15 to 40 percent slopes.
Warwick gravelly loam, 0 to 3 percent slopes.
Warwick gravelly loam, 3 to 8 percent slopes.
Warwick gravelly loam, 8 to 15 percent slopes.

These soils have a moderate moisture-holding capacity, and trees grow fairly well on them. The site indexes are 52 to 57 for northern hardwoods; 55 to 64 for upland oaks on the Agawam and Ondawa soils and 45 to 54 on the Merrimac and Warwick soils; 60 to 69 for white pine; 60 to 69 for red pine on the Agawam and Ondawa soils and 50 to 59 on the Merrimac and Warwick soils. Red spruce generally does not grow on these soils.

All species of trees develop adequate root systems and are windfirm in these deep soils. Because the soils are slightly droughty, they are better suited to conifers than to hardwoods. Nevertheless, hardwoods are adapted to these soils. Hardwood trees and shrubs compete somewhat with conifers and need to be controlled to prevent overtopping. Upland oaks have a lower site index than northern hardwoods. Mechanical scarification of these soils provides an adequate seedbed for natural regeneration of white pine if a seed source is available. Light grazing may permit the regeneration of white pine and exclude hardwoods. Excessive grazing, however, compacts the soil and may adversely affect the growth of trees.

The equipment limitation is slight on slopes of 0 to 15 percent, moderate on slopes of 15 to 25 percent, and severe on slopes greater than 25 percent. Seedling mortality and windthrow are only slight hazards, because these deep soils have a fairly good moisture-holding capacity and good internal drainage. The limitation on construction of woodland roads is also only slight.

WOODLAND SUITABILITY GROUP 6

In this group are well drained and moderately well drained, acid sandy soils. The soils in the uplands are nonstony to very stony, and those on terraces are nonstony. The slopes range from 0 to 25 percent.

The soils in the uplands formed in stony glacial till. Stones are on these soils and in them and in places boulders are below the surface. Some of the soils have a compact layer within 2½ feet of the surface. Others may have a compact layer below a depth of 3 to 4 feet. The compact layer has moderately slow to slow permeability.

The soils on terraces formed in deep sandy and gravelly deposits that have few or no stones. Some of them are underlain by a silty substratum that has moderately slow to slow permeability. This layer is generally at a depth of 2 to 2½ feet, but in places it is at a depth of 5 feet.

The soils in this group are—

Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes.
Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes.
Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes.
Charlton fine sandy loam, 3 to 8 percent slopes.
Charlton fine sandy loam, 8 to 20 percent slopes.
Charlton very stony fine sandy loam, 3 to 15 percent slopes.
Charlton very stony fine sandy loam, 15 to 25 percent slopes.
Cheshire fine sandy loam, 3 to 8 percent slopes.
Cheshire fine sandy loam, 8 to 15 percent slopes.
Cheshire fine sandy loam, 15 to 25 percent slopes.
Cheshire very stony fine sandy loam, 3 to 8 percent slopes.
Cheshire very stony fine sandy loam, 8 to 15 percent slopes.
Cheshire very stony fine sandy loam, 15 to 25 percent slopes.
Deerfield loamy fine sand, 0 to 3 percent slopes.
Essex fine sandy loam, 3 to 8 percent slopes.
Essex fine sandy loam, 8 to 15 percent slopes.
Essex fine sandy loam, 15 to 25 percent slopes.
Essex very stony fine sandy loam, 3 to 8 percent slopes.
Essex very stony fine sandy loam, 8 to 15 percent slopes.
Essex very stony fine sandy loam, 15 to 25 percent slopes.
Gloucester fine sandy loam, 0 to 3 percent slopes.
Gloucester fine sandy loam, 3 to 8 percent slopes.
Gloucester fine sandy loam, 8 to 15 percent slopes.
Gloucester fine sandy loam, 15 to 25 percent slopes.
Gloucester sandy loam, 3 to 8 percent slopes.
Gloucester sandy loam, 8 to 15 percent slopes.
Gloucester sandy loam, 15 to 25 percent slopes.
Gloucester very stony sandy loam, 3 to 8 percent slopes.
Gloucester very stony sandy loam, 8 to 15 percent slopes.
Gloucester very stony sandy loam, 15 to 25 percent slopes.
Scituate fine sandy loam, 0 to 3 percent slopes.
Scituate fine sandy loam, 3 to 8 percent slopes.
Scituate fine sandy loam, 8 to 15 percent slopes.
Scituate very stony fine sandy loam, 0 to 3 percent slopes.
Scituate very stony fine sandy loam, 3 to 8 percent slopes.
Scituate very stony fine sandy loam, 8 to 15 percent slopes.
Sudbury fine sandy loam, 0 to 3 percent slopes.
Sudbury fine sandy loam, 3 to 8 percent slopes.

These soils have moderate to high moisture-holding capacity, and trees grow fairly well on them. The site indexes are 46 to 51 for northern hardwoods on the Gloucester soils and 52 to 57 on the other soils; 45 to 54 for upland oaks on the Gloucester soils and 55 to 64 on the others; 50 to 59 for white pine on the Deerfield, Essex, and Gloucester soils and 60 to 69 on the other soils; and 60 to 69 for red pine. Red spruce generally does not grow on the soils in this group.

All species of trees develop deep rooting systems in these soils and are windfirm. Hardwoods regenerate readily and the stands can be improved without difficulty, but regeneration is usually difficult for conifers. Site preparation and subsequent weeding are necessary to develop young conifers until there is no danger of overtopping by hardwoods.

The use of equipment is slightly limited on slopes of 0 to 15 percent and moderately limited on slopes of 15 to 25 percent. The construction of woodland roads is slightly limited on all except the Deerfield, Scituate, and Sudbury soils. It is moderately limited on these soils because they are wet in the spring and sometimes in the fall. The hazards of windthrow and seedling mortality are slight for planted hardwoods or conifers.

WOODLAND SUITABILITY GROUP 7

In this group are poorly drained, nonstony to extremely stony soils that have slopes of 0 to 10 percent. These soils are on uplands, terraces, and flood plains. They formed in glacial till derived from acid and limy materials, in silty and clayey lacustrine deposits, in sandy and gravelly deposits, in sandy material underlain by clay, and in alluvium. These soils have a high water table at or near the surface for 7 to 9 months of the year.

The soils in this group are—

Cabot fine sandy loam, 0 to 3 percent slopes.
Cabot fine sandy loam, 3 to 8 percent slopes.
Cabot extremely stony fine sandy loam, 0 to 10 percent slopes.
Limerick silt loam.
Limerick-Saco silt loams (Limerick part only; see woodland suitability group 13 for the Saco part).
Raynham silt loam, 0 to 3 percent slopes.
Ridgebury fine sandy loam, 0 to 3 percent slopes.
Ridgebury fine sandy loam, 3 to 8 percent slopes.
Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes.
Rumney fine sandy loam.
Stissing silt loam, 0 to 8 percent slopes.
Stissing very stony silt loam, 3 to 8 percent slopes.
Swanton very fine sandy loam, 0 to 3 percent slopes.
Swanton very fine sandy loam, 3 to 8 percent slopes.
Walpole and Wareham fine sandy loams, 0 to 3 percent slopes.
Walpole and Wareham fine sandy loams, 3 to 8 percent slopes.

Although a high water table keeps these soils saturated 7 to 9 months of the year, trees grow well to fairly well on

them. The site indexes are 52 to 57 for northern hardwoods on the Cabot soils and 46 to 51 on the other soils; 55 to 64 for upland oaks; 60 to 69 for white pine; 70 or more for red pine; and 52 to 56 for red spruce. Red spruce is generally grown only on the Ridgebury soils in the western part of the county.

Many species of trees are moderately well adapted to these soils, but yields for most species except red pine are reduced by the high water table and at times by ponding. Shade-tolerant trees readily establish themselves in openings. The growth of miscellaneous hardwood trees and shrubs has to be controlled to prevent the overtopping of young conifers. The high water table prevents the development of deep rooting systems and consequently trees are not windfirm. This fact needs to be considered in maintaining stand density, as open stands are more subject to windthrow than dense stands.

Because of the high water table, the hazards of seedling mortality and windthrow and the limitations on equipment and woodland roads are severe.

WOODLAND SUITABILITY GROUP 8

In this group are droughty, sandy and gravelly soils on terraces and flood plains. These soils formed in deep deposits of sandy or sandy and gravelly, acid materials. The slopes range from 0 to 35 percent.

These soils have rapid permeability and good internal drainage. They are generally not stony, although there are a few stones and boulders in places.

The soils in this group are—

Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes.
Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes.
Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes.
Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes.
Hinckley sandy loam, 0 to 3 percent slopes.
Hinckley sandy loam, 3 to 8 percent slopes.
Hinckley sandy loam, 8 to 15 percent slopes.
Hinckley sandy loam, 15 to 35 percent slopes.
Suncook loamy sand.
Windsor loamy fine sand, 0 to 3 percent slopes.
Windsor loamy fine sand, 3 to 8 percent slopes.
Windsor loamy fine sand, 8 to 15 percent slopes.
Windsor loamy fine sand, 15 to 35 percent slopes.
Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes.

These coarse-textured, droughty soils have a low moisture-holding capacity, and trees grow slowly on them. The site indexes are 46 to 51 for northern hardwoods, 45 to 54 for upland oaks; 50 to 59 for white pine; 50 to 59 for red pine on the Hinckley soils and 60 to 69 on the other soils. Red spruce does not generally grow on the soils in this group.

All species of trees develop adequate rooting systems in these deep, dry soils. Droughtiness inhibits growth, however, and hardwood trees and shrubs do not grow vigorously. Their density is less than on soils having a higher moisture-holding capacity. The weeding out of hardwood growth is usually not necessary to develop young coniferous stands. Areas regenerate readily to conifers if a seed source is available.

These deep, nonstony, sandy and gravelly soils have only slight limitations for woodland roads. The hazard of windthrow is also only slight because the soils have good internal drainage and do not have layers that inhibit deep rooting. Seedling mortality of planted hardwoods and conifers is moderate because of droughtiness. The equipment limitation is slight on 0 to 15 percent slopes, moderate on 15 to 25 percent slopes, and severe on slopes greater than 25 percent.

WOODLAND SUITABILITY GROUP 9

In this group are poorly drained, nonstony soils on sandy, silty, and clayey terraces. Their slopes range from 0 to 8 percent but are mostly 0 to 3 percent. These soils have a slowly permeable subsoil and a high water table at or near the surface for about 7 to 9 months of the year.

The soils in this group are—

Saugatuck loamy sand.
Scantic silt loam, 0 to 3 percent slopes.
Scantic silt loam, 3 to 8 percent slopes.

Trees do not grow well on these soils because they are saturated a good part of the year, and they consist of infertile sandy material or very slowly permeable clayey material. The site indexes are 46 to 51 for northern hardwoods; 45 to 54 for upland oaks; 60 to 69 for white pine on the Saugatuck soils and 50 to 59 on the Scantic soils; and 50 to 59 for red pine. Red spruce does not generally grow on the soils in this group.

Many trees are moderately well adapted to these soils. Yields of most trees are reduced, however, because of the high water table and ponding. Shade-tolerant trees readily establish themselves in openings. The growth of miscellaneous hardwood trees and shrubs has to be controlled to prevent overtopping of young conifers. The high water table prevents the development of deep rooting systems. Consequently, trees are not windfirm. This fact needs to be considered in maintaining stand density, as open stands are more subject to windthrow than dense stands.

Windthrow and seedling mortality and limitations on equipment and woodland roads are severe because these soils are saturated for 7 or more months of the year.

WOODLAND SUITABILITY GROUP 10

In this group are shallow soils in uplands. These soils have formed in acid glacial till. Their slopes range from 3 to 25 percent.

The depth to bedrock is generally 1½ to 2 feet, and the distance between rock outcrops is generally 100 to 300 feet or more. Stones are below the surface layer and in places on the surface where they have not been removed to permit tillage.

The soils in this group are—

Hollis fine sandy loam, 3 to 8 percent slopes.
Hollis fine sandy loam, 8 to 15 percent slopes.
Hollis very rocky fine sandy loam, 3 to 15 percent slopes.
Hollis very rocky fine sandy loam, 15 to 25 percent slopes.
Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes.
Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes.
Lyman very rocky loam, 3 to 15 percent slopes.
Lyman very rocky loam, 15 to 25 percent slopes.
Nassau very rocky silt loam, 3 to 15 percent slopes.
Nassau very rocky silt loam, 15 to 25 percent slopes.
Shapleigh fine sandy loam, 3 to 8 percent slopes.
Shapleigh fine sandy loam, 8 to 15 percent slopes.
Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes.
Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes.
Westminster loam, 3 to 8 percent slopes.
Westminster loam, 8 to 15 percent slopes.

Westminster loam, 15 to 25 percent slopes.
Westminster very rocky loam, 3 to 15 percent slopes.
Westminster very rocky loam, 15 to 25 percent slopes.

Trees generally grow slowly on these rocky and shallow soils. The site indexes are 52 to 57 for northern hardwoods; 54 to less than 44 for upland oaks; 50 to 59 for white pine and red pine; and 46 to 51 for red spruce. Red spruce generally grows only on the Lyman and Westminster soils, which are at higher elevations in the western part of the county.

These soils vary in depth, but generally bedrock is less than 2 feet from the surface. This variability causes a range in the productive potential of adapted trees. Hardwoods usually regenerate naturally. Conifers establish themselves readily but need to be released from hardwood competition until they reach a height of 5 to 10 feet. Partial cuttings should be avoided, as trees are only moderately windfirm on these soils.

Because of the shallowness and rock outcrops, the limitations on equipment and woodland roads and the hazards of windthrow and seedling mortality are moderate.

WOODLAND SUITABILITY GROUP 11

In this group are extremely rocky and shallow soils in uplands. These soils are also stony. They formed in acid, glacial till. Their slopes range from 3 to 90 percent. The depth to bedrock is generally less than 1½ to 2 feet, and rock outcrops are generally 5 to 75 feet apart.

The soils in this group are—

Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes.
Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes.
Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes.
Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes.
Lyman extremely rocky loam, 3 to 25 percent slopes.
Lyman extremely rocky loam, 25 to 80 percent slopes.
Nassau extremely rocky silt loam, 3 to 25 percent slopes.
Nassau extremely rocky silt loam, 25 to 75 percent slopes.
Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes.
Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes.
Westminster extremely rocky loam, 3 to 25 percent slopes.
Westminster extremely rocky loam, 25 to 75 percent slopes.

Trees grow very slowly on these extremely rocky and shallow soils. The site indexes are 46 to 51 for northern hardwoods; 44 and lower for upland oaks; 49 and lower for white pine and red pine; and 45 and lower for red spruce. Red spruce generally grows only on the Lyman and Westminster soils, which are at higher elevations in the western part of the county.

Because these soils are shallow and have many rock outcrops, they produce very low yields of forest crops. Woodland stands generally do not justify intensive management for lumber.

On these shallow, steep, rocky soils, the hazards of seedling mortality and windthrow are severe. The use of equipment and the construction of woodland roads are also severely limited.

WOODLAND SUITABILITY GROUP 12

In this group are very droughty, sandy soils on terraces. These soils formed in deep, sandy deposits. They are nonstony, and their slopes range from 0 to 25 percent. In places these soils contain some gravel, and gravel strata may be at a depth of 4 to 5 feet. These soils are rapidly permeable.

The soils in this group are—

Carver loamy coarse sand, 0 to 3 percent slopes.
Carver loamy coarse sand, 3 to 8 percent slopes.
Carvery loamy coarse sand, 8 to 15 percent slopes.
Carver loamy coarse sand, 15 to 25 percent slopes.

These coarse-textured, very droughty soils have a very low moisture-holding capacity, and trees grow very slowly on them. The site indexes are 45 or lower for northern hardwoods; 44 or lower for upland oaks; and 49 or lower for white pine and red pine. Red spruce does not generally grow on these soils.

All adapted species of trees can develop adequate rooting systems in these deep, very droughty soils. Droughtiness inhibits growth, however, and hardwood trees and shrubs do not grow vigorously. It is not usually necessary to weed out hardwood growth so that young conifers can develop. Most areas of these soils grow up in conifers if a seed source is available. Many areas are wooded with pitch pine and scrub oak.

Seedling mortality is severe because of the extreme droughtiness. The windthrow hazard, however, is slight because these deep, nonstony sandy soils have good internal drainage and do not have layers that inhibit root development. The limitation on woodland roads is also slight. The equipment limitation is slight on slopes of 0 to 15 percent and moderate on those of 15 to 25 percent.

WOODLAND SUITABILITY GROUP 13

In this group are very poorly drained, nonstony to extremely stony soils in depressions or low places on uplands, terraces, and flood plains. These soils formed in glacial till derived from acid and limy materials, in silty and clayey lacustrine deposits, in sandy and gravelly material, in alluvium, and in organic deposits. Most of the soils have slopes of less than 3 percent.

Generally, these soils have a water table at or near the surface 10 or more months of the year.

The soils in this group are—

Biddeford silt loam.
Cabot loam, black surface, 0 to 3 percent slopes.
Cabot very stony loam, black surface, 0 to 3 percent slopes.
Cabot very stony loam, black surface, 3 to 8 percent slopes.
Limerick-Saco silt loams, (Saco part only; see woodland suitability group 7 for the Limerick part).
Muck.
Muck, shallow.
Peat.
Saco silt loam.
Scarboro fine sandy loam, brownish subsoil variant.
Whitman fine sandy loam, 0 to 3 percent slopes.
Whitman extremely stony fine sandy loam, 0 to 3 percent slopes.

These soils are saturated most of the year, and trees grow very slowly on them. Excess wetness makes them unsuitable for upland oaks and red pine. Northern hardwoods are not suited to the Peat soil and have a site index of 45 and lower on the other soils. The site index for white pine is 49 and lower on the Biddeford soils and 50 to 59 on the other soils. Red spruce generally grows only on the Muck, Peat, and Whitman soils. The site index for red spruce is 46 to 51 on the Whitman soils and 45 and lower on the Muck and Peat soils.

Depending upon the degree of wetness at any given place, trees grow individually or in groups on these soils, and they generally grow on hummocks. The trees are very shallow rooted because of the high water table. Natural regeneration should be relied upon for the existing species. On these very wet soils, seeding mortality and windthrow are severe hazards, and limitations on equipment and woodland roads are also severe.

Use of Soils for Wildlife

In this section the principal kinds of wildlife are briefly noted. The soil associations shown in the general soil map are grouped in five wildlife areas and the food, cover, and kinds of wildlife in each group are discussed. In addition, the suitability of the soils of the county for particular kinds of wildlife and wildlife habitats is rated. These ratings are given in table 4.

TABLE 4.—*Suitability of soils for wildlife habitats and kinds of wildlife*

[Key—1=well suited; 2=suitable; 3=poorly suited; 4=unsuited]

Soil series and map symbols	Kind of habitat								Kind of wildlife		
	Grain and seed crop	Grass and legume	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water	Excavated pond	Openland wildlife	Woodland wildlife	Wetland wildlife
Agawam:											
AfA, AgA	1	1	1	1	3	4	4	4	1	1	4
AfB, AfC, AgB, AgC	2	1	1	1	3	4	4	4	1	1	4
AfD	3	2	1	1	3	4	4	4	2	2	4
Belgrade:											
BaA	2	1	1	1	3	3	3	3	1	1	3
BaB	2	1	1	1	3	4	4	4	1	1	4
Berkshire:											
BbB, BbC, BeB, BeC	2	1	1	1	3	4	4	4	1	1	4
BbD, BeD	3	2	1	1	3	4	4	4	2	2	4
BcB, BcC, BcD, BfB, BfC, BfD	4	3	1	1	2	4	4	4	3	1	4
BdB, BdD, BdF, BgB, BgD, BgF	4	4	1	1	2	4	4	4	3	2	4
Bernardston:											
BhB, BhC	2	1	1	1	3	4	4	4	1	1	4
BhD	3	2	1	1	3	4	4	4	2	2	4
BmB, BmC, BmD	4	3	1	1	2	4	4	4	3	1	4
BmF	4	4	1	1	2	4	4	4	3	1	4
Biddeford:											
Bn	4	3	3	1	1	1	1	1	3	1	1
Broadbrook:											
BsB, BsC	2	1	1	1	3	4	4	4	1	1	4
BsD	3	2	1	1	3	4	4	4	2	2	4
BtC, BtD	4	3	1	1	2	4	4	4	3	1	4
Buckland:											
BuA	2	1	1	1	3	3	3	3	1	1	3
BuB, BuC	2	1	1	1	3	4	4	4	1	1	4
BuD	3	2	1	1	3	4	4	4	2	2	4
BvB, BvC, BvD	4	3	1	1	2	4	4	4	3	1	4
BwB, BwC	4	4	1	1	2	4	4	4	3	2	4
Buxton:											
BxA	2	1	1	1	3	3	3	3	1	1	3
BxB	2	1	1	1	3	4	4	4	1	1	4
Cabot:											
CaA	3	2	2	1	2	1	1	1	2	1	1
CaB	3	2	2	1	2	3	4	4	2	1	4
CbB	4	4	2	1	2	3	4	4	3	2	4
CcA	4	4	2	1	2	1	1	1	3	2	1
CdA	4	3	2	1	2	1	2	2	3	2	1
CdB	4	3	2	1	2	3	4	4	3	2	4
Carver:											
CeA, CeB, CeC	3	3	3	3	2	4	4	4	3	2	4
CeD	4	3	3	3	2	4	4	4	4	3	4
Charlton:											
CkB, CkC	2	1	1	1	3	4	4	4	1	1	4
CmC, CmD	4	3	1	1	2	4	4	4	3	1	4
CnB, CnD, CnE	4	4	1	1	2	4	4	4	3	2	4
Cheshire:											
CoB, CoC	2	1	1	1	3	4	4	4	1	1	4
CoD	3	2	1	1	3	4	4	4	2	1	4
CpB, CpC, CpD	4	3	1	1	2	4	4	4	3	1	4
CrB, CrD, CrE	4	4	1	1	2	4	4	4	3	2	4

TABLE 4.—*Suitability of soils for wildlife habitats and kinds of wildlife*—Continued

Soil series and map symbols	Kind of habitat								Kind of wildlife		
	Grain and seed crop	Grass and legume	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water	Excavated pond	Openland wildlife	Woodland wildlife	Wetland wildlife
Colrain:											
CsB, CsC	2	1	1	1	3	4	4	4	1	1	4
CsD	3	2	1	1	3	4	4	4	2	1	4
CvB, CvC, CvD	4	3	1	1	2	4	4	4	3	1	4
CxB, CxD, CxF	4	4	1	1	2	4	4	4	3	2	4
Deerfield:											
DfA	3	2	2	3	3	3	3	3	2	3	3
Dutchess:											
DuB, DuC	2	1	1	1	3	4	4	4	1	1	4
DuD	3	2	1	1	3	4	4	4	2	2	4
DvC, DvD	4	3	1	1	2	4	4	4	3	1	4
DxD, DxF	4	4	1	1	2	4	4	4	3	2	4
Essex:											
EfB, EfC	2	1	1	1	3	4	4	4	1	1	4
EfD	3	2	1	1	3	4	4	4	2	2	4
EvB, EvC, EvD	4	3	1	1	2	4	4	4	3	1	4
ExB, ExC, ExE	4	4	1	1	2	4	4	4	3	2	4
Gloucester:											
GfA, GfB, GfC, GmB, GmC	2	1	1	2	3	4	4	4	1	2	4
GfD, GmD	3	2	1	2	3	4	4	4	2	2	4
GvB, GvC, GvD	4	3	1	2	2	4	4	4	3	2	4
GxB, GxC, GxE	4	4	1	2	2	4	4	4	3	2	4
Hadley:											
HaA, HbA	1	1	1	1	3	4	4	4	1	1	4
HaB, HbB	2	1	1	1	3	4	4	4	1	1	4
HcA	4	3	3	1	1	4	4	4	3	1	4
Hartland:											
HdA	1	1	1	1	3	4	4	4	1	1	4
HdB, HdC	2	1	1	1	3	4	4	4	1	1	4
HdD	3	2	1	1	3	4	4	4	2	2	4
Hinckley:											
HgA, HgB, HgC, HkA, HkB, HkC	2	2	2	2	2	4	4	4	2	2	4
HgD, HkD	3	2	2	2	2	4	4	4	2	2	4
Hollis:											
HmB, HmC	2	2	2	2	2	4	4	4	2	2	4
HnC, HnD	4	3	2	2	2	4	4	4	3	2	4
HoD, HoF	4	4	3	3	1	4	4	4	4	3	4
Holyoke and Sutherland:											
HvC, HvD	4	3	2	2	2	4	4	4	3	2	4
HxD, HxF	4	4	3	3	1	4	4	4	4	3	4
Limerick:											
Lk	3	2	2	1	2	2	3	4	2	1	3
Limerick-Saco:											
Ls [1]	----	----	----	----	----	----	----	----	----	----	----
Lyman:											
LvC, LvD	4	3	2	2	2	4	4	4	3	2	4
LxC, LxF	4	4	3	3	1	4	4	4	4	3	4
Marlow:											
MaB, MaC, MdB, MdC	2	1	1	1	3	4	4	4	1	1	4
MaD, MdD	3	2	1	1	3	4	4	4	2	2	4
MbB, MbC, MbD, MeB, MeC, MeD	4	3	1	1	2	4	4	4	3	1	4
McB, McD, MfB, MfD, MfE	4	4	1	1	2	4	4	4	3	2	4
Merrimac:											
MgA	1	1	1	1	3	4	4	4	1	1	4
MgB, MgC	2	1	1	1	3	4	4	4	1	1	4
MgD	3	2	1	1	3	4	4	4	2	2	4
MmA, MmB, MmC	2	1	2	2	3	4	4	4	1	2	4
MmE	4	3	2	2	3	4	4	4	3	3	4
Muck:											
Mu	4	3	4	4	1	2	1	1	4	4	1
Ms	4	3	4	3	1	2	1	1	4	3	1
Nassau:											
NaC, NaD	4	3	2	2	2	4	4	4	3	2	4
NeC, NeF	4	4	3	3	1	4	4	4	4	3	4

See footnotes at end of table.

TABLE 4.—*Suitability of soils for wildlife habitats and kinds of wildlife*—Continued

Soil series and map symbols	Kind of habitat								Kind of wildlife		
	Grain and seed crop	Grass and legume	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water	Excavated pond	Openland wildlife	Woodland wildlife	Wetland wildlife
Ninigret:											
NfA, NgA	2	1	1	1	3	3	3	3	1	1	3
NfB, NgB	2	1	1	1	3	4	4	4	1	1	4
Ondawa:											
Of	4	3	3	1	1	4	4	4	3	1	4
Peat:											
Pa	4	3	4	4	1	2	1	1	4	4	1
Peru:											
PbA	2	1	1	1	3	3	3	3	1	1	3
PbB, PbC	2	1	1	1	3	4	4	4	1	1	4
PcB, PcC, PcD	4	3	1	1	2	4	4	4	3	1	4
PeB, PeC	4	4	1	1	2	4	4	4	3	2	4
Pittstown:											
PnB	2	1	1	1	3	4	4	4	1	1	4
Podunk:											
Po	2	1	1	1	3	3	3	3	1	1	3
Raynham:											
RaA	3	2	2	1	2	1	1	1	2	1	1
Ridgebury:											
RdA	3	2	2	1	2	1	1	1	2	1	1
RdB	3	2	2	1	2	3	4	4	2	1	4
RgB	4	4	2	1	2	3	4	4	3	2	4
Riverwash:											
Rs [2]	----	----	----	----	----	----	----	----	----	----	----
Rumney:											
Ru	3	2	2	1	2	2	3	4	2	1	3
Saco:											
Sa	4	3	3	1	1	1	4	4	3	1	3
Saugatuck:											
Sb	3	2	2	1	2	1	1	1	2	1	1
Scantic:											
ScA	3	2	2	1	2	1	1	1	2	1	1
ScB	3	2	2	1	2	4	4	4	2	1	4
Scarboro:											
Sd	4	3	3	1	1	1	1	1	3	1	1
Scituate:											
SeA	2	1	1	1	3	3	3	3	1	1	3
SeB, SeC	2	1	1	1	3	4	4	4	1	1	4
SfA	4	3	1	1	2	3	3	3	3	1	3
SfB, SfC	4	3	1	1	2	4	4	4	3	1	4
SgB, SgC	4	4	1	1	2	4	4	4	3	2	4
Shapleigh:											
ShB, ShC	2	2	2	2	2	4	4	4	2	2	4
SkC, SkD	4	3	2	2	2	4	4	4	3	2	4
SmC, SmF	4	4	3	3	1	4	4	4	4	3	4
Shelburne:											
SnB, SnC	2	1	1	1	3	4	4	4	1	1	4
SnD	3	2	1	1	3	4	4	4	2	2	4
SoB, SoC, SoD	4	3	1	1	2	4	4	4	3	1	4
SpB, SpD, SpF	4	4	1	1	2	4	4	4	3	2	4
Stissing:											
SrB	3	2	2	1	2	2	2	2	2	1	2
SsB	4	3	2	1	2	3	4	4	3	2	4
Sudbury:											
StA	2	1	1	1	3	3	3	3	1	1	3
StB	2	1	1	1	3	4	4	4	1	1	4
Suffield:											
SuB, SuC2	2	1	1	1	3	4	4	4	1	1	4
SuE2	4	4	1	1	3	4	4	4	3	2	4
Suncook:											
Sv	3	3	3	3	2	4	4	4	3	3	4
Sutton:											
SwB, SwC	2	1	1	1	3	4	4	4	1	1	4
SxB, SxC	4	3	1	1	2	4	4	4	3	1	4
SyB, SyC	4	4	1	1	2	4	4	4	3	2	4

See footnotes at end of table.

TABLE 4.—*Suitability of soils for wildlife habitats and kinds of wildlife*—Continued

Soil series and map symbols	Kind of habitat								Kind of wildlife		
	Grain and seed crop	Grass and legume	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water	Excavated pond	Openland wildlife	Woodland wildlife	Wetland wildlife
Swanton:											
SzA	3	2	2	1	2	1	1	1	2	1	1
SzB	3	2	2	1	2	4	4	4	2	1	4
Walpole and Wareham:											
WaA	3	2	2	1	2	1	1	1	2	1	1
WaB	3	2	2	1	2	3	4	4	2	1	4
Warwick:											
WfA, WgA	1	1	1	1	3	4	4	4	1	1	4
WfB, WfC, WgB, WgC	2	1	1	1	3	4	4	4	1	1	4
WfD	4	3	1	1	3	4	4	4	3	1	4
Westminster:											
WmB, WmC	2	2	2	2	2	4	4	4	2	2	4
WmD	3	2	2	2	2	4	4	4	2	2	4
WnC, WnD	4	3	2	2	2	4	4	4	3	2	4
WrD, WrF	4	4	3	3	1	4	4	4	4	3	4
Whitman:											
WsA	4	3	3	1	1	1	1	1	3	1	1
WtA	4	4	3	1	1	1	2	2	4	2	1
Windsor:											
WuA, WuB, WuC, WvB	3	3	3	3	2	4	4	4	3	3	4
WuE	4	3	3	3	2	4	4	4	4	3	4
Winooski:											
Ww	2	1	1	1	3	3	3	3	1	1	3

[1] See separate ratings for Limerick and Saco soils. [2] Not rated.

The principal kinds of wildlife in the county

The occurrence and abundance of all species of wildlife are related to the soils. Most of the relationships are indirect and are influenced primarily by land use, kinds of plant cover in both woodland and cultivated areas, and topography. Waterfowl, for example, are directly related to such soil characteristics as wetness. The abundance, size, and reproductive capacity of deer, rabbits, and some other species may be related to soil fertility. Brook trout are larger, more abundant, and grow faster in streams that flow through areas where the soils contain limestone than in streams in areas containing no limestone.

White-tailed deer are the principal large game animals in Franklin County. Black bear and wildcats are minor species that occur mainly in the western part of the county.

Small game includes ruffed grouse, cottontail, varying hare, ring-neck pheasant, raccoon, gray squirrel, and woodcock. Beaver, which were nearly extinct a few years ago, are now common in most parts of the county. Their ponds provide nesting sites and feeding grounds for wood ducks and black ducks. The local increase in the number of these ducks is directly related to the increase in the number of beaver ponds in the county.

The ring-necked pheasant is stocked annually in the county by the Massachusetts Division of Fisheries and Game. Most of the birds are released in the Connecticut River valley, where the climate is better suited and the food supply is enough to carry survivors through the winter.

Varying hare are released by the same agency and several local sportmen's organizations. They are released primarily in the western part of the county and in a narrow strip along the north boundary, where the food supply, cover, and climate are most suitable.

The principal game fish are large-mouth bass, pickerel, brook trout, brown trout, and rainbow trout. Game fish are managed mainly by the Massachusetts Division of Fisheries and Game in public waters. Only a few fish ponds are privately owned and managed in the county.

Wildlife areas

For convenience, the various soil associations of the county are grouped in five wildlife areas. These areas and their principal kinds of wildlife are discused in the following pages.

WILDLIFE AREA 1

This area is equivalent to soil associations 1 and 2 on the general soil map. It consists mainly of the hilly to very steep upland till soils. The Lyman and Westminster soils make up about 60 percent of the area. These soils are shallow to bedrock. The Berkshire, Marlow, and Peru soils make up most of the rest. These are acid, well drained and moderately well drained soils.

About 85 percent of this wildlife area is in woodland, and about 15 percent is used for cultivated crops. Maple, birch, and beech are the principal trees in the woodland, but there are some spruce, hemlock, and white pine trees. Many pastures and hayfields have been neglected and abandoned, and desirable grasses and legumes are being replaced with weeds, shrubs, and small trees.

The principal wildlife in this area are deer, varying hare, ruffed grouse, and waterfowl. The deep snow and lack of food during the long cold winters make this area unsuitable for ring-necked pheasant.

Deer.—The hayfields, pastures, and abandoned fields furnish excellent food for deer from early in spring to early in winter. Brushland occurs throughout the area, and deer feed on the buds and twigs, especially in the winter when the ground is covered with snow. There are many areas of dense spruce and hemlock cover that can be used for winter yards, but well-protected areas with good winter feed are not common.

Varying hare.—The abandoned fields and pastures provide excellent year-round feeding areas for the varying hare. Additional winter grazing is provided by shrubs and grasses that grow in old logging roads and along highways. Areas of mixed conifers and northern hardwoods are used for cover, especially those having an understory of mountain-laurel.

Ruffed grouse.—The areas of northern hardwoods are used by ruffed grouse for nesting and for rearing broods. Fruit- and seed-bearing shrubs in cutover woodlots, abandoned fields, and along field borders provide excellent sources of food from spring until early in winter. During the winter months, the grouse use the spruce and hemlock stands in the woodlands for cover and feeding grounds. In sections that have been logged recently, there are numerous stands of small aspen, birch, and willow trees. The buds of these trees are a source of food for ruffed grouse in winter and early in spring.

Waterfowl.—Widely scattered beaver ponds provide the only nesting and feeding grounds for waterfowl in this part of the county.

WILDLIFE AREA 2

This area is equivalent to soil association 3 on the general soil map. It is a nearly level to sloping area that is made up mainly of well-drained to somewhat droughty Merrimac and Ondawa soils. About 95 percent of the area is used for cultivated crops and pasture, and about 5 percent is in woodland. The woodland consists of mixed stands of birch, aspen, willow, and red maple. The cleared land is used mainly for hay and pasture.

The principal wildlife in this area are deer, ruffed grouse, and waterfowl. This area is generally unsuitable for varying hare because of lack of cover. It is also unsuitable for ring-necked pheasant because of the severe winters and the lack of seed and grain crops. Some pheasant are released during the hunting season, but few survive.

Deer.—The hayfields and pastures furnish excellent food for deer from early in spring to early in winter. Cover and winter feed are generally lacking in the area, but deer from the adjacent uplands of wildlife area 1 use this area for feeding grounds from early in spring until early in winter.

Ruffed grouse.—The small areas of woodland are used sparingly early in spring as feeding grounds by ruffed grouse. The lack of cover and year-round sources of food make this area generally unsuitable for a large permanent population of ruffed grouse.

Waterfowl.—There are few shallow impoundments in this area suitable for nesting and feeding grounds for waterfowl. A limited number of nesting and feeding grounds, however, are available along Clesson Brook, North River, and the Deerfield River.

WILDLIFE AREA 3

This soil area is equivalent to soil associations 4, 5, and 6 on the general soil map. It consists of gently sloping to hilly upland ridges. The soils are dominantly well drained and moderately well drained, but susbtantial areas of rocky soils are included. About 50 percent of the area is used for cultivated crops and pasture, and about 50 percent is in woodland. Most of the cultivated acreage is used for hay and pasture, but some silage corn is grown on most all farms in the area. Maple, birch, and beech are the main trees in woodlands, but there are a few white pine and hemlock.

The principal wildlife in this area are deer, varying hare, ruffed grouse, and waterfowl. Severe winters and lack of food make this wildlife area generally unsuitable for ring-necked pheasant. Some birds are liberated during the hunting season, but few survive.

Deer.—There are many hayfields and pastures in this area that provide excellent grazing for deer from spring until late in fall and early in winter. Hardwood sprouts and seedlings have grown up in recently logged areas and furnish good winter feed. Abandoned pastures soon develop a dense stand of juniper that deer use for cover. The hemlock stands provide good winter cover.

Varying hare.—Hayfields and pastures that are adjacent to abandoned land or woodland furnish good summer grazing and cover for hare. Wet areas associated with the dominant soils support dense thickets of woody shrubs, usually including mountain-laurel. These thickets are used the year round by varying hare for food and cover.

Ruffed grouse.—Borders between woodlands and pastures and hayfields furnish good cover and feeding sites for grouse. Shrubs that produce seeds and fruit volunteer readily in such places and are used by grouse and other kinds of wildlife for food. Hawthorn trees volunteer in some overgrazed or abandoned pastures, generally as scattered trees but in places as thickets. These are used by ruffed grouse in the fall for both food and cover.

Waterfowl.—Scattered beaver ponds and old mill ponds furnish limited nesting and feeding grounds for waterfowl.

WILDLIFE AREA 4

This area is equivalent to soil associations 7, 8, 9, and 10 on the general soil map. It is in the Connecticut River valley. Except those in association 9, the soils in this wildlife area are nearly level to sloping, and dominantly slightly droughty, well drained, and moderately well drained. They are used mainly for cultivated crops. Soil association 9 consists of steep, rocky land that is mainly in woodland. Scattered areas of poorly drained and very poorly drained soils occur throughout all parts of this wildlife area.

The principal wildlife in the area are deer, waterfowl, and ring-necked pheasant. Lack of food and cover make this wildlife area unsuitable for varying hare. Except for scattered areas adjacent to the uplands, this part of the county is generally unsuitable for ruffed grouse.

Deer.—Mixed stands of conifers and hardwoods in association 9 and in some of the poorly and very poorly drained sections of the other associations of this wildlife area are

used by deer for year-round food and cover. In addition, pastures and hayfields adjacent to these wooded tracts furnish excellent grazing from early in spring to early in winter. Some deer move into these grazing areas from the adjacent uplands in wildlife area 3 and from association 11 of wildlife area 5.

Waterfowl.—Most of the natural wetlands suitable for waterfowl occur on the Limerick and Saco soils. These soils are for the most part within short distances of either the Deerfield or Connecticut Rivers and occupy depressions in former channels of these rivers.

Ring-necked pheasant.—Because of land use in this part of the county, areas used for seed and grain crops are close to hayfields and swampy or marshy areas. This combination furnishes food, nesting sites, and year-round cover for ring-necked pheasant. In addition the winter weather is less severe than in the rest of the county. All of these factors combine to produce a suitable habitat for pheasant. The normal bird population is increased during the hunting season by the liberation of birds raised on game farms, but a substantial number survives both the hunting season and natural predators.

WILDLIFE AREA 5

This area is equivalent to soil associations 11 and 12. It consists of gently sloping to steep till ridges of the upland and nearly level to sloping outwash plains. The dominant soils on the ridges are the shallow-to-bedrock Shapleigh and the well-drained Essex and Gloucester soils. The excessively drained Hinckley and somewhat excessively drained Merrimac soils are dominant on the outwash plains. Areas of wet soils are associated with the dominant soils in this wildlife area.

About 80 percent of the area is in woodland, and about 20 percent is used for hay and pasture. The mixed stands of pine, maple, and oak are dominant in the woodland. Some birch, beech, and hemlock trees also grow. Many of the poorly drained and very poorly drained wooded areas have almost pure stands of red maple.

The principal wildlife in this area are deer, varying hare, ruffed grouse, and waterfowl. The lack of cultivated land used for seed and grain crops makes this part of the county generally unsuitable for ring-necked pheasant.

Deer.—In summer, areas used for hay and pasture provide limited grazing for deer. In winter, hedgerows and borders adjacent to cultivated fields and hardwood sprouts on a few recently logged areas provide most of the grazing. Dense hemlock stands are plentiful enough to furnish winter cover. Gray birch, red maple, alder, and willow are available in small amounts for winter food in the poorly and very poorly drained areas.

Varying hare.—The vegetation in most of this part of the county seems to be unsuitable for varying hare. The northern third of this area is an exception. Here the woodlands consist mainly of mixed conifers and northern hardwoods in the uplands and small dense stands of hemlock in the poorly drained places. Mountain-laurel is the dominant plant in the understory. This kind of woodland furnishes both food and cover for the varying hare.

Ruffed grouse.—The woodland in this part of the county provides good nesting sites and cover for grouse. However, the amount of food that is available in spring, summer, and fall may be limited by the general droughtiness of the soils in the area.

Waterfowl.—The majority of naturally wet areas suitable for waterfowl occur in the Ridgebury, Walpole and Wareham, and Scarboro soils. These are poorly drained and very poorly drained soils that are associated with the dominant soils in this part of the county. Major areas of these soils occur near the north end of the Quabbin Reservoir. Beaver ponds are scattered throughout this part of the county and are suitable for waterfowl.

Suitability of the soils for wildlife habitats and kinds of wildlife

The soils of the county have been rated in table 4 according to their suitability for the establishment, development, or maintenance of particular kinds of wildlife habitats. If no rating is given, the soil is either unsuitable for a particular habitat, or its suitability is not known. Also rated in table 4 is the general suitability of the soils for openland, woodland, and wetland wildlife.

In the text that follows, the kinds of habitats and kinds of wildlife are described, and the suitability ratings for wildlife habitats used in table 4 are defined.

KINDS OF HABITATS

Soil ratings for the habitats listed in table 4 are explained as follows:

Grain and seed crop habitat.—The soils are rated for this habitat according to their suitability for producing domestic grains or seed-producing annual herbaceous plants planted for wildlife food. Examples of these plants are corn, wheat, millet, rye, and buckwheat.

Grass and legume habitat.—The soils are rated according to their suitability for producing grass and legumes planted for wildlife food and cover. Examples of these plants are fescue, brome, bluegrass, timothy, redtop, orchardgrass, red canarygrass, clover, and alfalfa.

Wild herbaceous upland plant habitats.—The soils are rated according to their suitability for producing native or introduced perennial grasses and forbs that provide food and cover principally to upland forms of wildlife and that are established mainly through natural reseeding. Examples of these plants are wheatgrasses, wild rye, oatgrass, strawberries, beggarweed, lespedeza, nightshade, goldenrod, and dandelion.

Hardwood woodland plant habitat.—The soils are rated according to their suitability for producing deciduous trees, shrubs, and woody vines that produce fruit, nuts, buds, catkins, twigs, or foliage that are eaten extensively by wildlife. These plants are commonly established by natural reseeding, but they may also be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, maple, birch, poplar, blueberry, and rose.

Coniferous woodland plant habitat.—The soils are rated according to their suitability for producing cone-bearing trees and shrubs, primarily for wildlife cover but also for food in the form of browse, seeds, or fruitlike cones. These plants are commonly established by reseeding, but they may also be planted. Examples are pine, spruce, hemlock, red cedar, juniper, and yew.

Wetland food and cover plant habitat.—The soils are rated according to their suitability for producing annual

and perennial wild herbaceous plants that grow on damp to wet sites, exclusive of submerged or floating aquatics. These plants provide food or cover that is used mainly by wetland forms of wildlife. Examples are smartweed, wild millet, bulrush, sedge, reed, wildrice, switchgrass, bluejoint, and cattail.

Shallow water habitat.—The soils are rated according to their suitability for impoundments, excavations, or constructions for the control of water, generally to a depth not exceeding 5 feet. Examples are low dikes and levees, shallow dugout ponds, level ditches, and devices to control the water level of marshy streams.

Excavated pond habitat.—The soils are rated according to their suitability for dugout water areas. The water should be suitable in quality, depth, and supply for fish or wildlife; for example, a pond having a minimum surface area of 1/10 acre, an average water depth of 6 feet over at least one-fourth of the area, and a dependable high water table or other source of unpolluted water of low acidity. The suitability of sites for impounded ponds may be governed by the depth of soil over bedrock or coarse material, the suitability of the soil material for embankments, the suitability of underlying material for holding water, the source of water, the slope of the site, and the hazard of flooding. Consequently, no rating is given in table 4 for impounded ponds.

KINDS OF WILDLIFE

The kinds of wildlife, as listed in table 4, are defined as follows:

Openland wildlife.—Birds and mammals that normally frequent cropland pastures, meadows, lawns, and areas overgrown with grass, herbs, and shrubs.

Woodland wildlife.—Birds and mammals that normally frequent wooded areas of hardwood trees and shrubs, coniferous trees and shrubs, or mixed growth of such plants.

Wetland wildlife.—Birds and mammals that normally frequent ponds, marshes, swamps, and other wet areas.

Suitability ratings for wildlife habitats

Well suited.—This rating, as shown in table 4, indicates that habitats can generally be easily established, developed, or maintained on the soils. The soils with this rating have few limitations in their suitability for the installation of habitats, and satisfactory results are well assured.

Suitable.—This rating indicates that the soils are slightly to moderately limited in their suitability for the establishment, development, or maintenance of habitats. Because of these limitations, the habitats need more intensive management than those rated "well suited," and success is not quite so well assured.

Poorly suited.—This rating indicates that the soils are rather severely limited in their suitability for the establishment, development, or maintenance of wildlife habitats. The management of habitats in these soils may be difficult and expensive, and good results are not well assured.

Unsuited.—This rating indicates that habitats cannot be established, developed, or maintained on the soils, or that use of the soils for habitats is generally impractical. Results are highly doubtful.

Use of Soils for Engineering Purposes [3]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to engineers are permeability to water, shear strength, compaction characteristics, grain size, plasticity, and pH. Depths to water table and to bedrock and the topography of the area where the soil occurs are also important in planning engineering works.

This soil survey report can be used by engineers to:

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations, and in planning detailed investigations at selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structures with soil mapping units to develop information for overall planning that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The engineering interpretations in this report can be useful for many purposes. These interpretations, however, do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where excavations are deeper than the layers that have been 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 by soil scientists may not be familiar to engineers, and some terms may have a special meaning in soil science. Several of these terms are defined in the Glossary at the back of the report.

Engineering test data, estimated soil properties, and interpretations

To be able to make the best use of the soil maps and the soil survey report, the engineer should know the properties of the soil material and the condition of the soil in

[3] Prepared with the assistance of MILES J. HUBLER, engineering specialist, Soil Conservation Service.

place. The three tables—5, 6, and 7—in this section contain a summary of soil properties significant to engineering and some engineering interpretations.

TEST DATA

The results of tests on 18 samples from 6 extensive soil series in Franklin County are given in table 5. The tests were conducted by the Materials Division, Bureau of Public Roads, according to standard procedures of the American Association of State Highway Officials (AASHO). One profile of each series is modal, that is, near the central concept of the series; the other two are from soils having profiles within the range established for the series. Although the information is specific for each profile, it is intended for use only in the interpretations of the engineering properties of the series as a whole.

The engineering classifications of soils in this table are based on mechanical analyses and on tests of the liquid and plastic limits of the soils. Mechanical analyses were made by both sieve and hydrometer methods: the material coarser than 0.074 millimeter (No. 200 sieve) was analyzed by the sieve method; and material passing the No. 200 sieve was analyzed by the hydrometer method.

The liquid limit and plastic limit tests measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the 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. The plastic limit ranges from very high in clay soils to zero in sandy loam and sands.

The moisture-density compaction data for the tested soils are also given in table 5. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-density data are important in earthwork, for, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

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

Some engineers prefer to use the Unified system. In this system, soil material is divided into 15 classes: 8 classes are for coarse-grained material, 6 for fine-grained material, and 1 for organic material. The coarse-grained materials are gravels and sands and are identified as GW, GM, GP, GC, SW, SM, SC, and SP. The fine-grained materials are silts and clays and are identified as ML, MH, CL, CH, OL, and OH. Mechanical analyses, liquid limit, and plasticity index are used to classify the coarse and fine-grained materials. All highly organic soils are classed Pt. The Unified classification designation is given in the last column of table 5 for soils sampled in the county and tested in the laboratory.

ESTIMATED SOIL PROPERTIES

A brief description of the soils of Franklin County and estimates of soil properties that affect engineering works are given in table 6. The estimates are based on field observations and experience and on interpretations of actual tests by the Soil Conservation Service and the Bureau of Public Roads. Each soil series is classified according to the AASHO and the Unified systems. Many soils have more than one grouping under these systems because of the allowable texture range at the series level or because of differences in texture within the profile.

In table 6 the depth to seasonally high water table applies to normal water tables or to perched water tables over hardpan or impervious strata of clay. It is estimated from the depth of the mottled layer, which indicated that the soil is saturated part of the time.

Permeability was estimated for the soil as it occurs in place. The estimates were based on soil structure and porosity and were compared with permeability tests on undisturbed cores of similar soil material.

The available water capacity in inches per inch of soil depth is the approximate amount of capillary water in the soil when wet to field capacity. When the soil is "air dry" this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation.

The reaction is stated as a pH value range and is based upon observations of soil types in place.

The shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. This potential is based on volume-change tests or observance of other physical properties or characteristics of the soil. In general clays have a much greater shrink-swell potential than sands.

INTERPRETATIONS

The suitability of the soils for some engineering uses and soil features that affect earth construction are given in table 7. The soils were evaluated on the bases of (1) test data, (2) estimates based on soil texture, and use (3) field experience.

As shown in this table, soils that are most suitable for winter grading are the sands, loamy sands, and sandy loams. Loams, silt loams, and silty clay loams and also poorly drained and very poorly drained soils are not suitable for winter grading because they contain large amounts of moisture during the winter.

Excessively drained and well drained soils generally are the least susceptible to frost heaving. Hazards of frost heaving increase with the degree of drainage, from moderately well drained to very poorly drained.

In table 7, the soils are rated as a source of top soil, sand and gravel, and roadfill.

TABLE 5.—*Engineering*

Soil type and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density [2]		Estimated percentage larger than 3 in. discarded in field sampling
					Maximum dry density	Optimum moisture	
			Inches		*Lb./cu.ft.*	*Percent*	
Berkshire fine sandy loam:							
Town of Hawley, Middle Road, 100 yds. N. of Savoy Road. (Modal)	Glacial till (schistose materials).	S38043	0–9	Ap	----	----	----
		S38044	9–14	B21	89	24	8
		S38045	38–46	C2	113	11	----
Town of Hawley, 100 yds. W. of corner of Middle Road and Hunt Road. (Compact substratum)	Glacial till (schistose materials).	S38046	0–8	Ap	----	----	----
		S38047	8–13	B21	89	24	20
		S38048	32–44	C2	117	10	----
150 ft. E. of Route 8A and 1 mile S. of North Heath. (Solum coarser textured than modal)	Glacial till (schistose materials).	S38049	2–8	B21	99	18	20
		S38050	15–26	B3	108	13	----
		S38051	36–50	C	111	12	10
Cabot fine sandy loam:							
½ mile N. of Foundry Village on York Road. (Modal)	Glacial till (schist and limestone).	S38052	0–9	Ap	----	----	----
		S38053	11–17	B21	101	17	----
		S38054	28–36	Cx	120	9	----
½ mile W. from Scott Road on Orcutt Hill Road. (Substratum finer textured than modal)	Glacial till (schist and limestone).	S38055	0–8	Ap	----	----	----
		S38056	15–22	B22g	116	11	----
		S38057	22–37	Cx	121	10	----
S. side of Route 2 and ½ mile W. of Greenfield Mountain. (Substratum coarser textured than modal)	Glacial till (schist and limestone).	S38058	0–8	Ap	----	----	----
		S38059	17–23	C1gx	115	12	----
		S38060	29–42	C3	121	9	----
Colrain fine sandy loam:							
0.6 mile E. of Stewartville and 0.1 mile NE. of Gates Road. (Modal)	Glacial till (mica schist and limestone).	S35913	0–9	Ap	96	18	----
		S35914	9–15	B21	102	17	----
		S35915	23–44	C2	112	13	----
½ mile N. of Route 116 on Mathews Road. (Substratum coarser textured than modal)	Glacial till (mica schist and limestone).	S35916	0–7	Ap	105	16	----
		S35917	7–15	B21	113	12	----
		S35918	22–45	C	116	8	----
⅛ mile N. of Route 2 on Colrain Road. (Compact substratum)	Glacial till (mica schist and limestone).	S35919	0–7	Ap	104	16	----
		S35920	14–26	B22	113	12	----
		S52921	35–40	C2	119	11	----
Gloucester very stony sandy loam:							
¼ mile S. of Chestnut Hill Road on Chestnut Hill Loop. (Modal)	Glacial till.	S34660	0–4	A1	106	15	10
		S34661	4–13	B21	116	12	15
		S34662	34–48	C2	125	9	15
4 miles S. of Orange and ¼ mile N. of junction of Route 122 and U.S. 202. (Solum coarser textured than modal)	Glacial till.	S34663	0–5	A1	100	19	5
		S34664	5–11	B21	118	13	5
		S34665	19–38	C21	126	9	10
2 miles E. of North New Salem and ⅛ mile E. of U.S. 202. (Amount of coarse skeleton in solum is small.)	Glacial till.	S34666	0–6	Ap	102	18	----
		S34667	6–13	B21	117	13	----
		S34668	33–47	C3	128	8	----
Hinckley sandy loam:							
Red pine plantation at Mount Toby Forest along Route 63. (Modal)	Glaciofluvial sands and gravels.	S34669	1½–6½	Ap2	117	13	----
		S34670	6½–18	B21	120	13	----
		S34671	29–39	IIC	129	11	----
1 mile S. of Montague Center. (Contains fine gravel)	Glaciofluvial sands and gravels.	S34675	0–7	Ap	117	13	----
		S34676	7–15	B2	128	10	----
		S34677	19–36	IIC2	124	12	----

See footnotes at end of table.

test data [1]

Mechanical analysis [3]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve [4]—						Percentage smaller than [4]—						AASHO [5]	Unified [6]
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	95	92	88	82	57	48	26	10	5	[7] NP	[7] NP	A-4(4)	ML.
92	79	77	75	72	54	48	23	7	4	NP	NP	A-4(5)	ML.
100	94	90	87	81	50	42	19	7	3	NP	NP	A-4(3)	SM.
100	94	92	89	84	57	50	28	12	6	NP	NP	A-4(4)	ML.
80	74	72	70	66	46	40	22	9	5	NP	NP	A-4(4)	ML.
100	96	91	86	78	46	38	18	6	3	NP	NP	A-4(2)	SM.
80	67	63	62	54	26	22	12	6	2	NP	NP	A-2-4(0)	SM.
100	97	92	86	76	48	40	18	5	3	NP	NP	A-4(3)	SM.
90	76	68	64	56	32	26	12	4	2	NP	NP	A-2-4(0)	SM.
100	85	83	80	70	39	34	20	10	6	NP	NP	A-4(1)	SM.
100	93	91	86	72	29	23	11	4	3	NP	NP	A-2-4(0)	SM.
100	97	93	86	70	33	27	15	7	3	NP	NP	A-2-4(0)	SM.
100	100	98	95	89	59	52	34	17	11	NP	NP	A-4(5)	ML.
100	99	97	89	78	53	46	27	11	8	NP	NP	A-4(4)	ML.
100	97	94	87	74	36	30	22	10	6	NP	NP	A-4(0)	SM.
100	--------	--------	100	95	69	62	40	21	14	NP	NP	A-4(7)	ML.
100	100	98	95	87	58	51	32	14	8	NP	NP	A-4(5)	ML.
100	98	92	85	72	36	30	19	8	5	NP	NP	A-4(0)	SM.
100	95	88	84	70	34	29	17	8	5	NP	NP	A-2-4(0)	SM.
100	98	92	86	76	40	34	20	9	5	NP	NP	A-4(1)	SM.
100	90	80	74	56	20	15	10	4	2	NP	NP	A-2-4(0)	SM.
100	99	95	91	81	50	43	26	13	9	NP	NP	A-4(3)	SM.
100	95	88	84	72	40	34	19	9	7	NP	NP	A-4(1)	SM.
100	90	78	70	51	19	15	7	4	2	NP	NP	A-2-4(0)	SM.
100	94	88	83	71	37	32	22	12	7	33	6	A-4(0)	SM.
100	97	91	86	70	34	28	17	9	4	NP	NP	A-2-4(0)	SM.
100	94	87	80	67	36	32	21	11	8	23	4	A-4(0)	SM-SC.
100	86	83	81	62	29	23	14	7	5	NP	NP	A-2-4(0)	SM.
85	65	55	53	42	19	16	10	5	4	NP	NP	A-1-b(0)	SM.
[8] 76	53	41	35	21	10	4	3	2	1	NP	NP	A-1-a(0)	GP-GM.
100	86	80	76	61	26	22	14	9	7	NP	NP	A-2-4(0)	SM.
95	84	68	63	48	18	15	10	6	4	NP	NP	A-1-b(0)	SM.
90	67	56	50	34	12	9	5	3	2	NP	NP	A-1-b(0)	SM.
100	--------	--------	100	85	36	31	19	9	7	NP	NP	A-4(0)	SM.
100	92	92	91	79	32	27	18	10	8	NP	NP	A-2-4(0)	SM.
100	90	79	72	55	23	18	11	4	3	NP	NP	A-2-4(0)	SM.
100	100	98	96	63	32	28	19	11	7	NP	NP	A-2-4(0)	SM.
100	--------	99	97	53	16	14	7	4	3	NP	NP	A-2-4(0)	SM.
100	75	53	38	10	3	2	1	1	1	NP	NP	A-1-a(0)	SP.
100	93	86	81	53	28	25	18	10	6	NP	NP	A-2-4(0)	SM.
100	78	60	52	26	14	14	8	5	3	NP	NP	A-1-b(0)	SM.
100	100	88	66	20	4	3	2	1	1	NP	NP	A-1-b(0)	SP.

TABLE 5.—*Engineering*

Soil type and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density [2]		Estimated percentage larger than 3 in. discarded in field sampling
					Maximum dry density	Optimum moisture	
½ mile S. of Moores Pond and 4 miles N. of Orange Center on Wendell Road. (Contains coarse gravel)	Glaciofluvial sands and gravels.	S34672	0–7	Ap	117	13	
		S34673	7–17	B2	116	14	
		S34674	23–37	IIC2	120	11	3
Peru loam: At junction of Branch Hill Road, Colrain Stage Road, and South Road. (Modal)	Glacial till (schist, phyllite, and gneiss).	S35922	0–9	Ap	91	22	
		S35923	18–25	B23	118	10	
		S35924	31–42	C2x	117	11	
Peru very stony loam: 1 mile E. of North Heath School on Route 8A. (Coarser textured than modal)	Glacial till.	S35925	0–9	A1	87	24	
		S35926	9–15	B21	103	17	
		S35927	31–38	C2x	119	10	
Peru very stony loam: ¼ mile W. of North Heath School on Route 9. (Substratum finer textured than modal)	Glacial till (quartzite, gneiss, and and schist).	S35928	0–9	A1	88	24	
		S35929	16–24	C1x	117	9	
		S35930	30–36	C3x	122	11	

[1] Tests performed by the Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*).

[2] Based on AASHO Designation T 99–57, Method C (*1*).

[3] Mechanical analyses according to AASHO Designation T 88–57(*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size 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 texture classes for soils.

TABLE 6.—*Brief description of soils and their*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
AfA	Agawam fine sandy loam, 0 to 3 percent slopes.	3–5+	>10	Well-drained sandy soils developed in deep sand deposits, generally free of gravel to a depth of 42 inches; soils consist of 2 feet of fine sandy loam or sandy loam underlain by loamy sand or sand; stratified sand and gravel occur in places at a depth below 42 inches; soils are on stream terraces.	0–11
AfB	Agawam fine sandy loam, 3 to 8 percent slopes.				11–25
AfC	Agawam fine sandy loam, 8 to 15 percent slopes.				25–46
AfD	Agawam fine sandy loam, 15 to 25 percent slopes.				
AgA	Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes.	3–5+	>10	Well-drained sandy soils, generally free of gravel, underlain by bedded silt and very fine sand; soils consist of 2½ feet of fine sandy loam or sandy loam underlain by silty material.	0–15
AgB	Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes.				15–28
AgC	Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes.				28–60
BaA	Belgrade silt loam, 0 to 3 percent slopes.	1.5	>10	Moderately well drained silty soils developed in deep deposits of bedded silt and very fine sand; soils consist of 2 feet of silt loam or very fine sandy loam underlain by varved silt and very fine sand; occur on lacustrine terraces.	0–18
BaB	Belgrade silt loam, 3 to 8 percent slopes.				18–24
					24–60

test data [1]—Continued

Mechanical analysis [3]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve [4]—						Percentage smaller than [4]—						AASHO [5]	Unified [6]
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	95	84	79	44	17	15	10	5	2	NP	NP	A-1-b(0)	SM.
100	90	86	84	45	24	22	12	5	2	NP	NP	A-1-b(0)	SM.
97	62	50	42	10	1	1	1	0	0	NP	NP	A-1-a(0)	SP.
100	92	88	85	76	47	41	26	12	7	42	10	A-5(2)	SM.
100	95	86	81	72	42	35	20	8	4	NP	NP	A-4 (1)	SM.
100	--------	99	97	89	53	46	30	16	11	19	3	A-4(4)	ML.
100	87	85	83	78	54	49	33	17	12	44	8	A-5(4)	ML.
100	96	92	88	83	55	50	34	18	14	30	7	A-4(4)	ML-CL.
[8] 96	84	76	71	62	31	25	14	5	4	NP	NP	A-2-4(0)	SM.
100	100	98	97	89	51	46	30	16	11	NP	NP	A-4(3)	ML.
100	98	95	92	79	35	28	18	8	6	NP	NP	A-2-4(0)	SM.
100	100	98	96	88	56	50	36	22	16	20	5	A-4(4)	ML-CL.

[4] Based on total material. Laboratory test data corrected for amount discarded in field sampling.
[5] Based on AASHO Designation M 145-49(*1*).
[6] Based on the Unified Soil Classification System (*20*). SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification.
[7] NP=Nonplastic.
[8] Material larger than 3 inches received in laboratory.

estimated physical and chemical properties

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Fine sandy loam	SM or ML	A-2 or A-4	95-100	90-100	30-60	2. 0-6. 3	0. 13-0. 18	4. 5-6. 5	Low.
Fine sandy loam	SM	A-2 or A-4	95-100	90-100	25-45	2. 0-6. 3	0. 10-0. 15	4. 5-6. 2	Low.
Loamy fine sand	SM or SP	A-1, A-2, or A-3.	90-100	85-100	10-35	>6. 3	0. 04-0. 09	4. 5-6. 2	Low.
Fine sandy loam	SM	A-2 or A-4	90-100	85-95	20-50	2. 0-6. 3	0. 13-0. 18	4. 5-6. 5	Low.
Sandy loam	SM	A-2 or A-4	90-100	85-95	20-50	2. 0-6. 3	0. 10-0. 15	4. 5-6. 0	Low.
Silt and very fine sand.	ML or CL	A-4	100	95-100	55-95	<0. 63	0. 15-0. 23	5. 0-6. 5	Low to moderate.
Silt loam	ML or CL	A-4	95-100	95-100	70-95	0. 63-2. 0	0. 15-0. 23	5. 0-6. 5	Low to moderate.
Silt loam	ML or CL	A-4	95-100	95-100	60-95	0. 63-2. 0	0. 15-0. 23	5. 0-6. 5	Low to moderate.
Silt and very fine sand.	ML or CL	A-4	95-100	95-100	55-95	<0. 63	0. 15-0. 23	5. 0-6. 5	Low to moderate.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
BbB	Berkshire fine sandy loam, 3 to 8 percent slopes.	3–5+	3–30+	Well-drained loamy soils developed in firm to loose glacial till derived chiefly from micaceous schist; soils consist of 2 feet of fine sandy loam or loam over fine sandy loam or loamy fine sand; contain stones and some boulders; occur on uplands. Compact horizon below 2½ feet in places.	0–8 8–22 22–40
BbC	Berkshire fine sandy loam, 8 to 15 percent slopes.				
BbD	Berkshire fine sandy loam, 15 to 25 percent slopes.				
BcB	Berkshire very stony fine sandy loam, 3 to 8 percent slopes.				
BcC	Berkshire very stony fine sandy loam, 8 to 15 percent slopes.				
BcD	Berkshire very stony fine sandy loam, 15 to 25 percent slopes.				
BdB	Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes.				
BdD	Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes.				
BdF	Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes.				
BeB	Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes.				
BeC	Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes.				
BeD	Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes.				
BfB	Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.				
BfC	Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes.				
BfD	Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes.				
BgB	Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes.				
BgD	Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes.				
BgF	Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes.				
BhB	Bernardston channery silt loam, 3 to 8 percent slopes.	3–5+	3–30+	Well-drained silty soils developed in compact glacial till derived from phyllite; soils contain many flat phyllite fragments and some stones; occur on uplands.	0–18 18–30
BhC	Bernardston channery silt loam, 8 to 15 percent slopes.				
BhD	Bernardston channery silt loam, 15 to 25 percent slopes.				
BmB	Bernardston very stony silt loam, 3 to 8 percent slopes.				
BmC	Bernardston very stony silt loam, 8 to 15 percent slopes.				
BmD	Bernardston very stony silt loam, 15 to 25 percent slopes.				
BmF	Bernardston very stony silt loam, 25 to 55 percent slopes.				
Bn	Biddeford silt loam.	0	>10	Very poorly drained silty and clayey soils in depressions on lacustrine terraces; soils consist of about 1½ feet of silty material underlain by varved clay.	0–12 12–15 15–24
BsB	Broadbrook very fine sandy loam, 3 to 8 percent slopes.	3–5+	3–10+	Well-drained soils developed in silty mantle underlain by compact glacial till; soils consist of about 2½ feet of very fine sandy loam to silt loam over firm gravelly fine sandy loam glacial till; the mantle has few coarse fragments.	0–10 10–27 27–40
BsC	Broadbrook very fine sandy loam, 8 to 15 percent slopes.				
BsD	Broadbrook very fine sandy loam, 15 to 25 percent slopes.				
BtC	Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes.				
BtD	Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes.				
BuA	Buckland fine sandy loam, 0 to 3 percent slopes.	1.5	3–20+	Moderately well drained loamy soils developed in compact glacial till derived from	0–7 7–21
BuB	Buckland fine sandy loam, 3 to 8 percent slopes.				

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Fine sandy loam	SM or ML	A-4 or A-2	80-95	75-90	25-60	0. 63-6. 3	0. 13-0. 30	4. 5-6. 5	Low.
Fine sandy loam	SM or ML	A-4	70-95	65-90	45-55	0. 63-6. 3	0. 13-0. 25	4. 5-5. 5	Low.
Fine sandy loam	SM	A-2 or A-4	65-90	65-90	30-45	<0. 2-6. 3	0. 13-0. 18	4. 5-6. 0	Low.
Channery silt loam.	SM or SC	A-4 or A-2	65-80	55-75	25-45	0. 63-2. 0	0. 15-0. 20	4. 5-6. 0	Low.
Channery silt loam.	SM or SC	A-4 or A-2	65-80	60-70	30-45	<0. 2	0. 15-0. 20	4. 5-5. 5	Low.
Silt loam	ML, CL, OL, or MH.	A-4, A-6, or A-7.	100	100	70-90	0. 2-0. 63	0. 15-0. 23	4. 5-6. 0	Moderate.
Silty clay loam	ML, CL, or CH.	A-6 or A-7	100	100	70-95	<0. 2	0. 13-0. 20	5. 0-6. 0	Moderate.
Clay and silt	CL, CH, or MH.	A-6 or A-7	100	100	85-100	<0. 2	0. 13-0. 20	5. 5-6. 5	Moderate.
Very fine sandy loam.	ML	A-4	75-100	70-100	50-85	0. 63-2. 0	0. 13-0. 20	4. 5-6. 5	Low.
Very fine sandy loam.	ML	A-4	65-95	60-90	50-75	0. 63-2. 0	0. 13-0. 20	5. 0-6. 0	Low.
Gravelly fine sandy loam.	SM	A-2 or A-4	60-85	60-80	25-40	<0. 2-0. 63	0. 13-0. 18	5. 5-6. 5	Low.
Fine sandy loam	ML or SM	A-4	90-100	75-100	40-75	0. 63-2. 0	0. 13-0. 18	5. 0-6. 5	Low.
Fine sandy loam	ML or SM	A-2 or A-4	70-100	65-95	30-55	0. 63-2. 0	0. 13-0. 18	5. 5-6. 5	Low.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
BuC	Buckland fine sandy loam, 8 to 15 percent slopes.			siliceous limestone and mica schist; soils consist of about 1½ feet of fine sandy loam or loam over compact fine sandy loam or loam; contain stones and a few boulders.	21–36
BuD	Buckland fine sandy loam, 15 to 25 percent slopes.				
BvB	Buckland very stony fine sandy loam, 3 to 8 percent slopes.				
BvC	Buckland very stony fine sandy loam, 8 to 15 percent slopes.				
BvD	Buckland very stony fine sandy loam, 15 to 25 percent slopes.				
BwB	Buckland extremely stony fine sandy loam, 3 to 8 percent slopes.				
BwC	Buckland extremely stony fine sandy loam, 8 to 25 percent slopes.				
BxA	Buxton silt loam, 0 to 3 percent slopes.	1.5	>10	Moderately well drained silty and clayey soils on lacustrine terraces; soils consist of about 1½ feet of silt loam over a foot of silty clay or silty clay loam underlain by varved silt and clay.	0–15
BxB	Buxton silt loam, 3 to 10 percent slopes.				15–25 25–33
CaA	Cabot fine sandy loam, 0 to 3 percent slopes.	0–1	3–10+	Poorly drained loamy soils developed on compact glacial till derived from siliceous limestone and mica schist; soils consist of about 1½ feet of friable fine sandy loam or loam underlain by material with similar textures but much firmer; contain stones and some boulders.	0–9
CaB	Cabot fine sandy loam, 3 to 8 percent slopes.				9–21
CbB	Cabot extremely stony fine sandy loam, 0 to 10 percent slopes.				21–36
CcA	Cabot loam, black surface, 0 to 3 percent slopes.	0	3–10+	Very poorly drained loamy soils developed on compact glacial till derived from siliceous limestone and mica schist; soils consist of about 1 foot of friable loam underlain by firm fine sandy loam; contain stones and some boulders.	0–14
CdA	Cabot very stony loam, black surface, 0 to 3 percent slopes.				14–40
CdB	Cabot very stony loam, black surface, 3 to 8 percent slopes.				
CeA	Carver loamy coarse sand, 0 to 3 percent slopes.	>5	>20	Excessively drained, coarse sandy soils developed in deep sand deposits with little or no gravel; soils consist of 1½ to 2½ feet of loamy coarse sand underlain by coarse sand.	0–18
CeB	Carver loamy coarse sand, 3 to 8 percent slopes.				
CeC	Carver loamy coarse sand, 8 to 15 percent slopes.				18–48
CeD	Carver loamy coarse sand, 15 to 25 percent slopes.				
CkB	Charlton fine sandy loam, 3 to 8 percent slopes.	3–5+	3–30+	Well-drained sandy soils developed in glacial till derived from schist, gneiss, and phyllite; soils consist of 1½ feet of fine sandy loam underlain by sandy loam or fine sandy loam material; contain stones and some boulders; compact horizon below 2½ feet in most places.	0–18
CkC	Charlton fine sandy loam, 8 to 20 percent slopes.				18–32
CmC	Charlton very stony fine sandy loam, 3 to 15 percent slopes.				
CmD	Charlton very stony fine sandy loam, 15 to 25 percent slopes.				
CnB	Charlton extremely stony fine sandy loam, 3 to 8 percent slopes.				
CnD	Charlton extremely stony fine sandy loam, 8 to 25 percent slopes.				
CnE	Charlton extremely stony fine sandy loam, 25 to 45 percent slopes.				
CoB	Cheshire fine sandy loam, 3 to 8 percent slopes.	3–5+	3–10+	Well-drained sandy soils developed in glacial till derived from reddish-brown Triassic sandstone and conglomerate; soils consist of about 1 foot of fine sandy loam underlain by gravelly sandy loam; contain stones and few boulders; compact below 2½ feet in places.	0–14
CoC	Cheshire fine sandy loam, 8 to 15 percent slopes.				14–36
CoD	Cheshire fine sandy loam, 15 to 25 percent slopes.				
CpB	Cheshire very stony fine sandy loam, 3 to 8 percent slopes.				
CpC	Cheshire very stony fine sandy loam, 8 to 15 percent slopes.				
CpD	Cheshire very stony fine sandy loam, 15 to 25 percent slopes.				
CrB	Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes.				
CrD	Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes.				
CrE	Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes.				

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.004 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Loam	ML or CL	A-4	80-100	75-100	50-75	<0. 2-0. 63	0. 13-0. 20	6. 0-7. 0	Low.
Silt loam	ML or CL	A-4	100	100	60-90	0. 2-0. 63	0. 15-0. 23	5. 5-6. 5	Low to moderate.
Silty clay	ML or CL	A-4 or A-6	100	100	75-95	<0. 2-0. 63	0. 13-0. 20	6. 0-6. 5	Moderate.
Silt and clay	CL, ML or MH.	A-6 or A-7	100	100	90-100	<0. 2	0. 13-0. 20	6. 0-7. 0	Moderate.
Fine sandy loam	SM or ML	A-4	80-100	70-100	35-70	0. 63-2. 0	0. 13-0. 18	5. 5-6. 5	Low.
Fine sandy loam	SM or ML	A-2 or A-4	80-100	70-85	25-60	0. 63-2. 0	0. 13-0. 18	6. 0-7. 0	Low.
Fine sandy loam	SM or ML	A-2 or A-4	80-100	70-95	30-65	<0. 2-0. 63	0. 13-0. 18	6. 5-7. 0	Low.
Loam	ML	A-4	85-100	75-100	50-75	0. 63-2. 0	0. 15-0. 20	6. 0-7. 0	Low.
Fine sandy loam	SM or ML	A-2 or A-4	80-100	70-95	25-65	<0. 2-0. 63	0. 13-0. 18	6. 5-7. 0	Low.
Loamy coarse sand	SP-SM or SM.	A-2 or A-3	75-100	65-100	10-35	>6. 3	0. 04-0. 09	4. 5-6. 0	Low.
Coarse sand	SP or SM	A-3	85-100	80-100	2-10	>6. 3	<0. 04	4. 5-5. 5	Low.
Fine sandy loam	SM or SC	A-2 or A-4	70-90	65-90	15-45	2. 0->6. 3	0. 13-0. 18	4. 5-5. 5	Low.
Fine sandy loam	SM	A-2 or A-4	70-85	60-85	15-45	<0. 2-6. 3	0. 10-0. 18	5. 0-6. 0	Low.
Fine sandy loam	SM or ML	A-2 or A-4	70-95	65-95	25-55	2. 0->6. 3	0. 13-0. 18	4. 5-6. 5	Low.
Gravelly sandy loam.	SM	A-2 or A-4	60-90	60-85	20-45	0. 63->6. 3	0. 10-0. 13	4. 5-5. 5	Low.

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TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
CsB	Colrain fine sandy loam, 3 to 8 percent slopes.	3-5+	3-20+	Well-drained to somewhat excessively drained sandy soils developed in glacial till derived from siliceous limestone and mica schist; soils consist of 2 feet of fine sandy loam underlain by fine sandy loam to loamy sand; contain stones and few boulders; compact below 2½ feet in places.	0-9 9-23 23-44
CsC	Colrain fine sandy loam, 8 to 15 percent slopes.				
CsD	Colrain fine sandy loam, 15 to 25 percent slopes.				
CvB	Colrain very stony fine sandy loam, 3 to 8 percent slopes.				
CvC	Colrain very stony fine sandy loam, 8 to 15 percent slopes.				
CvD	Colrain very stony fine sandy loam, 15 to 25 percent slopes.				
CxB	Colrain extremely stony fine sandy loam, 3 to 8 percent slopes.				
CxD	Colrain extremely stony fine sandy loam, 8 to 25 percent slopes.				
CxF	Colrain extremely stony fine sandy loam, 25 to 50 percent slopes.				
DfA	Deerfield loamy fine sand, 0 to 3 percent slopes.	1.5	>10	Moderately well drained sandy soil developed in deep sand deposits on terraces; soil consists of about 1½ feet of loamy fine sand underlain by fine or medium sand; generally free of gravel.	0-10 10-16 16-60
DuB	Dutchess silt loam, 3 to 8 percent slopes.	3-5+	3-10+	Well-drained silty soils developed in glacial till derived from phyllite; soils consist of about 1½ feet of silt loam or heavy loam underlain by friable silt loam to fine sandy loam material; contain flat phyllite fragments and stones; compact below 2½ feet in places.	0-20 20-40
DuC	Dutchess silt loam, 8 to 15 percent slopes.				
DuD	Dutchess silt loam, 15 to 25 percent slopes.				
DvC	Dutchess very stony silt loam, 3 to 15 percent slopes.				
DvD	Dutchess very stony silt loam, 15 to 25 percent slopes.				
DxD	Dutchess extremely stony silt loam, 8 to 25 percent slopes.				
DxF	Dutchess extremely stony silt loam, 25 to 55 percent slopes.				
EfB	Essex fine sandy loam, 3 to 8 percent slopes.	3-5+	3-20+	Well-drained sandy soils developed in glacial till derived from granite and gneiss; soils consist of about 1 foot of fine sandy loam over 1 foot of loamy sand underlain by compact loamy sand material; contain stones and some boulders.	0-15 15-25 25-36
EfC	Essex fine sandy loam, 8 to 15 percent slopes.				
EfD	Essex fine sandy loam, 15 to 25 percent slopes.				
EvB	Essex very stony fine sandy loam, 3 to 8 percent slopes.				
EvC	Essex very stony fine sandy loam, 8 to 15 percent slopes.				
EvD	Essex very stony fine sandy loam, 15 to 25 percent slopes.				
ExB	Essex extremely stony fine sandy loam, 3 to 8 percent slopes.				
ExC	Essex extremely stony fine sandy loam, 8 to 25 percent slopes.				
ExE	Essex extremely stony fine sandy loam, 25 to 45 percent slopes.				
GfA	Gloucester fine sandy loam, 0 to 3 percent slopes.	3-5+	3-20+	Somewhat excessively drained sandy soils developed in glacial till derived from granite, gneiss, and quartzite; soils consist of about 1 foot of sandy loam or fine sandy loam underlain by loamy sand; contain many stones and boulders; compact below 2½ feet in most places.	0-15 15-33 33-45
GfB	Gloucester fine sandy loam, 3 to 8 percent slopes.				
GfC	Gloucester fine sandy loam, 8 to 15 percent slopes.				
GfD	Gloucester fine sandy loam, 15 to 25 percent slopes.				
GmB	Gloucester sandy loam, 3 to 8 percent slopes.				
GmC	Gloucester sandy loam, 8 to 15 percent slopes.				
GmD	Gloucester sandy loam, 15 to 25 percent slopes				
GvB	Gloucester very stony sandy loam, 3 to 8 percent slopes.				
GvC	Gloucester very stony sandy loam, 8 to 15 percent slopes.				
GvD	Gloucester very stony sandy loam, 15 to 25 percent slopes.				
GxB	Gloucester extremely stony sandy loam, 3 to 8 percent slopes.				
GxC	Gloucester extremely stony sandy loam, 8 to 25 percent slopes.				

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Fine sandy loam	SM or ML	A-2 or A-4	85-100	80-95	30-55	2. 0->6. 3	0. 13-0. 18	5. 0-6. 5	Low.
Fine sandy loam	SM	A-2 or A-4	80-95	75-95	30-45	2. 0->6. 3	0. 13-0. 18	5. 5-6. 5	Low.
Gravelly sandy loam.	SM, SC, or ML.	A-2 or A-4	75-100	70-95	15-60	<0. 63->6. 3	0. 04-0. 13	6. 0-7. 0	Low.
Loamy fine sand	SM	A-2	95-100	95-100	15-30	>6. 3	0. 04-0. 09	4. 5-6. 5	Low.
Loamy fine sand	SM	A-2	95-100	95-100	15-30	>6. 3	0. 04-0. 09	5. 0-6. 0	Low.
Fine sand or sand	SP or SP-SM.	A-3 or A-2.	95-100	95-100	5-25	>6. 3	<0. 04	5. 0-6. 5	Low.
Silt loam	GM or SC	A-4 or A-2	60-80	55-75	25-45	0. 63-2. 0	0. 15-0. 23	4. 5-6. 0	Low.
Silt loam	SM or GM	A-4 or A-2	50-70	40-60	20-45	0. 63-6. 3	0. 13-0. 23	4. 5-5. 5	Low.
Fine sandy loam	SM, SC, or ML.	A-2 or A-4	75-100	70-100	30-65	2. 0->6. 3	0. 13-0. 18	4. 5-6. 5	Low.
Loamy sand	SM or SC	A-2 or A-4	60-100	55-100	20-45	2. 0->6. 3	0. 04-0. 13	4. 5-6. 0	Low.
Gravelly loamy sand.	SM	A-2 or A-4	65-95	60-90	25-45	<0. 2-0. 63	0. 04-0. 13	5. 0-6. 0	Low.
Sandy loam	SM	A-2 or A-4	60-100	55-100	15-40	2. 0->6. 3	0. 10-0. 13	4. 5-6. 5	Low.
Gravelly loamy coarse sand.	SM or GM	A-2 or A-1	55-95	50-90	15-30	2. 0->6. 3	0. 04-0. 13	4. 5-5. 5	Low.
Gravelly coarse sand.	SM or GM	A-2 or A-1	40-95	35-90	10-35	<0. 63->6. 3	0. 04-0. 09	5. 0-6. 0	Low.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
GxE	Gloucester extremely stony sandy loam, 25 to 45 percent slopes.				
HaA HaB HbA HbB HcA	Hadley silt loam, 0 to 3 percent slopes. Hadley silt loam, 3 to 8 percent slopes. Hadley very fine sandy loam, 0 to 3 percent slopes. Hadley very fine sandy loam, 3 to 8 percent slopes. Hadley very fine sandy loam, overflow, 0 to 3 percent slopes.	3–5+	>10	Well-drained silty soils developed in silty and very fine sandy alluvium; some areas are subject to yearly flooding by stream overflow, usually in spring.	0–26 26–40
HdA HdB HdC HdD	Hartland silt loam, 0 to 3 percent slopes. Hartland silt loam, 3 to 8 percent slopes. Hartland silt loam, 8 to 15 percent slopes. Hartland silt loam, 15 to 35 percent slopes.	3–5+	>10	Well-drained silty soils developed in deep very fine sand and silt deposits on lacustrine terraces; soils consist of 1½ to 3 feet of silt loam or very fine sandy loam over varved silt and very fine sand that contain thin lenses of clay in a few places.	0–17 17–42
HgA HgB HgC HgD HkA HkB HkC HkD	Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes. Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes. Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes. Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes. Hinckley sandy loam, 0 to 3 percent slopes. Hinckley sandy loam, 3 to 8 percent slopes. Hinckley sandy loam, 8 to 15 percent slopes. Hinckley sandy loam, 15 to 35 percent slopes.	3–5+	>10	Excessively drained sandy and gravelly soils developed in glaciofluvium derived primarily from granite, gneiss, and quartzite; depth to sandy, gravelly, and cobbly substratum ranges from about 1 to 1½ feet.	0–12 12–18 18–32
HmB HmC HnC HnD HoD HoF	Hollis fine sandy loam, 3 to 8 percent slopes. Hollis fine sandy loam, 8 to 15 percent slopes. Hollis very rocky fine sandy loam, 3 to 15 percent slopes. Hollis very rocky fine sandy loam, 15 to 25 percent slopes. Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes. Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes.	--------	<2	Somewhat excessively drained soils developed in glacial till; bedrock is usually less than 2 feet from surface; rock outcrops are about 30 to 100 feet apart; soils contain stones.	0–17 17+
HvC HvD HxD HxF	Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes. Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes. Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes. Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes.	--------	<2	Soils are shallow to bedrock—the depth is usually less than 2 feet; Holyoke soils are very fine sandy loam over diabase or basalt; Sunderland soils are fine sandy loam or sandy loam over Triassic sandstone. Estimates are for the Holyoke soils only; ranges for the Sunderland soils are similar.	0–14 14+
Lk	Limerick silt loam.	0–1	>10	Poorly drained silty soil developed in silty and very fine sandy alluvium; soil consists of about 1½ to 3 feet of silt loam over bedded silt and very fine sand and in places gravelly sand; some areas subject to yearly flooding by stream overflow, usually in spring.	0–26 26–38
Ls	Limerick-Saco silt loams. (See Limerick silt loam and Saco silt loam for estimated properties.)				
LvC LvD LxC	Lyman very rocky loam, 3 to 15 percent slopes. Lyman very rocky loam, 15 to 25 percent slopes. Lyman extremely rocky loam, 3 to 25 percent slopes.	--------	<2	Soils developed in thin mantle of glacial till derived from schist; depth to bedrock is usually less than 2 feet and rock outcrops are generally less than 100 feet	0–19 0–19+

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Very fine sandy loam or silt loam.	ML	A-4	100	100	60–85	0. 63–2. 0	0. 13–0. 23	4. 5–6. 0	Low.
Silt loam	ML	A-4	100	95–100	55–80	0. 63–2. 0	0. 13–0. 23	4. 5–6. 0	Low.
Silt loam	ML or CL	A-4	95–100	95–100	80–100	0. 63–2. 0	0. 15–0. 23	5. 0–6. 0	Low to moderate.
Silt and very fine sand.	ML or CL	A-4	95–100	95–100	70–95	<0. 63	0. 15–0. 23	5. 0–6. 0	Low to moderate.
Sandy loam over gravelly sandy loam.	SM	A-1 or A-2	70–100	65–100	15–35	>6. 3	0. 05–0. 15	4. 5–6. 5	Low.
Gravelly coarse sand.	SM or SP	A-1 or A-2	35–100	30–100	10–25	>6. 3	<0. 04	4. 5–5. 5	Low.
Stratified sand, gravel, and cobblestones.	SP or GP	A-1	25–90	15–70	0–5	>6. 3	<0. 04	5. 0–6. 0	Low.
Gravelly fine sandy loam.	SM or SC	A-2 or A-4	70–90	65–90	15–50	2. 0–>6. 3	0. 13–0. 18	4. 5–6. 0	Low.
Bedrock									
Very fine sandy loam or fine sandy loam.	ML or SM	A-4 or A-2	70–100	70–100	25–85	0. 63–>6. 3	0. 13–0. 20	4. 0–5. 5	Low.
Bedrock									
Silt loam	ML	A-4	100	100	60–90	0. 63–2. 0	0. 15–0. 23	5. 0–6. 0	Low.
Very fine sand and silt.	ML	A-4	100	95–100	55–80	0. 63–2. 0	0. 15–0. 23	5. 0–6. 0	Low.
Loam	ML or SM	A-4 or A-2	60–95	60–90	30–60	0. 63–6. 3	0. 15–0. 30	4. 0–5. 5	Low.
Bedrock									

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
LxF	Lyman extremely rocky loam, 25 to 80 percent slopes.			apart; soils also contain stones.	
MaB MaC MaD MbB MbC MbD McB McD MdB MdC MdD MeB MeC MeD MfB MfD MfE	Marlow loam, 3 to 8 percent slopes. Marlow loam, 8 to 15 percent slopes. Marlow loam, 15 to 25 percent slopes. Marlow very stony loam, 3 to 8 percent slopes. Marlow very stony loam, 8 to 15 percent slopes. Marlow very stony loam, 15 to 25 percent slopes. Marlow extremely stony loam, 3 to 8 percent slopes. Marlow extremely stony loam, 8 to 35 percent slopes. Marlow loam, dark subsoil, 3 to 8 percent slopes. Marlow loam, dark subsoil, 8 to 15 percent slopes. Marlow loam, dark subsoil, 15 to 25 percent slopes. Marlow very stony loam, dark subsoil, 3 to 8 percent slopes. Marlow very stony loam, dark subsoil, 8 to 15 percent slopes. Marlow very stony loam, dark subsoil, 15 to 25 percent slopes. Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes. Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes. Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes.	3–5+	3–30+	Well-drained loamy soils developed in glacial till derived primarily from micaceous schist; soils consist of about 2 feet of loam or fine sandy loam over material that is similar but very compact; contain stones and some boulders.	0–8 8–24 24–38
MgA MgB MgC MgD MmA MmB MmC MmE	Merrimac fine sandy loam, 0 to 3 percent slopes. Merrimac fine sandy loam, 3 to 8 percent slopes. Merrimac fine sandy loam, 8 to 15 percent slopes. Merrimac fine sandy loam, 15 to 25 percent slopes. Merrimac sandy loam, 0 to 3 percent slopes. Merrimac sandy loam, 3 to 8 percent slopes. Merrimac sandy loam, 8 to 15 percent slopes. Merrimac sandy loam, 15 to 35 percent slopes.	3–5+	>10	Well-drained to somewhat excessively drained sandy soils underlain by stratified sand and gravel at a depth of 1½ to 3 feet; soils consist of about 1½ to 2 feet of fine sandy loam or sandy loam over coarser textured material.	0–10 10–23 23–35
Ms Mu	Muck, shallow. Muck.	0	3–10+	Very poorly drained, decomposed organic deposits that range in thickness from 1 to more than 4 feet and are underlain by mineral soil material; not suitable for engineering purposes; each site needs to be examined.	0–12
NaC NaD NeC NeF	Nassau very rocky silt loam, 3 to 15 percent slopes. Nassau very rocky silt loam, 15 to 25 percent slopes. Nassau extremely rocky silt loam, 3 to 25 percent slopes. Nassau extremely rocky silt loam, 25 to 75 percent slopes.	--------	<2	Silty soils developed in thin mantle of glacial till derived from phyllite and slate; shallow to bedrock; rock outcrops are commonly 25 to 75 feet apart.	0–15 15+
NfA NfB	Ninigret fine sandy loam, 0 to 3 percent slopes. Ninigret fine sandy loam, 3 to 10 percent slopes.	1.5	>10	Moderately well drained sandy soils developed in deep sand deposits; soils consist of about 2 feet of fine sandy loam or sandy loam underlain by loamy fine sand or sand; bedded sand and gravel below 3½ feet in places.	0–10 10–26 26–48
NgA NgB	Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes. Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes.	1.5	>10	Moderately well drained sandy soils underlain by silty material at a depth of 1½ to 3 feet; soils consist of about 2 feet of fine sandy loam or sandy loam underlain by varved silt and very fine sand.	0–16 16–26 26–60

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Loam	ML or SM	A-4 or A-5	85-100	80-100	40-60	2. 0-6. 3	0. 15-0. 30	4. 5-6. 0	Low.
Loam	ML, CL, or SM.	A-4 or A-2	85-95	80-95	30-60	0. 63-6. 3	0. 15-0. 25	4. 5-5. 5	Low.
Loam	ML, CL, or SM.	A-4 or A-2	75-100	70-100	30-65	<0. 2-0. 63	0. 13-0. 18	5. 0-6. 0	Low.
Fine sandy loam	SM	A-2 or A-4	80-100	80-100	30-45	2. 0->6. 3	0. 13-0. 18	4. 5-6. 5	Low.
Sandy loam	SM	A-2 or A-4	75-95	70-90	30-45	2. 0->6. 3	0. 10-0. 13	4. 5-5. 5	Low.
Sands and gravel	SP, SP-SM, or GP.	A-1	45-75	40-70	0-10	>6. 3	<0. 04	5. 0-6. 0	Low.
Muck	Pt								
Very channery silt loam.	SM or SC	A-2 or A-4	60-80	45-75	15-45	2. 0-6. 3	0. 13-0. 20	4. 0-5. 5	Low.
Bedrock									
Fine sandy loam	SM or ML	A-2 or A-4	90-100	80-100	25-55	2. 0->6. 3	0. 13-0. 20	4. 5-6. 5	Low.
Fine sandy loam	SM	A-2 or A-4	90-100	80-100	25-45	2. 0->6. 3	0. 13-0. 18	5. 0-5. 5	Low.
Loamy fine sand over fine sand.	SM or SP	A-2 or A-3	95-100	90-100	5-35	>6. 3	0. 09-<0. 04	5. 0-6. 0	Low.
Fine sandy loam	SM	A-2 or A-4	90-100	80-100	20-55	2. 0->6. 3	0. 10-0. 18	5. 0-6. 5	Low.
Sandy loam	SM	A-2 or A-4	90-100	80-100	25-45	2. 0->6. 3	0. 10-0. 18	5. 0-5. 5	Low.
Silts and very fine sands.	ML or CL	A-4	95-100	95-100	55-95	<0. 63	0. 15-0. 23	5. 0-6. 0	Low to moderate.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
Of	Ondawa fine sandy loam.	3–5+	>10	Well-drained soil developed in sandy alluvium; soil consists of about 1½ feet of fine sandy loam or sandy loam underlain by material ranging in texture from sandy loam to gravelly sand; some areas subject to yearly flooding by stream overflow, usually in spring.	0–8 8–20 20–42
Pa	Peat.	0	3–10+	Very poorly drained partially decomposed organic deposits, often mixed with woody debris; they range in thickness from 1 foot to several feet; not suitable for engineering purposes; each site needs to be examined.	0–12
PbA PbB PbC PcB PcC PcD PeB PeC	Peru loam, 0 to 3 percent slopes. Peru loam, 3 to 8 percent slopes. Peru loam, 8 to 15 percent slopes. Peru very stony loam, 3 to 8 percent slopes. Peru very stony loam, 8 to 15 percent slopes. Peru very stony loam, 15 to 25 percent slopes. Peru extremely stony loam, 0 to 8 percent slopes. Peru extremely stony loam, 8 to 25 percent slopes.	1.5	3–20+	Moderately well drained loamy soils developed in glacial till derived primarily from micaceous schist; soils consist of about 2 feet of loam or fine sandy loam over compact fine sandy loam or loam; contain stones and some boulders.	0–6 6–21 21–36
PnB	Pittstown silt loam, 3 to 8 percent slopes.	1.5	3–10+	Moderately well drained silty soil developed in glacial till derived from phyllite; soil consists of about 1½ feet of silt loam over compact silt loam material; contain flat phyllite fragments and some stones.	0–8 8–21 21–36
Po	Podunk fine sandy loam.	1.5	>10	Moderately well drained soil developed in sandy alluvium; soil consists of about 1½ feet of fine sandy loam or sandy loam underlain by loamy sand; some areas subject to yearly flooding by stream overflow, usually in spring; gravel layers occur in some places below a depth of 2½ feet.	0–16 16–36
RaA	Raynham silt loam, 0 to 3 percent slopes.	0–1	>10	Poorly drained silty soil developed in deep deposits of silt and very fine sand; soil consists of about 2 feet of silt loam or very fine sandy loam over varved silt and very fine sand that contain thin lenses of clay in some places.	0–7 7–22 22–60
RdA RdB RgB	Ridgebury fine sandy loam, 0 to 3 percent slopes. Ridgebury fine sandy loam, 3 to 8 percent slopes. Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes.	0–1	3–20+	Poorly drained sandy soils developed in glacial till derived from granite, gneiss, and schist; soils consist of about 1 foot of fine sandy loam to loam over compact sandy loam or loamy sand material; contain stones and some boulders.	0–7 7–13 13–20
Rs	Riverwash.	0	>10	Shifting stream deposits of sand, gravel, and cobblestones; they occur as islands in streams and rivers and also along streambanks. Material too variable for estimate of properties.	--------
Ru	Rumney fine sandy loam.	0–1	>10	Poorly drained soil developed in sandy alluvium; soil consists of about 1½ feet of fine sandy loam, sandy loam, or loamy sand underlain by sand and gravel; some areas subject to yearly flooding by stream overflow, usually in spring.	0–16 16–36

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Fine sandy loam	SM or ML	A-2 or A-4	95-100	90-100	30-55	2.0->6.3	0.10-0.18	5.0-6.5	Low.
Fine sandy loam	SM	A-2 or A-4	95-100	90-100	25-50	2.0->6.3	0.10-0.18	5.0-6.5	Low.
Loamy fine sand over sand and gravel.	SM	A-1 or A-2	60-100	55-100	15-45	<6.3	0.09-<0.04	5.0-6.5	Low.
Peat	Pt								
Loam	SM or ML	A-4 or A-5	85-100	80-95	45-55	2.0-6.3	0.15-0.30	4.5-6.5	Low.
Loam	SM, ML, or CL.	A-2 or A-4	80-95	80-95	30-55	0.63-6.3	0.15-0.25	4.5-5.5	Low.
Fine sandy loam	SM, ML, or CL.	A-2 or A-4	70-100	70-100	30-60	<0.2-0.63	0.13-0.18	5.0-6.0	Low.
Silt loam	SM or SC	A-4 or A-2	65-85	55-75	25-45	2.0-6.3	0.15-0.20	4.5-6.5	Low.
Silt loam	SM or SC	A-4 or A-2	60-85	50-75	25-45	0.63-2.0	0.15-0.20	4.5-6.0	Low.
Channery silt loam	SM, GM, or SC.	A-4 or A-2	60-80	55-75	30-45	<0.2	0.15-0.20	4.5-6.0	Low.
Fine sandy loam	SM or ML	A-2 or A-4	95-100	90-100	25-55	2.0->6.3	0.10-0.18	5.0-6.5	Low.
Sand	SM	A-1, A-2, or A-4.	60-100	50-100	15-45	>6.3	0.09-<0.04	5.0-6.5	Low.
Silt loam	ML or CL	A-4	95-100	95-100	65-95	0.63-2.0	0.15-0.23	4.5-6.5	Low to moderate.
Silt loam	ML or CL	A-4	95-100	95-100	65-95	0.2-0.63	0.15-0.23	4.5-6.0	Low to moderate.
Silt and very fine sand.	ML or CL	A-4	95-100	95-100	60-95	0.2-0.63	0.15-0.23	5.0-6.0	Low to moderate.
Fine sandy loam	SM or ML	A-4 or A-5	80-100	75-95	40-55	2.0-6.3	0.10-0.20	4.5-6.5	Low.
Sandy loam	SM	A-2 or A-4	80-95	70-90	25-45	2.0->6.3	0.10-0.15	4.5-5.5	Low.
Loamy sand	SM	A-2 or A-4	75-95	65-95	20-45	<0.2-0.63	0.04-0.15	4.5-6.0	Low.
Fine sandy loam	SM or ML	A-2 or A-4	95-100	80-100	25-55	2.0->6.3	0.10-0.18	5.5-6.5	Low.
Sand	SM or GM	A-1 or A-2	50-100	40-90	15-35	>6.3	0.09-<0.04	5.5-6.5	Low.

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TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
Sa	Saco silt loam.	0	>10	Very poorly drained soil developed in sandy and silty alluvium; soil consists of about 1 foot of silt loam or fine sandy loam underlain by material that ranges in texture from silt loam to gravelly sand; inundated seasonally by stream overflow.	0–8 8–36
Sb	Saugatuck loamy sand.	0–1	>10	Poorly drained, acid soil developed in deep sand deposits; soil consists of about 1 foot of loamy sand or sand over 1 foot of cemented sand underlain by loose sand; strata of gravel below 3 feet in places.	0–10 10–21 21–28
ScA ScB	Scantic silt loam, 0 to 3 percent slopes. Scantic silt loam, 3 to 8 percent slopes.	0–1	>10	Poorly drained silty and clayey soils developed in deep deposits of varved silt and clay; soils consist of about 1½ to 2½ feet of silt loam underlain by clayey material.	0–15 15–25 25–48
Sd	Scarboro fine sandy loam, brownish subsoil variant.	0	>10	Very poorly drained sandy soil on sand and gravel terraces; soil consists of about 1 foot of sandy loam or fine sandy loam over 1 foot of sand to sandy loam underlain by sand and gravel.	0–10 10–25 25–36
SeA SeB SeC SfA SfB SfC SgB SgC	Scituate fine sandy loam, 0 to 3 percent slopes. Scituate fine sandy loam, 3 to 8 percent slopes. Scituate fine sandy loam, 8 to 15 percent slopes. Scituate very stony fine sandy loam, 0 to 3 percent slopes. Scituate very stony fine sandy loam, 3 to 8 percent slopes. Scituate very stony fine sandy loam, 8 to 15 percent slopes. Scituate extremely stony fine sandy loam, 0 to 8 percent slopes. Scituate extremely stony fine sandy loam, 8 to 25 percent slopes.	1.5	3–20+	Moderately well drained sandy soils developed in glacial till derived from granite and gneiss; soils consist of about 1 foot of fine sandy loam, sandy loam, or loamy sand over loamy sand or sandy loam; compact material usually at a depth of 2 feet; soils contain stones and some boulders.	0–15 15–25 25–46
ShB ShC SkC SkD SmC SmF	Shapleigh fine sandy loam, 3 to 8 percent slopes. Shapleigh fine sandy loam, 8 to 15 percent slopes. Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes. Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes. Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes. Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes.	--------	<2	Excessively drained soils developed in thin mantle of glacial till derived from granite and quartzite; depth to bedrock is usually less than 2 feet, and rock outcrops are 10 to 100 feet apart; soils also contain stones and boulders.	0–8 8–16 16+
SnB SnC SnD SoB SoC SoD SpB SpD SpF	Shelburne loam, 3 to 8 percent slopes. Shelburne loam, 8 to 15 percent slopes. Shelburne loam, 15 to 25 percent slopes. Shelburne very stony loam, 3 to 8 percent slopes. Shelburne very stony loam, 8 to 15 percent slopes. Shelburne very stony loam, 15 to 25 percent slopes. Shelburne extremely stony loam, 3 to 8 percent slopes. Shelburne extremely stony loam, 8 to 25 percent slopes. Shelburne extremely stony loam, 25 to 50 percent slopes.	3–5+	3–20+	Well-drained loamy soils developed in glacial till derived from mica schist and siliceous limestone; soils consist of about 2 feet of loam or fine sandy loam over compact loamy material; compact material usually at depth of 2 feet; soils contain stones and a few boulders.	0–8 8–25 25–36

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Silt loam	SM, ML, or OL.	A-2 or A-4	75–100	70–100	30–85	0. 63–2. 0	0. 13–0. 23	4. 5–6. 5	Low.
Silt loam	SM or ML	A-1, A-2, or A-4.	60–100	55–100	15–80	0. 63–>6. 3	0. 23–<0. 04	4. 5–6. 5	Low.
Loamy sand	SM	A-2 or A-4	95–100	85–100	15–45	>6. 3	0. 04–0. 09	3. 5–6. 0	Low.
Sand	SM or SP SM.	A-1, A-2, or A-4.	95–100	85–100	5–45	0. 2–0. 63	<0. 04	4. 0–5. 5	Low.
Sand	SM or SP	A-1, A-2, A-3, or A-4.	90–100	85–100	5–45	>6. 3	<0. 04	4. 0–5. 5	Low.
Silt loam	ML, MH, or OH.	A-4, A-5, or A-7.	100	95–100	85–100	0. 2–0. 63	0. 15–0. 23	5. 0–6. 0	Low to moderate.
Silty clay loam or silty clay.	ML, MH, CL, or CH.	A-4, A-6, or A-7.	100	95–100	90–100	<0. 2–0. 63	0. 13–0. 20	5. 0–6. 0	Moderate.
Varved silt and clay.	ML or CL	A-4, A-6, or A-7.	100	95–100	95–100	<0. 2	0. 13–0. 20	5. 0–6. 5	Moderate.
Fine sandy loam	SM	A-2 or A-4	95–100	85–100	20–45	2. 0–>6. 3	0. 10–0. 18	4. 5–6. 0	Low.
Fine sand	SM or SP-SM.	A-2 or A-4	85–100	80–100	5–40	>6. 3	0. 09–<0. 04	4. 5–6. 0	Low.
Fine sand	SM, SP, or GP-GM.	A-1, A-2, or A-3.	45–100	40–100	5–15	>6. 3	<0. 04	4. 5–6. 0	Low.
Fine sandy loam	SM, SC, or ML.	A-2 or A-4	75–100	70–95	25–55	2. 0–>6. 3	0. 04–0. 18	4. 0–6. 0	Low.
Coarse sandy loam.	SM or SC	A-2 or A-4	60–95	50–90	15–45	2. 0–>6. 3	0. 04–0. 15	4. 5–6. 0	Low.
Gravelly loamy sand.	SM	A-2 or A-4	60–95	60–90	25–45	<0. 2–0. 63	0. 04–0. 15	4. 5–6. 0	Low.
Fine sandy loam	SM	A-2 or A-4	60–100	55–100	15–40	2. 0–>6. 3	0. 10–0. 18	5. 0–6. 5	Low.
Loamy sand	SM or GM	A-1 or A-2	40–95	35–90	10–35	>6. 3	0. 04–0. 13	5. 0–6. 0	Low.
Bedrock									
Loam	SM or ML	A-2 or A-4	80–100	75–100	30–75	0. 63–2. 0	0. 13–0. 20	5. 0–6. 5	Low.
Loam	SM or ML	A-2 or A-4	70–100	65–95	30–55	0. 63–2. 0	0. 13–0. 20	5. 5–6. 5	Low.
Loam	SM, ML, or CL.	A-2 or A-4	70–100	65–95	20–60	<0. 2–0. 63	0. 13–0. 20	6. 0–7. 0	Low.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
SrB SsB	Stissing silt loam, 0 to 8 percent slopes. Stissing very stony silt loam, 3 to 8 percent slopes.	0–1	3–10+	Poorly drained silty soils developed in glacial till derived from phyllite; soils consist of about 1½ feet of silt loam over compact silt loam; contain flat phyllite fragments and some stones.	0–8 8–16 16–26
StA StB	Sudbury fine sandy loam, 0 to 3 percent slopes. Sudbury fine sandy loam, 3 to 8 percent slopes.	1.5	>10	Moderately well drained sandy soils underlain by sand and gravel; soils consist of about 2 feet of fine sandy loam or sandy loam over stratified sand and gravel and, in places, cobbles.	0–10 10–23 23–52
SuB SuC2 SuE2	Suffield silt loam, 3 to 8 percent slopes. Suffield silt loam, 8 to 15 percent slopes, eroded. Suffield silt loam, 15 to 35 percent slopes, eroded.	3–5+	3–10+	Well-drained silty and clayey soils developed in deep deposits of varved silt and clay; soils consist of about 1½ feet of silt loam over clayey material.	0–16 16–24 24–36
Sv	Suncook loamy sand.	2–3+	>10	Excessively drained soil developed in sandy alluvium; soil consists of about 1 foot of loamy sand usually underlain by sand that is gravelly in places; some areas are flooded yearly by stream overflow, usually in spring.	0–13 13–42
SwB SwC SxB SxC SyB SyC	Sutton fine sandy loam, 3 to 8 percent slopes. Sutton fine sandy loam, 8 to 20 percent slopes. Sutton very stony fine sandy loam, 3 to 8 percent slopes. Sutton very stony fine sandy loam, 8 to 15 percent slopes. Sutton extremely stony fine sandy loam, 0 to 8 percent slopes. Sutton extremely stony fine sandy loam, 8 to 25 percent slopes.	1.5	3–30+	Moderately well drained soils developed in glacial till derived from schist, gneiss, and phyllite; soils consist of about 2 feet of fine sandy loam underlain by fine sandy loam; contain stones and some boulders; compact below 2½ feet in most places.	0–8 8–24 24–36
SzA SzB	Swanton very fine sandy loam, 0 to 3 percent slopes. Swanton very fine sandy loam, 3 to 8 percent slopes.	0–1	>10	Poorly drained sandy soils underlain by varved silt and clay; soils consist of about 1½ feet of very fine sandy loam, fine sandy loam, or sandy loam over clayey material.	0–15 15–24 24–36
WaA WaB	Walpole and Wareham fine sandy loams, 0 to 3 percent slopes. Walpole and Wareham fine sandy loams, 3 to 8 percent slopes.	0–1	>10	Poorly drained sandy soils on sandy and gravelly terraces; Walpole soils have a fine sandy loam or sandy loam subsoil; Wareham soils have a loamy sand subsoil; the substratum of both soils is sandy and gravelly. These estimates are for Walpole soils. Those for Wareham soils are listed below. Wareham soils only.	0–7 7–26 26–36 0–7 7–30 30–48
WfA WfB WfC WfD WgA WgB WgC	Warwick gravelly fine sandy loam, 0 to 3 percent slopes. Warwick gravelly fine sandy loam, 3 to 8 percent slopes. Warwick gravelly fine sandy loam, 8 to 15 percent slopes. Warwick gravelly fine sandy loam, 15 to 40 percent slopes. Warwick gravelly loam, 0 to 3 percent slopes. Warwick gravelly loam, 3 to 8 percent slopes. Warwick gravelly loam, 8 to 15 percent slopes.	3–5+	>10	Well-drained sandy and loamy soils developed in glaciofluvial deposits derived from phyllite, schist, and quartzite; soils consist of about 1 foot of gravelly fine sandy loam or gravelly loam over 1 foot of gravelly fine sandy loam underlain by stratified sand and gravel.	0–8 8–20 20–35

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Silt loam	SM or ML	A-2 or A-4	65-95	60-90	30-75	2.0-6.3	0.15-0.23	4.5-6.5	Low.
Silt loam	SM or ML	A-2 or A-4	60-95	55-90	30-55	0.63-2.0	0.15-0.23	4.5-6.0	Low.
Silt loam	SM or ML	A-2 or A-4	60-95	55-95	25-55	<0.2	0.15-0.23	5.0-6.0	Low.
Fine sandy loam	SM	A-2 or A-4	80-100	80-100	20-45	2.0->6.3	0.10-0.18	4.5-6.5	Low.
Fine sandy loam	SM	A-2 or A-4	75-95	70-90	20-45	2.0->6.3	0.10-0.18	4.5-6.0	Low.
Sand and gravel	SP-SM, SP, or GP.	A-1	45-75	40-70	0-10	>6.3	<0.04	5.0-6.0	Low.
Silt loam	ML, CL, or SM.	A-4	100	85-100	40-90	0.63-2.0	0.15-0.23	5.0-6.5	Low to moderate.
Silty clay loam	ML or CL	A-4 or A-6	100	95-100	70-90	0.2-0.63	0.13-0.20	5.0-6.0	Moderate.
Silt and clay	ML or CL	A-4, A-6, or A-7.	100	95-100	80-100	<0.2	0.13-0.20	5.0-6.0	Moderate.
Loamy sand	SM	A-2	85-100	70-100	15-30	>6.3	0.04-0.09	4.5-5.5	Low.
Sand	SM, SP, or GP.	A-1, A-2, or A-3.	40-100	35-100	0-30	>6.3	0.09-<0.04	4.5-5.5	Low.
Fine sandy loam	SM or ML	A-4 or A-5	80-100	75-95	35-55	2.0-6.3	0.13-0.20	4.5-6.5	Low.
Fine sandy loam	SM or SC	A-2 or A-4	75-95	70-90	20-45	0.63-6.3	0.13-0.18	4.5-5.5	Low.
Fine sandy loam	SM or SC	A-2 or A-4	70-90	60-85	20-45	<0.63-6.3	0.10-0.18	5.0-6.0	Low.
Fine sandy loam or very fine sandy loam.	SM or ML	A-4	95-100	95-100	35-55	2.0->6.3	0.10-0.18	4.5-6.5	Low.
Silt loam or silty clay loam.	SM, ML, or CL.	A-2, A-4, or A-6.	95-100	95-100	20-55	0.63-2.0	0.13-0.23	5.0-6.5	Low to moderate.
Silt and clay	CL or ML	A-4, A-6, or A-7.	100	100	65-95	<0.2	0.13-0.20	5.0-6.5	Moderate.
Fine sandy loam	SM	A-2 or A-4	90-100	85-100	35-50	2.0->6.3	0.12-0.17	4.5-6.0	Low.
Fine sandy loam	SM	A-2 or A-4	85-100	80-100	35-45	2.0->6.3	0.10-0.15	4.5-5.5	Low.
Sand and gravel	SM, SP, or GP.	A-1, A-2, or A-3.	50-100	40-100	5-25	>6.3	<0.04	5.0-6.0	Low.
Fine sandy loam	SM	A-2 or A-4	90-100	85-100	25-45	2.0-6.3	0.12-0.17	4.5-6.0	Low.
Loamy sand	SM	A-2	95-100	95-100	15-30	>6.3	0.04-0.09	4.5-5.5	Low.
Sand and gravel	SM, SP, or GP.	A-1, A-2, or A-3.	50-100	40-100	5-25	>6.3	<0.04	5.0-6.0	Low.
Gravelly fine sandy loam.	SM	A-2 or A-4	70-100	65-90	25-45	2.0->6.3	0.10-0.20	5.0-6.5	Low.
Gravelly fine sandy loam.	SM	A-2 or A-4	65-95	60-85	20-45	2.0->6.30	0.10-0.18	5.0-6.0	Low.
Sand and gravel	SP-SM, SP, or GP.	A-1	40-75	30-60	0-10	>6.3	<0.04	5.0-6.0	Low.

TABLE 6.—*Brief description of soils and their estimated*

Symbol on map	Soil name	Depth to seasonal high water table	Depth to bedrock	Brief description of soil	Depth from surface
		Feet	*Feet*		*Inches*
WmB	Westminster loam, 3 to 8 percent slopes.	--------	<2	Loamy soils developed in thin mantle of glacial till derived from mica schist and in places an admixture of siliceous limestone; soils consist of about 1½ feet of loam or fine sandy loam over bedrock; rock outcrops are 20 to 150 feet apart; soils contain stones.	0–4
WmC	Westminster loam, 8 to 15 percent slopes.				4–18
WmD	Westminster loam, 15 to 25 percent slopes.				
WnC	Westminster very rocky loam, 3 to 15 percent slopes.				18+
WnD	Westminster very rocky loam, 15 to 25 percent slopes.				
WrD	Westminster extremely rocky loam, 3 to 25 percent slopes.				
WrF	Westminster extremely rocky loam, 25 to 75 percent slopes.				
WsA	Whitman fine sandy loam, 0 to 3 percent slopes.	0	3–10+	Very poorly drained soils developed in glacial till derived from granite, gneiss, and schist; soils consist of about 1½ feet of fine sandy loam, loam, or silt loam over sandy loam or fine sandy loam; contain stones and some boulders.	0–19
WtA	Whitman extremely stony fine sandy loam, 0 to 3 percent slopes.				19–36
WuA	Windsor loamy fine sand, 0 to 3 percent slopes.	3–5+	>10	Excessively drained sandy soils developed on wind- or water-sorted sand deposits; soils consist of about 2 feet of loamy fine sand over sand; usually free of gravel but may have strata of gravel at depths of 4 to 5 feet.	0–20
WuB	Windsor loamy fine sand, 3 to 8 percent slopes.				
WuC	Windsor loamy fine sand, 8 to 15 percent slopes.				20–42
WuE	Windsor loamy fine sand, 15 to 35 percent slopes.				
WvB	Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes.				
Ww	Winooski very fine sandy loam.	1.5	>10	Moderately well drained silty soil developed in silty and very fine sandy alluvium; soil consists of about 2 to 2½ feet of silt loam or very fine sandy loam underlain by material ranging from silt loam to sandy loam; some areas subject to yearly flooding by stream overflow, usually in spring.	0–30
					30–42

TABLE 7.—*Interpretation of*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Agawam (AfA, AfB, AfC, AfD).	Good	Moderate	Good	Sand fair; gravel poor.	Fair	Soil properties favorable, except that banks are erodible.
Agawam (silty substratum) (AgA, AgB, AgC).	Fair	Moderate	Good	Sand fair; not suitable for gravel.	Solum fair; silty substratum poor.	Seepage over silty substratum.

See footnotes at end of table.

physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
Loam	SM or ML	A-2 or A-4	75-95	70-90	30-60	0. 63-6. 3	0. 15-0. 30	4. 5-6. 0	Low.
Loam or fine sandy loam.	SM or ML	A-2 or A-4	70-95	60-90	30-60	0. 63-6. 3	0. 15-0. 30	4. 5-6. 5	Low.
Bedrock									
Fine sandy loam	SM, SC, or ML.	A-2 or A-4	75-100	65-90	25-55	0. 63-6. 3	0. 13-0. 20	4. 5-6. 0	Low.
Gravelly sandy loam.	SM or ML	A-2 or A-4	70-95	60-90	20-55	<0. 2-0. 63	0. 10-0. 13	5. 0-6. 0	Low.
Loamy fine sand	SM	A-2	95-100	95-100	10-30	>6. 3	0. 04-0. 09	4. 5-5. 5	Low.
Sand	SM or SP	A-2 or A-3	95-100	95-100	0-35	>6. 3	<0. 04	4. 5-6. 0	Low.
Very fine sandy loam.	ML	A-4	100	100	60-85	0. 63-2. 0	0. 13-0. 23	5. 0-6. 5	Low.
Very fine sand and silt.	ML or SM	A-4 or A-2	100	95-100	25-80	0. 63-6. 3	0. 10-0. 23	5. 0-6. 5	Low.

engineering properties of soils

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Rapid to very rapid seepage.	Moderately rapid to rapid permeability; fair to good strength and stability; may be susceptible to piping.	Drainage not needed	Moderate water-holding capacity and intake rate.	Sandy material at depth of about 2 feet that has rapid permeability.	Erodible, especially on steeper slopes; low water-holding capacity at depth of 18 to 24 inches.
Very slow seepage because of silty substratum.	Sandy soil down to substratum has moderately rapid permeability and fair to good strength and stability; silty substratum has moderately slow to slow permeability, fair strength, and poor stability, and is susceptible to piping.	Drainage not needed	Moderate water-holding capacity and intake rate.	Moderately slow to slow permeability in silty substratum usually at depth of 24 to 30 inches.	Vegetation difficult to establish in silty substratum.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Belgrade (BaA, BaB).	Poor	High	Fair	Not suitable	Poor	Seasonal high water table; slopes erodible; some susceptibility to frost heaving.
Berkshire (BbB, BbC, BbD, BcB, BcC, BcD, BdB, BdD, BdF). Berkshire, dark subsoil, (BeB, BeC, BeD, BfB, BfC, BfD, BgB, BgD, BgF).	Fair	Moderate	Fair; poor on stony phases.	Not suitable	Good	Stones and some boulders; some steep slopes; may have seepage in deep cuts.
Bernardston (BhB, BhC, BhD, BmB, BmC, BmD, BmF).	Fair	Moderate	Good; poor on stony phases.	Not suitable	Fair	Subject to seepage and slides above hardpan; stones and some boulders; some steep slopes.
Biddeford (Bn).	Not suitable	High	Poor	Not suitable	Not suitable	High water table most of year; plastic soil material; susceptible to frost heaving.
Broadbrook (BsB, BsC, BsD, BtC, BtD).	Fair	Moderate	Good; poor on stony phases.	Not suitable	Fair	Silty solum erodible; subject to seepage and slides above hardpan; some stones.
Buckland (BuA, BuB, BuC, BuD, BvB, BvC, BvD, BwB, BwC).	Fair	Moderate	Good; poor on stony phases.	Not suitable	Fair	Subject to seepage and slides above hardpan; stones and some boulders; seasonal high water table.
Buxton (BxA, BxB).	Poor	High	Fair	Not suitable	Poor	Seasonal high water table or seepage; plastic soil material; slopes erodible; susceptible to frost heaving; subject to seepage and slides above clayey substratum.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Slow seepage	Slow permeability; fair strength; poor stability; susceptible to piping.	Slow permeability; seasonal high water table or seepage; surface drainage needed; subsurface drainage may be difficult.	High water-holding capacity; slow intake rate.	Slow permeability; erodible.	Highly erodible.
Moderate to rapid seepage.	Moderate to moderately rapid permeability to substratum; stones and some boulders; fair to good strength; fair to poor stability; substratum has moderately rapid to slow permeability.	Drainage not needed	Moderate to high water-holding capacity; moderate intake rate.	Stony soil material; some areas too steep.	Stony soil material; some areas too steep.
Very slow seepage because of hardpan at depth of 18 to 24 inches.	Moderate to slow permeability; hardpan at depth of 18 to 24 inches; good to fair strength; fair stability; stones and some boulders.	Moderate permeability in all of surface layer and subsoil except hardpan; slow permeability in hardpan, at depth of 18 to 24 inches; drainage usually not needed except for seep spots.	High water-holding capacity; slow to moderate intake rate.	Stony soil material; very slow permeability in hardpan at depth of 18 to 24 inches; some areas too steep.	Stony soil material; hardpan at depth of 18 to 24 inches; seepage; some steep slopes, vegetation difficult to establish in hardpan.
Very slow seepage because of clayey material and high water table.	Slow to moderately slow permeability; fair to poor strength; poor to good stability; wet most of year; surface unsuitable in places.	Slow to moderately slow permeability; high water table; most areas in depressions; outlets difficult to find; subsurface drainage difficult.	Irrigation not needed; wet most of year; high water-holding capacity; slow intake rate.	Not needed because of nearly level slopes and high water table most of year.	Not used for this purpose; high water table most of year; most areas in depressions.
Slow to very slow seepage because of hardpan at about 24 inches.	Moderate permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan; fair strength and poor stability down to substratum; good to fair strength and fair stability in substratum.	Drainage not needed	High water-holding capacity; slow to moderate intake rate.	Erodible; moderately slow to slow permeability in hardpan, at depth of about 24 inches; stony in places.	Highly erodible silty solum; hardpan at depth of about 24 inches; vegetation difficult to establish in hardpan.
Very slow seepage because of hardpan at 18 to 24 inches.	Moderate permeability in all of surface layer and subsoil except hardpan; slow to moderately slow in hardpan at depth of 18 to 24 inches; soil contains stones and some boulders; has good to fair strength and fair stability.	Moderate permeability in all of surface layer and subsoil except the hardpan; slow to moderately slow permeability in hardpan, at depth of 18 to 24 inches; subsurface drainage satisfactory.	Not usually irrigated; moderate water-holding capacity and intake rate.	Stony soil material; slow to moderately slow permeability in hardpan, at depth of 18 to 24 inches.	Stony soil material; seepage; hardpan at depth of 18 to 24 inches vegetation difficult to establish in hardpan.
Very slow seepage because of clayey substratum at depth of about 24 inches.	Moderately slow to slow permeability; fair strength; poor stability down to substratum; good in substratum.	Moderately slow to slow permeability; surface drainage needed; subsurface drainage difficult.	Not usually irrigated; high water-holding capacity; slow intake rate.	Slow permeability in clayey substratum, at depth of about 24 inches; erodible.	Highly erodible; vegetation difficult to establish in clayey substratum.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Cabot (CaA, CaB, CbB).	Not suitable	High	Poor	Not suitable	Poor	High water table in fall, winter, and spring; stones and some boulders; susceptible to frost heaving.
Cabot black surface (CcA, CdA, CdB).	Not suitable	High	Poor	Not suitable	Not suitable	High water table most of year; stones and some boulders; susceptible to frost heaving.
Carver (CeA, CeB, CeC, CeD)	Good	Low	Poor	Sand good; gravel poor.	Fair	Soil properties favorable but vegetation is difficult to establish on cut banks because of droughtiness.
Charlton (CkB, CkC, CmC, CmD, CnB, CnD, CnE).	Fair	Moderate	Fair; poor on stony phases.	Not suitable	Good	Stones and some boulders; some steep slopes; seepage in some deep cuts.
Cheshire (CoB, CoC, CoD, CpB, CpC, CpD, CrB, CrD, CrE).	Fair	Moderate	Fair; poor on stony phases.	Not suitable	Good	Stones and some boulders; some steep slopes; seepage in some deep cuts.
Colrain (CsB, CsC, CsD, CvB, CvC, CvD, CxB, CxD, CxF).	Fair	Moderate	Fair; poor on stony phases.	Not suitable	Good	Stones and some boulders; some steep slopes; seepage in some deep cuts.
Deerfield (DfA).	Fair	Moderate	Poor	Sand good; gravel poor.	Good	Seasonal high water table during winter and spring.
Dutchess (DuB, DuC, DuD, DvC, DvD, DxD, DxF).	Good	Moderate	Fair	Not suitable	Fair	Stones and some boulders; some steep slopes; bedrock within 3 to 5 feet of surface in places.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Very slow seepage because of hardpan at depth of about 18 inches.	Moderate permeability in all of surface layer and subsoil except hardpan; moderately slow to slow permeability in hardpan, at depth of about 18 inches; soil is intermittently wet; contains stones and some boulders; has good to fair strength and fair to poor stability.	Moderate permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of about 18 inches; high water table; if adequate outlets are provided, subsurface drainage is satisfactory.	Not irrigated; high water table; moderate water-holding capacity and intake rate.	Usually not needed, as most areas are level and have high water table; moderately slow to slow permeability in hardpan, at depth of about 18 inches; stony soil material.	Not usually used for this purpose, as most areas are level and have high water table; stony soil material.
Very slow seepage because of high water table most of year and hardpan.	Moderately slow to slow permeability in hardpan; soil contains stones and some boulders; is wet most of year; has good to fair strength and fair to poor stability.	High water table; most areas in depressions; outlets difficult to find; if adequate outlets are provided, subsurface drainage may be satisfactory.	Not needed, wet most of year.	Not needed because of flat topography and high water table most of year.	Not used for this purpose; high water table most of year; most areas in depressions.
Very rapid seepage.	Rapid permeability; good to fair strength and stability.	Drainage not needed	Very low water-holding capacity, rapid intake rate; frequent applications of water required.	Not usually used for this purpose; rapid permeability; some areas too steep.	Not usually used for this purpose; rapid permeability; low water-holding capacity; vegetation difficult to establish; some areas too steep.
Moderate to rapid seepage.	Moderately rapid to rapid permeability in solum; stones and some boulders; good to fair strength; fair stability; moderately slow to slow permeability in substratum in many places.	Drainage not needed	Moderate water-holding capacity and intake rate.	Stony soil material; some areas too steep.	Stony soil material; some areas too steep.
Rapid seepage	Moderately rapid to rapid permeability; stones and some boulders; good to fair strength; fair stability; in moderate permeability.	Drainage not needed	Moderate water-holding capacity and intake rate.	Stony soil material; some areas too steep.	Stony soil material; some areas too steep.
Rapid seepage	Rapid permeability; stones and some boulders; good to fair strength; fair stability; in places substratum has moderately slow to slow permeability.	Drainage not needed	Moderate water-holding capacity and intake rate.	Stony soil material; some areas too steep.	Stony soil material; some areas too steep.
Very rapid seepage in summer and fall.	Rapid permeability; good to fair strength and stability.	Rapid permeability; seasonal high water table; subsurface drainage satisfactory.	Low water-holding capacity; rapid intake rate.	Not usually needed as most areas nearly level; rapid permeability.	Not usually used for this purpose; most areas nearly level; rapid permeability.
Moderate seepage; may be rapid in substratum.	Moderate to moderately rapid permeability; stones and some boulders; good to fair strength; fair stability.	Drainage not needed	Moderate to high water-holding capacity; moderate intake rate.	Stony soil material; some areas too steep.	Stony soil material; some areas too steep.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Essex (EfB, EfC, EfD, EvB, EvC, EvD, ExB, ExC, ExE).	Fair	Moderate	Fair; poor on stony phases.	Poor	Good	Subject to seepage and slides above hardpan; stones and boulders; some steep slopes.
Gloucester (CfA, GfB, GfC, GfD, GmB, GmC, GmD, GvB, GvC, GvD, GxB, GxC, GxE).	Good	Low	Fair to poor	Poor	Good	Stones and boulders; some steep slopes; seepage in some deep cuts.
Hadley (HaA, HaB, HbA, HbB, HcA).	Poor	Moderate	Good	Poor	Poor	Subject to flooding; slopes erodible; some susceptibility to frost heaving.
Hartland (HdA, HdB, HdC, HdD).	Poor	Moderate	Good	Not suitable	Poor	Soil properties favorable but slopes are erodible.
Hinckley (HgA, HgB, HgC, HgD, HkA, HkB, HkC, HkD).	Good	Low	Poor	Good	Good	Some steep slopes; vegetation difficult to establish on banks because of droughtiness.
Hollis (HmB, HmC, HnC, HnD, HoD, HoF).	Fair	Moderate	Poor to very poor.	Not suitable	Poor	Shallow to bedrock; rock outcrops; stone and some boulders; some steep slopes.
Holyoke and Sunderland (both). (HvC, HvD, HxD, HxF).	Fair	Moderate	Poor	Not suitable	Poor	Shallow to bedrock; rock outcrops; stones and some boulders; many steep slopes.
Limerick (Lk).	Not suitable	High	Fair	Not suitable	Not suitable	High water table; subject to flooding; susceptible to frost heaving.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Slow to very slow seepage because of hardpan at about 24 inches.	Rapid to moderately rapid permeability in all of surface layers and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of 24 inches; soil contains stones and boulders; has good to fair strength and fair stability.	Rapid to very rapid permeability in all of surface layer and subsoil except the hardpan; slow to very slow permeability in hardpan; drainage usually not needed except for seep spots.	Moderate water-holding capacity and intake rate.	Stony and bouldery soil material; moderately slow to slow permeability in hardpan, at depth of 24 inches; some areas too steep.	Stony and bouldery soil material; hardpan at about 24 inches; seepage; vegetation difficult to establish in hardpan.
Very rapid seepage.	Moderately rapid to rapid permeability; stones and boulders; good to fair strength and stability; in places, a hardpan below a depth of 2½ feet has moderately slow to slow permeability.	Drainage not needed	Low to moderate water-holding, capacity; rapid to moderate intake rate; frequent applications of water required.	Stony and bouldery soil material; some areas too steep.	Stony and bouldery soil material; some areas too steep.
Moderate seepage	Moderate permeability; fair strength; poor stability; susceptible to piping; subject to flooding.	Moderate permeability; may need surface drainage.	High water-holding capacity; moderate to slow intake rate.	Not usually needed, as most areas nearly level.	Highly erodible; not usually used for this purpose; most areas nearly level.
Moderate to slow seepage.	Moderate permeability in solum; slow to moderately slow permeability in substratum; subject to piping; fair strength; poor stability.	Drainage not needed	High water-holding capacity; moderate to slow intake rate.	Erodible; few areas too steep.	Highly erodible; high water-holding capacity; few areas too steep.
Very rapid seepage.	Rapid permeability; good to fair strength and stability.	Drainage not needed	Low water-holding capacity; rapid intake rate; frequent applications of water required.	Rapid permeability; gravelly material at 1 to 2 feet; some areas too steep.	Low water-holding capacity; vegetation difficult to establish.
Moderate to rapid seepage; bedrock within 18 inches.	Stones and some boulders; moderately rapid to rapid permeability; good to fair strength; fair stability; bedrock within depth of 18 inches.	Drainage not needed	Not usually irrigated; moderate water-holding capacity and intake rate; bedrock within depth of 18 inches.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.
Moderate to rapid seepage; bedrock within depth of 18 inches.	Stones and some boulders; moderate to rapid permeability; good to fair strength; fair to poor stability; bedrock within depth of 18 inches.	Drainage not needed	Not irrigated; moderate to high water-holding capacity; moderate intake rate; bedrock within depth of 18 inches.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; many areas too steep.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; many areas too steep.
Very slow seepage when water table is high, moderate when low.	Moderate permeability; intermittently wet; fair strength; poor to good stability; susceptible to piping.	Moderate permeability; high water table; subject to flooding; surface drainage needed; if adequate outlets are provided, subsurface drainage is usually satisfactory; outlets may be difficult to find.	Not irrigated; high water-holding capacity; moderate to slow intake rate; high water table.	Not needed because of nearly level slopes and high water table.	Not usually used for this purpose; high water table; subject to flooding; nearly level slopes, or in depression.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Limerick-Saco silt loams (Ls).	Not suitable	High	Poor	Not suitable	Not suitable	High water table; subject to flooding; susceptible to frost heaving.
Lyman (LvC, LvD, LxC, LxF).	Fair	Moderate	Poor	Not suitable	Poor	Shallow to bedrock; rock outcrops; stones and some boulders; some steep slopes.
Marlow (MaB, MaC, MaD, MbB, MbC, MbD, McB, McD). Marlow (dark subsoil) (MdB, MdC, MdD, MeB, MeC, MeD, MfB, MfD, MfE).	Fair	Moderate	Good, poor on stony phases.	Not suitable	Fair	Stones and some boulders; subject to seepage and slides above hardpan; some steep slopes.
Merrimac (MgA, MgB, MgC, MgD, MmA, MmB, MmC, MmE).	Good	Low	Fair	Good	Good	Vegetation difficult to establish on cut banks in gravelly substratum because of droughtiness.
Muck (Ms, Mu).	Not suitable	High	Not suitable; used for top dressing.	Not suitable	Not suitable	High water table most of year; susceptible to frost heaving; highly organic material.
Nassau (NaC, NaD, NeC, NeF).	Fair	Moderate	Poor	Not suitable	Poor	Shallow to bedrock; rock outcrops; stones and some boulders; some steep slopes.
Ninigret (NfA, NfB).	Fair	Moderate	Good	Sand fair; gravel, not suitable.	Good	Seasonal high water table in winter and spring; slopes erodible.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Very slow seepage; because of high water table.	Moderate permeability; in places the substratum of Saco has moderately rapid or rapid permeability; intermittently wet; good to fair strength; poor to good stability; susceptible to piping.	Moderate permeability; in places the substratum of Saco has moderately rapid or rapid permeability; high water table; subject to flooding; surface drainage needed; subsurface drainage may be difficult.	Not irrigated; high water table.	Not needed because of high water table and flat topography.	Not used for this purpose; high water table; nearly level slopes; subject to flooding, or in depressions.
Moderate to rapid seepage; bedrock within depth of 18 inches.	Moderate to rapid permeability; stones and some boulders; good to fair strength; fair to poor stability; bedrock within depth of 18 inches.	Drainage not needed	Not irrigated; bedrock within depth of 18 inches; moderate to high water-holding capacity; moderate intake rate.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.
Very slow seepage in hardpan at about 24 inches.	Moderate to rapid permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of 24 inches; soil contains stones and some boulders; has good to fair strength, and fair to poor stability.	Moderate to rapid permeability in all the surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan; drainage usually not needed except to drain seep spots.	Moderate to high water-holding capacity; moderate intake rate.	Stony soil material; moderately slow to slow permeability in hardpan, at depth of 24 inches; some areas too steep.	Stony soil material; hardpan at depth of 24 inches; some areas too steep; vegetation difficult to establish in hardpan.
Very rapid seepage	Moderately rapid to rapid permeability; good to fair strength and stability.	Drainage not needed	Moderate to low water-holding capacity; moderate intake rate.	Rapid permeability in gravelly substratum, at depth of 18 to 30 inches; some areas too steep.	Rapid permeability in gravelly substratum, at depth of 18 to 30 inches; vegetation difficult to establish in gravelly material; some areas too steep.
Very slow seepage because of high water table most of year.	Not suitable; wet most of year; organic materials.	High water table; most areas in depressions; outlets difficult to find; if adequate outlets are provided, subsurface drainage is satisfactory.	Not irrigated; wet most of year.	Not needed because of high water table most of year; flat topography.	Not used for this purpose; high water table most of year; most areas in depressions.
Moderate seepage; bedrock within 18 inches.	Moderately rapid permeability; stones; good to fair strength; fair stability; bedrock within depth of 18 inches.	Drainage not needed	Not irrigated; bedrock within depth of 18 inches; moderate to high water-holding capacity; moderate intake rate.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.
Very rapid seepage in sandy substratum during summer and fall.	Moderately rapid to rapid permeability; good to fair strength and stability.	Moderately rapid to rapid permeability; seasonal high water table; subsurface drainage satisfactory.	Moderate water-holding capacity and intake rate.	Not usually needed, as most areas are nearly level.	Not usually used for this purpose; most areas nearly level.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Ninigret silty substratum (NgA, NgB).	Poor	Moderate	Good	Solum fair for sand; substratum not suitable.	Solum good; silty substratum poor.	Seasonal high water table in winter and spring; slopes erodible; seepage and slides above silty substratum.
Ondawa (Of).	Good	Low	Good	Sand good; gravel fair.	Good	Subject to flooding
Peat (Pa).	Not suitable	High	Not suitable; used for topdressing.	Not suitable	Not suitable	High water table most of year; susceptible to frost heaving; highly organic material.
Peru (PbA, PbB, PbC, PcB, PcC, PcD, PeB, PeC).	Poor	Moderate	Good; poor on stony phases.	Not suitable	Fair	Stones and some boulders; subject to seepage and slides above hardpan; seasonal high water table.
Pittstown (PnB).	Fair	Moderate	Fair	Not suitable	Fair	Seasonal high water table; subject to seepage and slides above hardpan; stones and some boulders.
Podunk (Po).	Fair	Moderate	Fair	Sand good; gravel fair.	Good	Subject to flooding; seasonal high water table.
Raynham (RaA).	Poor	High	Poor	Not suitable	Not suitable	High water table; susceptible to frost heaving; slopes erodible.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Rapid to very rapid seepage in solum and very slow in silty substratum.	Moderately rapid to rapid permeability in sandy soil down to substratum; moderately slow to slow permeability in silty substratum; good to fair strength and stability down to substratum; fair strength and poor stability in substratum.	Moderately rapid to rapid permeability in sandy soil down to substratum; moderately slow to slow permeability in silty substratum; seasonal high water table; subsurface drainage satisfactory.	Moderate water-holding capacity and intake rate.	Not usually needed, as most areas are nearly level; moderately slow to slow permeability in silty substratum, usually at depth of 24 to 30 inches.	Not usually used for this purpose; most areas nearly level; moderately slow to slow permeability in silty substratum, usually at depth of 24 to 30 inches.
Rapid to very rapid seepage.	Moderately rapid to rapid permeability; fair to good strength and stability.	Drainage not needed	Moderate water-holding capacity and intake rate.	Usually not needed as most areas are nearly level.	Not usually used for this purpose; most areas nearly level; vegetation may be difficult to establish in sandy substratum.
Very slow seepage because of high water table most of year.	Not suitable; wet most of year; organic materials.	High water table; in depressions; outlets difficult to find; if adequate outlets are provided, subsurface drainage is satisfactory.	Not irrigated; wet most of year.	Not needed because of high water table most of year and flat topography.	Not used for this purpose; high water table most of year; flat topography.
Very slow seepage because of hardpan at depth of about 18 to 24 inches.	Moderate to moderately rapid permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of about 18 to 24 inches; soil contains stones and some boulders; has good to fair strength and good to poor stability.	Moderately slow to slow permeability in hardpan, at depth of about 18 to 24 inches; seasonal high water table or seepage; subsurface drainage satisfactory.	Not usually irrigated; moderate to high water-holding capacity; moderate intake rate.	Stony soil material; moderately slow to slow permeability in hardpan, at depth of about 18 to 24 inches.	Stony soil material; hardpan at depth of about 18 to 24 inches; seepage; vegetation difficult to establish in hardpan.
Very slow seepage in hardpan, at 18 to 24 inches.	Slow permeability in hardpan, at depth of 18 to 24 inches; soil contains stones; has good to fair strength and fair to poor stability.	Moderate to moderately rapid permeability in solum; slow permeability in hardpan; at depth of 18 to 24 inches; seasonal high water table or seepage; subsurface drainage satisfactory.	Not usually irrigated; high water-holding capacity; slow to moderate intake rate.	Stony soil material; slow permeability in hardpan, at depth of 18 to 24 inches.	Stony soil material; seepage; hardpan at depth of 18 to 24 inches; vegetation difficult to establish in hardpan.
Rapid to very rapid seepage.	Moderately rapid to rapid permeability; fair to good strength and stability.	Moderately rapid to rapid permeability; seasonal high water table; subsurface drainage satisfactory; subject to flooding.	Moderate water-holding capacity and intake rate.	Not usually needed because of level topography; rapid permeability in substratum.	Not usually used for this purpose; nearly level slopes.
Very slow seepage	Moderate to moderately slow permeability; intermittently wet; fair strength; good to poor stability; susceptible to piping.	Moderate to moderately slow permeability; seasonal high water table; surface drainage needed; subsurface drainage may be difficult.	Not irrigated; high water table; high water-holding capacity; slow intake rate.	Not needed because of level topography and high water table.	Not usually used for this purpose; most areas level; high water table.

TABLE 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Ridgebury (RdA, RdB, RgB).	Not suitable	High	Poor	Not suitable	Fair	High water table in fall, winter, and spring; stones and boulders; susceptible to frost heaving.
Riverwash (Rs).	Poor	Variable	Not suitable	Sand poor; gravel good.	Good to fair	Subject to frequent flooding.
Rumney (Ru).	Poor	High	Fair	Poor	Poor	Subject to flooding; high water table; susceptible to frost heaving.
Saco (Sa).	Not suitable	High	Poor	Not suitable	Not suitable	High water table; frequently flooded; susceptible to frost heaving.
Saugatuck (Sb).	Not suitable	High	Poor	Poor	Poor	High water table in fall, winter, and spring; susceptible to frost heaving.
Scantic (ScA, ScB).	Not suitable	High	Poor	Not suitable	Not suitable	High water table; plastic soil material; susceptible to frost heaving.
Scarboro brownish subsoil variant. (Sd).	Not suitable	High	Poor	Poor	Poor	High water table most of year; susceptible to frost heaving.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Very slow seepage because of hardpan at depth of 12 to 18 inches and high water table.	Moderately rapid to rapid permeability in all of surface layers and subsoil except in hardpan; and moderately slow to slow permeability in hardpan, at depth of 12 to 18 inches; soil is intermittently wet; contains stones and boulders; has good to fair strength and fair stability.	Moderately rapid to rapid permeability in all of surface layer and subsoil except hardpan; moderately slow to slow permeability in hardpan, at depth of 12 to 18 inches; high water table; if adequate outlets are provided, subsurface drainage is satisfactory.	Not irrigated; moderate water-holding capacity and intake rate; high water table.	Not usually needed, as most areas nearly level; stony soil material; high water table; moderately slow to slow permeability in hardpan, at depth of 12 to 18 inches.	Not usually used for this purpose; most areas nearly level; high water table; stony soil material.
Not used for this purpose.	Rapid permeability	Not used for agriculture.	Not used for agriculture.	Not used for this purpose.	Not used for this purpose.
Very slow seepage when water table is high, very rapid when low.	Moderately rapid to rapid permeability; intermittently wet; fair to good strength and stability.	Moderately rapid to rapid permeability; high water table; subject to flooding; surface drainage may be needed; if adequate outlets are provided, subsurface drainage is satisfactory; outlets may be difficult to find.	Not irrigated; high water table; moderate water-holding capacity and intake rate.	Not needed because of flat topography and water table.	Not usually used for this purpose; nearly level or level slopes; high water table; subject to flooding.
Very slow seepage because of high water table most of year.	Moderate to rapid permeability; wet most of year; good to fair strength; poor to good stability; susceptible to piping; surface may not be suitable for embankments.	High water table; subject to flooding; most areas in depressions; outlets difficult to find.	Not irrigated; wet most of year; subject to flooding.	Not needed because of high water table most of year and flat topography.	Not used for this purpose; high water table most of year; subject to flooding; most areas in depressions.
Very slow seepage when water table is high, very rapid when low.	Rapid permeability above and below cemented layer at about 10 to 20 inches; cemented layer has moderately slow to slow permeability; intermittently wet; good to fair strength and stability.	High water table; cemented layer has moderately slow to slow permeability; if adequate outlets are provided, subsurface drainage is satisfactory; outlets may be difficult to find.	Not irrigated; high water table; low water-holding capacity; rapid intake rate.	Not usually needed because of high water table and flat topography.	Not usually used for this purpose; high water table; nearly level or level slopes.
Very slow seepage because of clayey material at depth of about 18 inches.	Slow to moderately slow permeability; intermittently wet; fair to poor strength; good to poor stability.	Slow to moderately slow permeability in substratum; seasonal high water table; subsurface drainage difficult; surface drainage needed.	Not irrigated; high water table; high water-holding capacity; slow intake rate.	Not needed because of nearly level slopes and high water table.	Not usually used for this purpose; most areas nearly level or level; high water table.
Very slow seepage because of high water table most of year.	Moderately rapid to rapid permeability; wet most of year; good to fair strength and stability.	Moderately rapid to rapid permeability; high water table; most areas in depressions; outlets difficult to find; if adequate outlets are provided, subsurface drainage is satisfactory.	Not irrigated; wet most of year.	Not needed because of high water table most of year and flat topography.	Not used for this purpose; high water table most of year; most areas are depressional.

Table 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Scituate (SeA, SeB, SeC, SfA, SfB, SfC, SgB, SgC).	Poor	Moderate	Good; poor on stony phases.	Not suitable	Fair	Subject to seepage and slides above hardpan; seasonal high water table; stones and boulders.
Shapleigh (ShB, ShC, SkC, SkD, SmC, SmF).	Fair	Moderate	Fair, poor on stony phases.	Not suitable	Poor	Shallow to bedrock; rock outcrops; stones and boulders; some steep slopes.
Shelburne (SnB, SnC, SnD, SoB, SoC, SoD, SpB, SpD, SpF).	Fair	Moderate	Fair to poor	Not suitable	Fair	Subject to seepage and slides above hardpan; stones and some boulders; some steep slopes.
Stissing (SrB, SsB).	Not suitable	High	Poor	Not suitable	Poor	High water table in fall, winter, and spring; stones and some boulders; susceptible to frost heaving.
Sudbury (StA, StB).	Fair	Moderate	Fair	Good	Good	Seasonal high water table during winter and spring.
Suffield (SuB, SuC2, SuE2).	Poor	High	Fair	Not suitable	Poor	Plastic soil material; subject to seepage and slides above clayey material; slopes erodible; susceptible to frost heaving; some steep slopes.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Slow to very slow seepage because of hardpan at depth of 18 to 24 inches.	Moderately rapid to rapid permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of 18 to 24 inches; soil contains stones and boulders; has good to fair strength and stability.	Moderately rapid to rapid permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan; at depth of 18 to 24 inches; seasonal high water table or seepage; subsurface drainage satisfactory.	Moderate water-holding capacity and intake rate.	Stony and bouldery soil material; slow to moderately slow permeability in hardpan at depth of 18 to 24 inches.	Stony and bouldery soil material; hardpan at 18 to 24 inches; seepage; vegetation difficult to establish in hardpan.
Rapid seepage; bedrock within depth of 24 inches.	Moderately rapid to rapid permeability; stones and boulders; good to fair strength and stability; bedrock within depth of 24 inches.	Drainage not needed	Not irrigated; moderate to low water-holding capacity; moderate intake rate; bedrock within depth of 24 inches.	Bedrock within depth of 24 inches; rock outcrops from 5 to more than 100 feet apart; stony and bouldery soil material; some areas too steep.	Bedrock within depth of 24 inches; rock outcrops from 5 to more than 100 feet apart; stony and bouldery soil material; some areas too steep.
Very slow seepage because of hardpan at depth of about 24 inches.	Moderate permeability in all of surface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of about 24 inches; soil contains stones and some boulders; has good to fair strength and fair stability.	Moderate permeability in all of subsurface layer and subsoil except the hardpan; moderately slow to slow permeability in hardpan, at depth of about 24 inches; drainage usually not needed except in seep spots.	Moderate water-holding capacity and intake rate.	Stony soil material; hardpan at depth of about 24 inches; has slow to moderately slow permeability; some areas too steep.	Stony soil material; hardpan at depth of about 24 inches; some areas too steep; difficult to establish vegetation in hardpan.
Very slow seepage because of hardpan at depth of 18 inches and high water table.	Moderate to moderately rapid permeability in all of surface layer and subsoil except hardpan; slow permeability in hardpan, at depth of 18 inches; soil is intermittently wet; contains stones and some boulders; has fair to good strength, and fair to poor stability.	Moderate to moderately rapid permeability in all of surface layer and subsoil; slow permeability in hardpan; at depth of 18 inches; high water table; surface drainage needed; if adequate outlets are provided, subsurface drainage may be satisfactory.	Not irrigated; high water table; high water-holding capacity; slow to moderate intake rate.	Stony soil material; usually not needed because of high water table; most areas nearly level; slow permeability in hardpan at depth of 18 inches.	Not usually used for this purpose; most areas nearly level; high water table; stony soil material.
Very rapid seepage in summer and fall.	Moderately rapid to rapid permeability; good to fair strength and stability.	Moderately rapid to rapid permeability; seasonal high water table; subsurface drainage satisfactory.	Moderate water-holding capacity and intake rate.	Not usually needed, as most areas nearly level; rapid permeability in gravelly substratum.	Not usually used for this purpose; most areas nearly level; rapid permeability in gravelly substratum.
Very slow seepage because of clayey material at about 18 inches.	Moderate to slow permeability; fair strength; good to poor stability.	Drainage usually not needed.	High water-holding capacity; slow intake rate.	Soil properties favorable; some areas too steep; erodible; slow permeability in clayey substratum at depth of 18 inches; erodible.	Highly erodible; some areas too steep; vegetation difficult to establish in clayey substratum.

Table 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Suncook (Sv).	Good	Low	Poor	Good sand; not suitable for gravel.	Fair	Subject to flooding; vegetation difficult to establish on cut banks because of droughtiness.
Sutton (SwB, SwC, SxB, SxC, SyB, SyC).	Poor	Moderate	Fair; poor on stony phases.	Not suitable	Fair	Seasonal high water table in winter and spring; stones and boulders; may get seepage in deep cuts.
Swanton (SzA, SzB).	Not suitable	High	Poor	Solum poor; substratum not suitable.	Poor	High water table in fall, winter, and spring; susceptible to frost heaving; clayey substratum.
Walpole and Wareham (both) (WaA, WaB).	Poor	High	Poor	Poor	Poor	High water table in fall, winter, and spring; susceptible to frost heaving.
Warwick (WfA, WfB, WfC, WfD, WgA, WgB, WgC).	Good	Low	Fair	Good	Good	Soil properties favorable; vegetation difficult to establish in cut banks in gravelly substratum because of droughtiness.
Westminster (WmB, WmC, WmD, WnC, WnD, WrD, WrF).	Fair	Moderate	Fair, poor on rocky phases.	Not suitable	Poor	Shallow to bedrock; rock outcrops; stones and some boulders; some steep slopes.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Very rapid seepage.	Rapid permeability; good to fair strength and stability.	Drainage not needed.	Low water-holding capacity; rapid intake rate; frequent applications of water required.	Not usually needed, as most areas nearly level; rapid permeability.	Not usually used for this purpose; most areas nearly level; low water-holding capacity.
Moderate to rapid seepage in summer and fall.	Moderate to moderately rapid permeability to substratum; moderately slow to slow permeability in substratum in places; stones and some boulders; good to fair strength; fair stability.	Moderate to moderately rapid permeability to substratum; moderately slow to slow permeability in substratum in places; seasonal high water table or seepage; subsurface drainage satisfactory.	Not usually irrigated; moderate water-holding capacity and intake rate.	Stony soil material.	Stony soil material; may have seepage.
Very slow seepage because of clayey substratum and high water table.	Moderately rapid to rapid permeability in sandy soil down to substratum; slow permeability in clayey substratum; soil is intermittently wet; good to fair strength and fair stability in soil down to substratum; fair strength and good to poor stability in substratum.	Moderately rapid to rapid permeability in soil down to substratum; slow permeability in clayey substratum; high water table; if adequate outlets are provided, subsurface drainage is satisfactory.	Irrigation not usually needed; high water table; moderate water-holding capacity and intake rate.	Not usually needed because of high water table and because most areas are nearly level; slow permeability in clayey substratum.	Not usually used for this purpose; most areas nearly level or level; high water table.
Seepage very slow when water table is high and very rapid when low.	Moderately rapid to rapid permeability; intermittently wet; good to fair strength and stability.	Rapid permeability in substratum; high water table; if adequate outlets are provided, subsurface drainage is satisfactory.	Irrigation usually not needed; high water table; low to moderate water-holding capacity; rapid intake rate.	Not usually needed because of high water table and nearly level slopes; very rapid permeability.	Not usually used for this purpose; most areas nearly level or level; high water table; low water-holding capacity.
Rapid seepage in solum and very rapid in gravelly substratum at 18 to 30 inches.	Moderately rapid to rapid permeability down to substratum; rapid permeability in gravelly substratum, at depth of 18 to 30 inches; good to fair strength and stability.	Drainage not needed.	Moderate water-holding capacity and intake rate down to substratum; low water-holding capacity and rapid intake rate in gravelly substratum.	Rapid permeability in gravelly substratum, at depth of 18 to 30 inches; some areas too steep.	Rapid permeability in gravelly substratum, at depth of 18 to 30 inches; low water-holding capacity; difficult to establish vegetation in gravelly substratum.
Moderate to rapid seepage; bedrock within 18 inches.	Moderate to moderately rapid permeability; stones and some boulders; good to fair strength; fair to poor stability; bedrock within 18 inches of surface.	Drainage not needed.	Not irrigated; bedrock within depth of 18 inches; moderate to high water-holding capacity; moderate intake rate.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.	Bedrock within depth of 18 inches; rock outcrops from 5 to more than 100 feet apart; stony soil material; some areas too steep.

Table 7.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—			Soil features affecting—
			Topsoil	Sand and gravel	Road fill	Highway location
Whitman (WsA, WtA).	Not suitable	High	Poor	Not suitable	Fair	High water table most of year; stones and boulders; susceptible to frost heaving.
Windsor (WuA, WuB, WuC, WuE, WvB).	Good	Low	Poor	Sand good; gravel not suitable.	Fair	Slopes erodible; difficult to establish vegetation on cut banks because of droughtiness.
Winooski (Ww).	Poor	Moderate	Good	Not suitable	Poor	Seasonal high water table; subject to flooding; slopes erodible.

[1] Information also applies to dikes and levees.

Generally the top 5 to 9 inches of soil is stripped from the surface for use as topsoil, which has an expanding market in the county. To be suitable for topsoil, a soil should have a stone-free, medium-textured surface layer that contains moderate amounts of organic matter. This kind of material has a high moisture-holding capacity. A seedbed can easily be prepared in it, and vegetation can be readily established and maintained. The suitability ratings of good, fair, and poor are based upon soil characteristics, such as depth of suitable material, texture, and stoniness.

The suitability ratings for sand and gravel are based upon estimated quantity and quality of the sand and gravel in the soils of each series, and upon field observations. A rating of *good* does not imply that all areas of the soil specified will produce sand or gravel that is economically workable.

Bank-run sand and gravel from soils listed in table 7 as fair to good sources of sand and gravel are suitable for road fill. If the material is to be used for aggregate in concrete work, screening, and sometimes washing, is required to meet specifications for this product. The suitability of the soil material for road fill depends largely upon the texture of the soil material and its natural content of water. Soil materials that have high contents of silt and clay are rated poor or fair for road fill depending upon the natural content of water, the time it takes the materials to dry, and the difficulty of handling or compacting the material. Peats and mucks and soils that are high in clay are not suitable for road fill. The suitability ratings shown are comparative, and are estimated on the basis of test data and field experience.

The features of the soils of each series that affect their use for highways, farm ponds, and irrigation and drainage systems are given in table 7.

The soil features affecting highway location are high water table, flooding, seepage, highly plastic material, muck, peat, boulders, rock, slope stability, and susceptibility to frost heaving. Soils that are most suitable for reservoir areas are underlain by relatively impervious silt and clay or a hardpan. Embankments and dams for a farm pond should consist of material that has strength and stability and that can be compacted to make it impervious. Dugout ponds are installed principally to intercept the ground water table, and the water in the pond will fluctuate along with the water table.

Drainage systems are established primarily to prevent the accumulation of excess water on or in the soil by intercepting and controlling its flow or by lowering the water table. The drainage system provides a balance between

properties of soils—Continued

Soil features affecting—Continued					
Farm ponds		Agricultural drainage	Irrigation	Diversions [2]	Waterways [2]
Reservoir area	Embankments [1]				
Very slow seepage because of high water table most of year.	Moderate to moderately rapid permeability above depth of 18 inches; moderately slow to slow permeability at depth of about 18 inches; soil wet most of year; contains stones and boulders; has good to fair strength and fair to poor stability.	High water table; most areas in depressions; outlets difficult to find; if adequate outlets are provided, subsurface drainage is satisfactory.	Not needed; wet most of year.	Not needed because of high water table most of year and level slopes.	Not used for this purpose; high water table most of year; most areas are depressional.
Very rapid seepage.	Rapid permeability; good to fair strength and stability.	Drainage not needed	Low water-holding capacity; rapid intake rate; frequent applications of water required.	Rapid permeability; some areas too steep.	Erodible; low water-holding capacity; vegetation difficult to establish; some areas too steep.
Moderate seepage.	Moderate permeability; may have moderately rapid permeability below 30 inches; subject to flooding; fair strength; poor stability; susceptible to piping.	Moderate permeability; may have moderately rapid permeability below 30 inches; seasonal high water table; subject to flooding; surface drainage needed; subsurface drainage satisfactory.	High water-holding capacity; moderate to slow intake rate.	Not usually needed because of nearly level slopes.	Not usually used for this purpose; nearly level slopes.

[2] Statements about soil properties and ratings apply to surface 2 feet of soil.

air and moisture in the soil that is favorable for the growth of crops, the operation of equipment, and the support of engineering structures. Soils with impeded drainage, if underlain by loose and friable parent material, usually can be drained by tile or other subsurface drains. Soils that have a slowly permeable layer require closer spacing of the title. The closer this layer is to the surface, the closer the spacing. In silty soils that have greatly decreased permeability, spacing may have to be so close that tiling is economically impractical, except for picking up random seeps and springs. Most suitable for such soils is surface drainage that is accomplished by using open ditches and intervening areas that are shaped by grading, smoothing and, in places, bedding.

Use of Soils for Urban Development [4]

In this subsection the soils are rated according to their limitations for use for (1) septic-tank systems, (2) homesites, (3) school sites, and (4) sites for athletic fields or intensive play areas. The ratings are given in table 8.

[4] By STEPHEN J. ZAYACH, State soil scientist, Soil Conservation Service, Amherst, Mass.

Franklin County is essentially rural. Residential, commercial, and industrial expansion have been modest in recent years. In the area south of the county, however, expansion has been much more intensive, especially in the Connecticut Valley. The need for homes, modern factories, schools, shopping centers, and similar facilities has resulted in intense competition for land. Much of the good agricultural land has been converted to urban uses. Indications are that the Connecticut Valley part of Franklin County will have the same pattern of changes in land use as the area south of the county.

As a rule, soils that are the best for agriculture are also the best for urban uses. A land-use plan is needed to reserve productive soil areas for agriculture. The information in this and other sections of the report should be helpful to planning officials in making decisions about land use.

The information in this section can be used by many persons and agencies concerned with urban development. It can be used in regional planning, as well as in town planning. Regional planners are interested in soils from a broad viewpoint. Soil associations, topography, and landforms are their main consideration. This kind of information is provided by the General Soil Map.

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TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Agawam:				
AfA	Slight: No special problems.[1]	Slight: No special problems.	Slight: No special problems.	Slight: No special problems.
AfB	Slight: No special problems.[1]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
AfC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
AfD	Severe: Slopes 15 to 25 percent.[1]	Moderate: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
Agawam, silty substratum:				
AgA, AgB, AgC	Severe: Slowly permeable substratum.	Moderate: Slowly permeable silty material within 2 to 4 feet of surface.	Moderate: Silty material within 2 to 4 feet of surface.	Severe: Slowly permeable silty material within 2 to 4 feet of surface; slopes 8 to 20 percent in places.
Belgrade:				
BaA, BaB	Severe: Excess seepage or temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; moderately permeable.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; moderately permeable; silty texture makes trafficability a problem; some slopes 3 to 8 percent.
Berkshire:				
BbB, BeB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems except for some stones below surface soil.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
BbC, BcC, BeC, BfC	Moderate: Slopes 8 to 15 percent; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes 8 to 15 percent; very stony surface in places.	Moderate: Slopes 8 to 15 percent; very stony surface in places.	Severe: Slopes 8 to 15 percent.
BcB, BfB	Slight: No special problems except very stony surface; hardpan in places at a depth below 30 inches.[2]	Moderate: Very stony surface.	Moderate: Slopes 3 to 8 percent; very stony surface.	Moderate: Slopes 3 to 8 percent; very stony surface.
BbD, BcD, BeD, BfD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in many places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
BdB, BgB	Moderate: Extremely stony surface; hardpan in places at a depth below 30 inches.[2]	Severe: Extremely stony surface.	Moderate: Slopes 3 to 8 percent; extremely stony surface.	Severe: Extremely stony surface.
BdD, BdF, BgD, BgF	Severe: Slopes mainly 15 to 65 percent; few are 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 65 percent.	Severe: Slopes mainly 15 to 65 percent; few are 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 65 percent.
Bernardston:				
BhB, BhC, BmB, BmC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; slopes 3 to 15 percent.	Severe: Slopes 3 to 15 percent; slowly permeable hardpan within 2½ feet of surface.
BhD, BmD	Severe: Slowly permeable hardpan; slopes 15 to 25 percent.	Moderate: Hardpan within 2½ feet of surface; slopes 15 to 25 percent; many very stony surfaces.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan within 2½ feet of surface.
BmF	Severe: Slopes 25 to 55 percent; slowly permeable hardpan.	Severe: Slopes 25 to 55 percent.	Severe: Slopes 25 to 55 percent.	Severe: Slopes 25 to 55 percent.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Biddeford:				
Bn	Severe: High water table at or near surface most of year; slowly permeable.	Severe: High water table at or near surface most of year; ponding of surface runoff.	Severe: High water table at or near surface most of year; ponding of surface runoff.	Severe: High water table at or near surface most of year; ponding of surface water; slowly permeable; difficult to drain.
Broadbrook:				
BsB, BsC, BtC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; very stony surface; slopes mainly 8 to 15 percent.	Moderate: Slopes mainly 8 to 15 percent; hardpan within 2½ feet of surface; very stony surface in places.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent.
BsD, BtD	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in many places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan within 2½ feet of surface.
Buckland:				
BuA, BuB, BuC, BvB, BvC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Slowly permeable hardpan within 2½ feet of surface; excess seepage or high water table about 1½ feet from surface; slopes mainly 8 to 15 percent; very stony surface in places.	Moderate: Hardpan within 2½ feet of surface; excess seepage or high water table about 1½ feet from surface; very stony surface in places; slopes mainly 8 to 15 percent.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent.
BuD, BvD	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 15 to 25 percent.	Moderate: Hardpan within 2½ feet of surface; very stony surface in places; slopes 15 to 25 percent; excess seepage or high water table about 1½ feet from surface.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan within 2½ feet of surface.
BwB, BwC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Severe: Extremely stony surface.	Moderate: Extremely stony surface; hardpan within 2½ feet of surface; slopes mainly 3 to 15 percent; in places slopes are 15 to 25 percent and are a severe limitation.	Severe: Extremely stony surface; slopes mainly 3 to 15 percent; slowly permeable hardpan within 2½ feet of surface.
Buxton:				
BxA, BxB	Severe: Slowly permeable clayey substratum.	Moderate: Excess seepage or temporary high water table about 1½ feet from surface; slowly permeable clayey layer within 2½ feet of surface; moderate shrink-swell potential.	Moderate: Excess seepage or temporary high water table about 1½ feet from surface; clayey layer within 2½ feet of surface; moderate shrink-swell potential.	Severe: Slowly permeable clayey layer within 2½ feet of surface; difficult to drain; some slopes more than 8 percent.
Cabot:				
CaA, CaB, CbB	Severe: High water table at or near surface for 7 to 9 months of year; slowly permeable hardpan.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; slowly permeable hardpan.
Cabot, black surface:				
CcA, CdA, CdB	Severe: High water table at or near surface most of year; slowly permeable hardpan.	Severe: High water table at or near surface most of year.	Severe: High water table at or near surface most of year.	Severe: High water table at or near surface most of year; slowly permeable hardpan.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Carver:				
CeA	Slight: No special problems.[1]	Slight: No special problems, except that droughtiness causes some landscaping problems.	Slight: No special problems.	Moderate: Droughtiness causes difficulty in establishing and maintaining sod.
CeB	Slight: No special problems.[1]	Slight: No special problems, except that droughtiness causes some landscaping problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent; droughtiness causes difficulty in establishing and maintaining sod.
CeC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
CeD	Severe: Slopes 15 to 25 percent.[1]	Moderate: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
Charlton:				
CkB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
CkC, CmC	Moderate: Slopes mainly 8 to 15 percent; some slopes are 3 to 8 percent and are a slight limitation; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes mainly 8 to 15 percent; very stony surface in places.	Moderate: Slopes mainly 8 to 15 percent; some slopes more than 15 percent and are a severe limitation; very stony surface in places.	Severe: Slopes mainly 8 to 15 percent; some slopes are 3 to 8 percent and are a moderate limitation; very stony surface in places.
CmD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
CnB	Moderate: Extremely stony surface; hardpan in places at a depth below 30 inches.[2]	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes 3 to 8 percent.	Severe: Extremely stony surface.
CnD, CnE	Severe: Slopes mainly 15 to 45 percent; some slopes are 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent.	Severe: Slopes mainly 15 to 45 percent; some slopes are 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent.
Cheshire:				
CoB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
CoC, CpC	Moderate: Slopes 8 to 15 percent; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes 8 to 15 percent; very stony surface in places.	Moderate: Slopes 8 to 15 percent; very stony surface in places.	Severe: Slopes 8 to 15 percent.
CpB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Moderate: Very stony surface.	Moderate: Slopes 3 to 8 percent; very stony surface.	Moderate: Slopes 3 to 8 percent; very stony surface.
CoD, CpD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
CrB	Moderate: Extremely stony surface; hardpan in places at a depth below 30 inches.[2]	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes 3 to 8 percent.	Severe: Extremely stony surface.
CrD, CrE	Severe: Slopes mainly 15 to 45 percent; some slopes 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent.	Severe: Slopes mainly 15 to 45 percent; some slopes 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Colrain:				
CsB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
CsC, CvC	Moderate: Slopes 8 to 15 percent; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
CvB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Moderate: Very stony surface.	Moderate: Very stony surface; slopes 3 to 8 percent.	Moderate: Very stony surface; slopes 3 to 8 percent.
CsD, CvD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in many places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
CxB	Moderate: Extremely stony surface; hardpan in places at a depth below 30 inches.[2]	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes 3 to 8 percent.	Severe: Extremely stony surface.
CxD, CxF	Severe: Slopes mainly 15 to 50 percent; some slopes 8 to 15 percent and are a moderate limitation.[2]	Severe: Extremely stony surface; slopes mainly 15 to 50 percent.	Severe: Slopes mainly 15 to 50 percent; some slopes 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony slopes; slopes mainly 15 to 50 percent.
Deerfield:				
DfA	Moderate to severe: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.[3]	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.
Dutchess:				
DuB	Moderate: Moderate to moderately slow permeability; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
DuC, DvC	Moderate: Moderate to moderately slow permeability; slopes mainly 8 to 15 percent; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes mainly 8 to 15 percent; very stony surface in many places.	Moderate: Slopes mainly 8 to 15 percent; very stony surface in many places.	Severe: Slopes mainly 8 to 15 percent; some slopes 3 to 8 percent and are a moderate limitation.
DuD, DvD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in many places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
DxD, DxF	Severe: Slopes mainly 15 to 55 percent; some slopes 8 to 15 percent and are a moderate limitation.[2]	Severe: Extremely stony surface; slopes mainly 15 to 55 percent.	Severe: Slopes mainly 15 to 55 percent; some areas are on slopes of 8 to 15 percent and have moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 55 percent
Essex:				
EfB, EfC, EvB, EvC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; very stony surface; slopes mainly 8 to 15 percent.	Moderate: Slopes mainly 8 to 15 percent; very stony surface in many places; slowly permeable hardpan.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent.
EfD, EvD	Severe: Slowly permeable hardpan; slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony surface in many places.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan.
ExB, ExC	Severe: Slowly permeable hardpan; some slopes 15 to 25 percent.	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes mainly 3 to 15 percent; some slopes 15 to 25 percent and are a severe limitation.	Severe: Extremely stony surface; slowly permeable hardpan.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Essex—Continued				
ExE	Severe: Slopes 25 to 45 percent; slowly permeable hardpan.	Severe: Slopes 25 to 45 percent; extremely stony surface.	Severe: Slopes 25 to 45 percent.	Severe: Slopes 25 to 45 percent; extremely stony surface; slowly permeable hardpan.
Gloucester:				
GfA	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems; a few surface stones and boulders.	Slight: No special problems; a few surface stones and boulders.	Slight: No special problems; a few surface stones and boulders.
GfB, GmB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Slight: No special problems; a few surface stones and boulders.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
GvB	Slight: No special problems; hardpan in places at a depth below 30 inches.[2]	Moderate: Very stony and bouldery surface.	Moderate: Slopes 3 to 8 percent; very stony and bouldery surface.	Moderate: Slopes 3 to 8 percent; very stony and bouldery surface.
GfC, GmC, GvC	Moderate: 8 to 15 percent slopes; hardpan in places at a depth below 30 inches.[2]	Moderate: Slopes 8 to 15 percent; very stony surface in most places.	Moderate: Slopes 8 to 15 percent; very stony surface in most places.	Severe: Slopes 8 to 15 percent.
GfD, GmD, GvD	Severe: Slopes 15 to 25 percent.	Moderate: Slopes 15 to 25 percent; very stony and bouldery surface in most places.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
GxB, GxC	Moderate: Extremely stony and bouldery surface; slopes mainly 8 to 15 percent; some slopes 15 to 25 percent and are a severe limitation; hardpan in places at a depth below 30 inches.[2]	Severe: Extremely stony and bouldery surface; slopes mainly 8 to 15 percent.	Moderate: Extremely stony and bouldery surface; slopes mainly 8 to 15 percent; some slopes 15 to 25 percent and are a severe limitation.	Severe: Extremely stony and bouldery surface; slopes mainly 8 to 15 percent.
GxE	Severe: Slopes 25 to 45 percent.	Severe: Slopes 25 to 45 percent; extremely stony and bouldery surface.	Severe: Slopes 25 to 45 percent.	Severe: Slopes 25 to 45 percent; extremely stony and bouldery surface.
Hadley:				
HaA, HaB, HbB	Severe: Subject to infrequent flooding.	Severe: Subject to infrequent flooding.	Severe: Subject to infrequent flooding.	Moderate: Silty texture; trafficability problem; puddling; some slopes of 3 to 8 percent subject to infrequent flooding.
HbA	Severe: Subject to infrequent flooding.	Severe: Subject to infrequent flooding.	Severe: Subject to infrequent flooding.	Slight: No special problems except infrequent flooding.
HcA	Severe: Subject to flooding, usually yearly, early in spring.	Severe: Subject to flooding, usually yearly, early in spring.	Severe: Subject to flooding, usually yearly, early in spring.	Moderate: Subject to flooding, usually yearly, early in spring; silty texture; trafficability problem; puddling.
Hartland:				
HdA	Moderate: Moderate permeability.	Slight: No special problems.	Slight: No special problems.	Moderate: Silty texture; trafficability problem; puddling.
HdB	Moderate: Moderate permeability.	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent; silty texture; trafficability problems; puddling.
HdC	Moderate: Moderate permeability; slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
HdD	Severe: Slopes 15 to 35 percent.	Moderate: Slopes mainly 15 to 25 percent; some slopes more than 25 percent and are a severe limitation.	Severe: Slopes 15 to 35 percent.	Severe: Slopes 15 to 35 percent.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Hinckley:				
HgA	Slight: No special problems.[1]	Slight: No special problems.	Slight: No special problems.	Moderate: Gravelly surface soil.
HkA	Slight: No special problems.[1]	Slight: No special problems.	Slight: No special problems.	Slight: No special problems.
HgB, HkB	Slight: No special problems.[1]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent; gravelly surface in places.
HgC, HkC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
HgD, HkD	Severe: Slopes 15 to 35 percent.[1]	Moderate: Slopes mainly 15 to 25 percent; some slopes more than 25 percent and are severe limitation.	Severe: Slopes 15 to 35 percent.	Severe: Slope 15 to 35 percent.
Hollis:				
HmB, HmC, HnC, HnD, HoD, HoF.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy.
Holyoke and Sunderland:				
HvC, HvD, HxD, HxF	Severe: Bedrock generally within 1½ feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 90 percent.	Severe: Bedrock generally within 1½ feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 90 percent.	Severe: Bedrock generally within 1½ feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 90 percent.	Severe: Bedrock generally within 1½ feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 90 percent.
Limerick:				
Lk	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; subject to flooding.
Limerick-Saco:				
Ls	Severe: Subject to flooding; high water table at or near surface for 7 or more months of year.	Severe: Subject to flooding; high water table at or near surface for 7 or more months of year.	Severe: Subject to flooding; high water table at or near surface for 7 or more months of year.	Severe: High water table at or near surface for 7 or more months of year; subject to flooding.
Lyman:				
LvC, LvD, LxC, LxF	Severe: Bedrock generally within 2 feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 80 percent.	Severe: Bedrock generally within 2 feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 80 percent.	Severe: Bedrock generally within 2 feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 80 percent.	Severe: Bedrock generally within 2 feet of surface; very ledgy or extremely ledgy; slopes mainly 15 to 80 percent.
Marlow:				
MaB, MaC, MbB, MbC, MdB, MdC, MeB, MeC.	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; very stony surface; slopes mainly 8 to 15 percent.	Moderate: Slopes mainly 8 to 15 percent; very stony surface in many places; hardpan within 2½ feet of surface.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent.
MaD, MbD, MdD, MeD.	Severe: Slowly permeable hardpan within 2½ feet of surface; 15 to 25 percent slopes.	Moderate: Hardpan within 2½ feet of surface; slopes 15 to 25 percent; very stony surface in most places.	Severe: Slopes 15 to 25 percent; hardpan within 2½ feet of surface.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 15 to 25 percent.
McB, MfB	Severe: Slowly permeable hardpan within 2½ feet of surface.	Severe: Hardpan within 2½ feet of surface; extremely stony surface.	Moderate: Extremely stony surface; hardpan within 2½ feet of surface.	Severe: Extremely stony surface; slowly permeable hardpan within 2½ feet of surface.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Marlow—Continued				
McD, MfD, MfE	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 15 to 45 percent.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent.	Severe: Slopes mainly 15 to 45 percent; some slopes 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 45 percent; slowly permeable hardpan within 2½ feet of surface.
Merrimac:				
MgA, MmA	Slight: No special problems.[1]	Slight: No special problems.	Slight: No special problems.	Slight: No special problems.
MgB, MmB	Slight: No special problems.[1]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent.
MgC, MmC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
MgD	Severe: Slopes 15 to 25 percent.[1]	Moderate: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.
MmE	Severe: Slopes 15 to 35 percent.[1]	Severe: Slopes mainly 25 to 35 percent; some slopes 15 to 25 percent and are a moderate limitation.	Severe: Slopes 15 to 35 percent.	Severe: Slopes 15 to 35 percent.
Muck:				
Ms, Mu[4]				
Nassau:				
NaC, NaD, NeC, NeF	Severe: Bedrock generally within 1½ feet of surface; most areas extremely ledgy and on slopes of 15 to 75 percent.	Severe: Bedrock generally within 1½ feet of surface; most areas extremely ledgy and on slopes of 15 to 75 percent.	Severe: Bedrock generally within 1½ feet of surface; most areas extremely ledgy and on slopes of 15 to 75 percent.	Severe: Bedrock generally within 1½ feet of surface; most areas extremely ledgy and on slopes of 15 to 75 percent.
Ninigret:				
NfA, NfB	Moderate to severe: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.[3]	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; some slopes 3 to 10 percent.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; some slopes 3 to 10 percent.
Ninigret, silty substratum:				
NgA, NgB	Severe: Slowly permeable substratum.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; silty material mainly within 2 to 4 feet of surface.	Moderate: Temporary high water table about 1½ to 2 feet from surface, usually during winter and early in spring; silty material mainly within 2 to 4 feet of surface; some slopes 3 to 8 percent.	Severe: Slowly permeable substratum.
Ondawa:				
Of	Severe: Subject to flooding annually to once in 5 to 6 years, usually in spring.	Severe: Subject to flooding annually to once in 5 to 6 years, usually in spring.	Severe: Subject to flooding annually to once in 5 to 6 years, usually in spring.	Moderate: Subject to flooding annually to once in 5 or 6 years, usually in spring.
Peat:				
Pa[4]				

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Peru:				
PbA, PbB, PbC, PcB, PcC.	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface; very stony surface in many places; slopes 8 to 15 percent in many places.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface; very stony surface; slopes 8 to 15 percent in many places.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 8 to 15 percent in many places.
PcD	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 15 to 25 percent.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface; very stony surface; slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan within 2½ feet of surface.
PeB, PeC	Severe: Slowly permeable hardpan within 2½ feet of surface; some slopes 15 to 25 percent.	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes mainly 3 to 15 percent; some slopes 15 to 25 percent and are a severe limitation.	Severe: Extremely stony surface; slowly permeable hardpan within 2½ feet of surface; slopes mostly 8 to 25 percent.
Pittstown:				
PnB	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface; slopes 3 to 8 percent.	Severe: Slowly permeable hardpan within 2½ feet of surface.
Podunk:				
Po	Severe: Subject to flooding.	Severe: Subject to flooding.	Severe: Subject to flooding.	Moderate: Subject to flooding annually to once in 5 to 6 years, usually in spring; temporary high water table about 1½ to 2 feet from surface.
Raynham:				
RaA	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 monhts of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.
Ridgebury:				
RdA, RdB, RgB	Severe: Slowly permeable hardpan within 2½ feet of surface; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; slowly permeable hardpan within 2½ feet of surface.
Riverwash:				
Rs [4]				
Rumney:				
Ru	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: Subject to flooding; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; subject to flooding.
Saco:				
Sa	Severe: Subject to flooding; high water table at or near surface for most of year.	Severe: Subject to flooding; high water table at or near surface for most of year.	Severe: Subject to flooding; high water table at or near surface for most of year.	Severe: High water table at or near surface for most of year; subject to flooding.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Saugatuck:				
Sb	Severe: Slowly permeable layer; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: Slowly permeable layer; high water table at or near surface for 7 to 9 months of year.
Scantic:				
ScA, ScB	Severe: Slowly permeable; excess seepage or high water table at or near surface for 7 to 9 months of year.	Severe: Excess seepage or high water table at or near surface for 7 to 9 months of year.	Severe: Excess seepage or high water table at or near surface for 7 to 9 months of year.	Severe: Excess seepage or high water table at or near surface for 7 to 9 months of year; slowly permeable clayey layer within 2½ feet of surface.
Scarboro:				
Sd	Severe: High water table at or near surface for most of year.	Severe: High water table at or near surface for most of year.	Severe: High water table at or near surface for most of year.	Severe: High water table at or near surface for most of year.
Scituate:				
SeA, SeB, SeC, SfA, SfB, SfC.	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; excess seepage or temporary high water table about 1½ feet from surface very stony surface and slopes 8 to 15 percent in many places.	Moderate: Hardpan within 2½ feet of surface; very stony surface and slopes of 8 to 15 percent in many places.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes of 8 to 15 percent in many places.
SgB, SgC	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 3 to 15 percent.	Severe: Extremely stony surface.	Moderate: Extremely stony surface; hardpan within 2½ feet of surface; slopes mainly 3 to 15 percent; some slopes of 15 to 25 percent and are a severe limitation.	Severe: Extremely stony surface; slowly permeable hardpan within 2½ feet of surface; slopes mainly 3 to 15 percent.
Shapleigh:				
ShB, ShC, SkC, SkD, SmC, SmF.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy; slopes mainly 15 to 60 percent.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy; slopes mainly 15 to 60 percent.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy; slopes mainly 15 to 60 percent.	Severe: Bedrock generally within 2 feet of surface; most areas extremely ledgy; slopes mainly 15 to 60 percent.
Shelburne:				
SnB, SnC, SoB, SoC	Severe: Slowly permeable hardpan within 2½ feet of surface.	Moderate: Hardpan within 2½ feet of surface; very stony surface; slopes mainly 8 to 15 percent.	Moderate: Hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent; very stony surface in many places.	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 8 to 15 percent.
SnD, SoD	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes 15 to 25 percent	Moderate: Hardpan within 2½ feet of surface; slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent.	Severe: Slopes 15 to 25 percent; slowly permeable hardpan within 2½ feet of surface.
SpB	Severe: Slowly permeable hardpan within 2½ feet of surface.	Severe: Extremely stony surface.	Moderate: Extremely stony surface; slopes of 3 to 8 percent.	Severe: Extremely stony surface; slowly permeable hardpan within 2½ feet of surface.
SpD, SpF	Severe: Slowly permeable hardpan within 2½ feet of surface; slopes mainly 15 to 50 percent.	Severe: Extremely stony surface; mainly 15 to 50 percent slopes in places.	Severe: Slopes mainly 15 to 50 percent; some slopes are 8 to 15 percent and are a moderate limitation.	Severe: Extremely stony surface; slopes mainly 15 to 50 percent; slowly permeable hardpan within 2½ feet of surface.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Stissing:				
SrB, SsB	Severe: Slowly permeable hardpan within 2½ feet of surface; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; slowly permeable hardpan within 2½ feet of surface.
Sudbury:				
StA, StB	Moderate to severe: Temporary high water table within 1½ to 2 feet of surface, usually during winter and early in spring.[3]	Moderate: Temporary high water table within 1½ to 2 feet of surface, usually during winter and early in spring.	Moderate: Temporary high water table within 1½ to 2 feet of surface, usually during winter and early in spring; many slopes 3 to 8 percent.	Moderate: Temporary high water table within 1½ to 2 feet of surface, usually during winter and early in spring; many slopes of 3 to 8 percent.
Suffield:				
SuB, SuC2	Severe: Slowly permeable clayey layer within 2½ feet of surface.	Moderate: Clayey layer within 2½ feet of surface; slopes mainly 8 to 15 percent.	Moderate: Slopes mainly 8 to 15 percent; clayey layer within 2½ feet of surface.	Severe: Slowly permeable clayey layer within 2½ feet of surface; slopes mainly 8 to 15 percent.
SuE2	Severe: Slowly permeable clayey layer within 2½ feet of surface; slopes 15 to 35 percent.	Severe: Slopes mainly 25 to 35 percent; areas on 15 to 25 percent slopes have moderate limitation.	Severe: Slopes 15 to 35 percent.	Severe: Slopes 15 to 35 percent; slowly permeable clayey layer within 2½ feet of surface.
Suncook:				
Sv	Severe: Subject to stream flooding.	Severe: Subject to stream flooding.	Severe: Subject to stream flooding.	Moderate: Droughtiness causes difficulty in establishing and maintaining sod; subject to flooding.
Sutton:				
SwB, SxB	Moderate to severe: Excess seepage or temporary high water table about 1½ to 2 feet from surface; hardpan in places at a depth below 30 inches.[3]	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface; very stony surface in places.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface; slopes 3 to 8 percent; very stony surface in places.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface; slopes 3 to 8 percent; very stony surface in places.
SwC, SxC	Moderate to severe: Excess seepage or temporary high water table about 1½ to 2 feet from surface; hardpan in places at a depth below 30 inches.[3]	Moderate: Slopes 8 to 20 percent; excess seepage or temporary high water table about 1½ to 2 feet from surface; very stony surface in many places.	Moderate: Slopes mainly 8 to 15 percent; some slopes more than 15 percent and are a severe limitation; excess seepage or temporary high water table about 1½ to 2 feet from surface; very stony surface in many places.	Severe: Slopes 8 to 20 percent.
SyB, SyC	Moderate to severe: Excess seepage or temporary high water table 1½ to 2 feet from surface; extremely stony surface; hardpan in places at a depth below 30 inches.[3]	Severe: Extremely stony surface.	Moderate: Excess seepage or temporary high water table about 1½ to 2 feet from surface; extremely stony surface; slopes mainly 8 to 15 percent; some slopes 15 to 25 percent and are a severe limitation.	Severe: Extremely stony surface; slopes mainly 8 to 15 percent.
Swanton:				
SzA, SzB	Severe: Slowly permeable clayey substratum within 2½ feet of surface; high water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year; slowly permeable clayey substratum within 2½ feet of surface.

See footnotes at end of table.

TABLE 8.—*Rating of soils according to their estimated limitations for selected urban uses*—Continued

Soil series and map symbols	Septic-tank sewage effluent disposal	Homesites	School sites	Athletic fields or intensive play areas
Walpole and Wareham:				
WaA, WaB	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.	Severe: High water table at or near surface for 7 to 9 months of year.
Warwick:				
WfA, WgA	Slight: No special problems.[1]	Slight: No special problems.	Slight: No special problems.	Moderate: Gravelly surface.
WfB, WgB	Slight: No special problems.[1]	Slight: No special problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent; gravelly surface.
WfC, WgC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
WfD	Severe: Slopes 15 to 40 percent.[1]	Moderate: Slopes mainly 15 to 25 percent; some slopes 25 to 40 percent and are a severe limitation.	Severe: Slopes 15 to 40 percent.	Severe: Slopes 15 to 40 percent.
Westminster:				
WmB, WmC, WmD, WnC, WnD, WrD, WrF.	Severe: Bedrock generally within 2 feet of surface; most areas very ledgy or extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas very ledgy or extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas very ledgy or extremely ledgy.	Severe: Bedrock generally within 2 feet of surface; most areas very ledgy or extremely ledgy.
Whitman:				
WsA, WtA	Severe: High water table at or near surface most of year.	Severe: High water table at or near surface most of year; ponding of surface runoff.	Severe: High water table at or near surface most of year; ponding of surface runoff.	Severe: High water table at or near surface most of year; ponding of surface runoff.
Windsor:				
WuA	Slight: No special problems.[1]	Slight: No special problems; droughtiness causes some landscaping problems.	Slight: No special problems.	Moderate: Droughtiness causes difficulty in establishing and maintaining sod.
WuB, WvB	Slight: No special problems.[1]	Slight: No special problems; droughtiness causes some landscaping problems.	Moderate: Slopes 3 to 8 percent.	Moderate: Slopes 3 to 8 percent; droughtiness causes difficulty in establishing and maintaining sod.
WuC	Moderate: Slopes 8 to 15 percent.[1]	Moderate: Slopes 8 to 15 percent.	Moderate: Slopes 8 to 15 percent.	Severe: Slopes 8 to 15 percent.
WuE	Severe: Slopes 15 to 35 percent.[1]	Severe: Slopes mainly 25 to 35 percent; some slopes 15 to 25 percent and are a moderate limitation.	Severe: Slopes 15 to 35 percent.	Severe: Slopes 15 to 35 percent.
Winooski:				
Ww	Severe: Subject to flooding.	Severe: Subject to flooding.	Severe: Subject to flooding.	Moderate: Subject to flooding: temporary high water table about 1½ to 2 feet from surface.

[1] The rapidly permeable substratum may allow pollution of nearby shallow wells.

[2] The limitation may be severe if a hardpan occurs below a depth of 30 inches and interferes with sewage disposal.

[3] The soil has a severe limitation during a seasonally high water table.

[4] Peat; Muck; Muck, shallow; and Riverwash have very severe limitations for urban use.

Town planning boards and planning consultants need more detailed information about soils as sites for residential, commercial, industrial, and school facilities, and for recreation and other urban uses. They can refer to the soil mapping units shown on the photo-base maps in the back of this report and to the section "Descriptions of the Soils." This detailed information is also useful to conservation commissions, boards of selectmen, boards of health, tax assessors, zoning boards, real estate appraisers, subdivision developers, and others.

It should be understood that only the properties of soils were considered in rating the soils. Not considered were the size of soil areas, local sanitation requirements, transportation facilities, location of a site in relation to community centers, and other economic factors. These factors are important and may outweigh the importance of soil properties when decisions have to be made about the use of soil. The location of streams, communities, railroad tracks, and roads can be observed on the photo-base maps in the back of this report.

Soil properties influence the installation and functioning of septic tank systems and the development of sites for homes, schools, and athletic fields. In table 8 these limitations are rated as *slight*, *moderate*, or *severe*. The term, *slight*, includes the range from none to slight, since there are few soils that have no limitations. The rating merely indicates the severity of the problem. The decision as to whether a soil should be used for a specific purpose, regardless of its limitations, is not within the scope of this report.

The estimated ratings of soils for urban use are based on field observations and experience, as well as on data from laboratory and field research. These ratings should be used as a guide in locating sites for development. The information in this report is not a substitute for on-site investigation of specific tracts of land to be developed for a given use.

The ratings of the mapping units in the table indicate the degree and major kinds of limitations that can be expected for areas delineated on the photo-base soil map. Local variations within these delineated mapping units require on-site examination to determine the nature and extent of the variation. These variations are called mapping inclusions. Some of the more significant mapping inclusions are described under the mapping units in the section "Descriptions of the Soils."

In the following subsections the limitations and ratings, as shown in table 8, are defined.

Limitations of soils for septic-tank systems

Residential areas have expanded into rural communities beyond existing sewer lines, thus requiring individual sewage disposal systems. Sewage is commonly disposed of in these individual systems by a septic tank. There are several choices in the construction of septic-tank systems, and thorough investigation is necessary to determine which is the best construction for a specific site.

The location of a septic-tank system and the size of the tank and disposal area are determined largely by the volume of sewage and the rate at which it moves through the soil. Not only should soil properties be considered, but also the sanitary codes, housing density, size and shape of the lot, existing and known future water supplies, and the possible need for expanding the disposal system.

Many soils have properties or limitations that severely affect individual disposal systems, regardless of the size of the septic tank or the disposal area. Installing a disposal system in soil that has a slow percolation rate or a high water table causes a majority of septic-tank failures. Failures are also caused by faulty installation or improper use and maintenance.

The primary factors considered in rating the soils for septic-tank systems are permeability below a depth of 30 inches; hazard of flooding; depth to bedrock; depth to a temporary (seasonal) or relatively permanent high water table; slope, surface rockiness (ledginess); and surface stoniness.

The ratings of the soils for septic-tank systems are defined as follows:

Slight.—No special problems are expected. The use of approved design and installation usually result in satisfactory performance of septic-tank systems. The soils have (1) a water table that is generally at a depth of more than 4 feet; (2) slopes that range from 0 to 8 percent; (3) bedrock that is at a depth of more than 5½ feet; (4) a permeable substratum; (5) essentially no hazard of flooding; (6) no surface rockiness; and (7) a nonstony to very stony surface.

The sandy or gravelly soils in this limitation class have a very rapidly permeable substratum to a depth of 4 feet or more. Because of this very rapid permeability, however, water in nearby shallow wells may become polluted.

The soils that developed in glacial till have a substratum that generally has moderate or moderately rapid permeability. They have stones and some boulders below the surface, and in many areas, a very stony surface. These soils should be investigated carefully to determine whether a slowly permeable hardpan, which would interfere with effluent flow, occurs below a depth of 2½ to 5½ feet. Such a layer is a severe limitation.

Moderate.—Some site preparation is required to install the disposal system. The soils that are moderately limited have developed in sandy or gravelly deposits or in glacial till. These soils have (1) slopes of 8 to 15 percent but no seasonally high water table; or (2) an extremely stony surface.

Soils with moderate limitations generally have a permeable substratum to a depth of 4 feet or more. The rapid permeability of the sandy and gravelly soils may allow pollution of nearby shallow wells.

Soils in this class that developed in glacial till have stones and some boulders below the surface, and in many places, an extremely stony surface. These soils should be investigated carefully to determine whether a slowly permeable hardpan, which would interfere with effluent flow, occurs below a depth of 2½ to 5½ feet. Such a layer is a severe limitation.

Severe.—Soils that are severely limited normally are not used for septic-tank disposal fields. Intensive site preparation is required to overcome one or more of the following limitations: (1) A layer with slow or moderately slow permeability; (2) a high water table at or near the surface for at least 4 or 5 months of the year; (3) bedrock generally within 2 feet of the surface and a very rocky or extremely rocky surface in many places; (4) flooding; or (5) slopes greater than 15 percent.

Limitations of soils for homesites

The primary factors considered in rating soils for homesites are depth to a temporary (seasonal) or relatively permanent high water table; periodic flooding; slope; surface rockiness (ledginess); depth to bedrock; depth to a hardpan or a silt or clay layer; surface stoniness in relation to landscaping; and texture of the surface soil in relation to establishing and maintaining lawns and shrubs.

The soils are rated on the assumption that the houses will have one or two stories and a 7-foot cellar. Normally, the ceiling of the cellar is about 2 feet above the ground surface. The limitation of soils for individual sewage disposal systems is not considered in this rating.

The ratings of the soils for homesites are defined as follows:

Slight.—No special problems are expected. Houses built according to standard designs and construction methods are usually satisfactory on soils in this class. Lawns and shrubs are generally easily established and maintained. A few soils have a loamy sand surface texture. They are droughty and cause some landscaping problems. The soils (1) have slopes of 0 to 8 percent; (2) generally do not have a high water table or a slowly permeable layer within 4 feet of the surface; (3) generally have bedrock more than 6 feet below the surface; (4) have few or no stones or boulders on the surface in most areas; and (5) are not likely to be flooded.

Moderate.—Special care may be required in laying out lots and constructing access roads and in grading, stabilizing, draining, and landscaping. The soils have one or more of the following: (1) Good drainage but slopes of 8 to 25 percent; (2) moderately good drainage but a high water table in winter and early in spring; (3) a slowly permeable layer within 4 feet of the surface; or (4) a very stony surface.

The well-drained sandy or gravelly soils in this class have good internal drainage and are easy to excavate. In areas that have a temporarily high water table, however, water is likely to seep into cellars during spring and prolonged rainfall. This seepage also occurs where a slowly permeable layer is at the same depth as the cellar floor or above it.

Severe.—Intensive corrective measures are required to overcome one or more of the following: (1) A water table at or near the surface for at least 7 to 9 months of the year; (2) flooding; (3) slopes greater than 25 percent; (4) a very rocky or extremely rocky surface; (5) an extremely stony surface; or (6) bedrock generally within 2 feet of the surface.

Many areas of soils in this class have a high water table, an extremely stony surface, or bedrock within 2 feet of the surface. A high water table causes a serious drainage problem. An extremely stony surface mainly affects landscaping. Excavation is difficult in soils that are shallow to bedrock. Also, water and sewer lines are difficult to install in the bedrock.

Limitations of soils for school sites

The increasing population in many communities has resulted in a need for new or enlarged school facilities. This soil survey provides information that can be used in deciding on the location of school sites. The soils are rated on the assumption that the school buildings will not have a basement. Not considered in the rating are the location, size, and shape of the site and the limitations of the soils for sewage disposal.

These ratings are general guides for site selection. Investigation of each site is necessary to determine the in-place characteristics of the soils that affect the foundation and the specific location of the structure.

The primary factors considered in rating the soils for school sites are the hazard of flooding; depth to bedrock or slowly permeable layer; depth to temporary (seasonal) or relatively permanent high water table; surface rockiness (ledginess); slope of the area in relation to land leveling; and surface stoniness in relation to landscaping.

The ratings of the soils for school sites are defined as follows:

Slight.—No special problems are expected. The soils (1) are not likely to be flooded; (2) have slopes of 0 to 3 percent; and (3) generally do not have a high water table, bedrock, or a slowly permeable layer within 2½ feet of the surface. The sandy or gravelly soils have few or no stones and boulders on the surface or below it. The Gloucester soils that are in this limitation class developed in glacial till. They have a few stones and boulders on the surface, but stones are more numerous below it.

Moderate.—Special care may be required in grading, in controlling drainage, and in constructing access roads and parking lots. The soils have one or more of the following limitations: (1) Good drainage but slopes of 3 to 15 percent; (2) moderately good drainage but a high water table in the winter or early in the spring; or (3) a slowly permeable layer within 30 inches of the surface.

The soils in this class that developed in sandy or gravelly deposits have few or no stones and boulders; but soils that developed in glacial till have stones and boulders below the surface and, in many places, a very stony or an extremely stony surface.

Severe.—Intensive corrective measures are required to overcome one or more of the following: (1) Bedrock within 2½ feet of the surface; (2) a water table at or near the surface for 7 or more months of the year; (3) a very rocky or an extremely rocky surface; (1) flooding; or (5) slopes greater than 15 percent.

Limitations of soils for athletic fields

The primary properties considered in rating the soils for athletic fields are slope; surface rockiness (ledginess); depth to bedrock; depths to temporary (seasonal) or relatively permanent high water table; permeability within 30 inches of the surface; surface texture; and surface stoniness. These limitations also apply to playgrounds and other recreation areas that are used intensively.

The ratings are defined as follows:

Slight.—No special problems are expected. The soils (1) have slopes of 0 to 3 percent; (2) have bedrock normally more than 6 feet below the surface; (3) have a water table normally at a depth of more than 4 feet; (4) are permeable within 30 inches of the surface; and (5) have few or no stones, boulders, or gravel on the surface, and have a surface texture with good moisture-holding capacity to establish and maintain sod.

Moderate.—Special care may be required in overcoming problems of droughtiness, drainage, land leveling, or trafficability. The soils have one or more of the following: (1) Good internal drainage but slopes of 3 to 8 percent; (2) slopes of 0 to 3 percent but a gravelly or loamy sand surface layer; (3) a high water table within 1½ to 2 feet of the surface during winter, early in spring, and sometimes in the fall, or excess seepage water; (4) a silty surface layer that makes traffic a problem after rain; (5) moderate permeability within 30 inches of the surface; (6) a very stony surface; or (7) flooding as frequently as once a year to once in 5 or 6 years, generally in spring.

Leveling an area on an 8 percent slope requires a considerable amount of earth movement in contrast to leveling an area on a 2 percent slope. In addition, some of the sloping soils in this limitation class have a very stony or bouldery surface. Although soils in this class may have a high water table and require artificial drainage, they are permeable and easy to drain.

Severe.—Intensive corrective measures are required to overcome one or more of the following: (1) A very rocky or an extremely rocky surface; (2) bedrock generally within 2 feet of the surface; (3) a water table at or near the surface for 7 or more months of the year; (4) slopes greater than 8 percent; (5) a layer within 30 inches of the surface that has slow or moderately slow permeability; or (6) an extremely stony surface.

Descriptions of the Soils

This section describes the soil series and the mapping units in Franklin County. The procedure is first to describe each soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs.

The soil series contains a description of the soil profile, the major layers from the surface downward. This profile is considered typical, or representative, for all the soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit. Some technical terms are used in describing soil series and mapping units, simply because there are no nontechnical terms that convey precisely the same meaning. Many of the more commonly used terms are defined in the Glossary.

The acreage and proportionate extent of the mapping units are shown in table 9. Detailed technical descriptions of soil series are given in the section "Formation, Classification, and Morphology of Soils." At the back of the report is a list of the mapping units in the county and the capability unit and woodland suitability group each is in. The page where each of these groups is described is also given.

TABLE 9.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Agawam fine sandy loam, 0 to 3 percent slopes	2,190	0.5
Agawam fine sandy loam, 3 to 8 percent slopes	1,338	.3
Agawam fine sandy loam, 8 to 15 percent slopes	977	.2
Agawam fine sandy loam, 15 to 25 percent slopes	640	.1
Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes	256	(1)
Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes	277	(1)
Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes	433	(1)
Belgrade silt loam, 0 to 3 percent slopes	262	(1)
Belgrade silt loam, 3 to 8 percent slopes	207	(1)
Berkshire fine sandy loam, 3 to 8 percent slopes	177	(1)
Berkshire fine sandy loam, 8 to 15 percent slopes	276	(1)
Berkshire fine sandy loam, 15 to 25 percent slopes	160	(1)
Berkshire very stony fine sandy loam, 3 to 8 percent slopes	94	(1)
Berkshire very stony fine sandy loam, 8 to 15 percent slopes	992	.2
Berkshire very stony fine sandy loam, 15 to 25 percent slopes	604	.1
Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes	919	.2
Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes	1,851	.4
Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes	4,053	.9
Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes	286	(1)
Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes	64	(1)
Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes	76	(1)
Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes	437	(1)
Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes	796	0.2
Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes	489	.1
Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes	144	(1)
Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes	1,953	.4
Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes	1,101	.2
Bernardston channery silt loam, 3 to 8 percent slopes	158	(1)
Bernardston channery silt loam, 8 to 15 percent slopes	240	(1)
Bernardston channery silt loam, 15 to 25 percent slopes	112	(1)
Bernardston very stony silt loam, 3 to 8 percent slopes	227	(1)
Bernardston very stony silt loam, 8 to 15 percent slopes	815	.2
Bernardston very stony silt loam, 15 to 25 percent slopes	742	.2
Bernardston very stony silt loam, 25 to 55 percent slopes	395	(1)
Biddeford silt loam	149	(1)
Broadbrook very fine sandy loam, 3 to 8 percent slopes	105	(1)
Broadbrook very fine sandy loam, 8 to 15 percent slopes	167	(1)
Broadbrook very fine sandy loam, 15 to 25 percent slopes	303	(1)
Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes	173	(1)
Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes	327	(1)
Buckland fine sandy loam, 0 to 3 percent slopes	89	(1)
Buckland fine sandy loam, 3 to 8 percent slopes	950	.2
Buckland fine sandy loam, 8 to 15 percent slopes	1,120	.3

See footnote at end of table.

TABLE 9.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Buckland fine sandy loam, 15 to 25 percent slopes	372	(1)
Buckland very stony fine sandy loam, 3 to 8 percent slopes	956	0.2
Buckland very stony fine sandy loam, 8 to 15 percent slopes	1,086	.2
Buckland very stony fine sandy loam, 15 to 25 percent slopes	597	.1
Buckland extremely stony fine sandy loam, 3 to 8 percent slopes	1,253	.3
Buckland extremely stony fine sandy loam, 8 to 25 percent slopes	6,324	1.4
Buxton silt loam, 0 to 3 percent slopes	169	(1)
Buxton silt loam, 3 to 10 percent slopes	292	(1)
Cabot fine sandy loam, 0 to 3 percent slopes	82	(1)
Cabot fine sandy loam, 3 to 8 percent slopes	654	.1
Cabot extremely stony fine sandy loam, 0 to 10 percent slopes	1,464	.3
Cabot loam, black surface, 0 to 3 percent slopes	176	(1)
Cabot very stony loam, black surface, 0 to 3 percent slopes	901	.2
Cabot very stony loam, black surface, 3 to 8 percent slopes	243	(1)
Carver loamy coarse sand, 0 to 3 percent slopes	284	(1)
Carver loamy coarse sand, 3 to 8 percent slopes	344	(1)
Carver loamy coarse sand, 8 to 15 percent slopes	468	.1
Carver loamy coarse sand, 15 to 25 percent slopes	286	(1)
Charlton fine sandy loam, 3 to 8 percent slopes	159	(1)
Charlton fine sandy loam, 8 to 20 percent slopes	431	(1)
Charlton very stony fine sandy loam, 3 to 15 percent slopes	456	.1
Charlton very stony fine sandy loam, 15 to 25 percent slopes	115	(1)
Charlton extremely stony fine sandy loam, 3 to 8 percent slopes	413	(1)
Charlton extremely stony fine sandy loam, 8 to 25 percent slopes	2,188	.5
Charlton extremely stony fine sandy loam, 25 to 45 percent slopes	658	.2
Cheshire fine sandy loam, 3 to 8 percent slopes	214	(1)
Cheshire fine sandy loam, 8 to 15 percent slopes	302	(1)
Cheshire fine sandy loam, 15 to 25 percent slopes	135	(1)
Cheshire very stony fine sandy loam, 3 to 8 percent slopes	157	(1)
Cheshire very stony fine sandy loam, 8 to 15 percent slopes	171	(1)
Cheshire very stony fine sandy loam, 15 to 25 percent slopes	157	(1)
Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes	116	(1)
Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes	1,201	.3
Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes	253	(1)
Colrain fine sandy loam, 3 to 8 percent slopes	576	.1
Colrain fine sandy loam, 8 to 15 percent slopes	960	.2
Colrain fine sandy loam, 15 to 25 percent slopes	626	.1
Colrain very stony fine sandy loam, 3 to 8 percent slopes	481	.1
Colrain very stony fine sandy loam, 8 to 15 percent slopes	897	.2
Colrain very stony fine sandy loam, 15 to 25 percent slopes	1,598	.4
Colrain extremely stony fine sandy loam, 3 to 8 percent slopes	528	.1
Colrain extremely stony fine sandy loam, 8 to 25 percent slopes	6,382	1.4
Colrain extremely stony fine sandy loam, 25 to 50 percent slopes	415	(1)
Deerfield loamy fine sand, 0 to 3 percent slopes	424	(1)
Dutchess silt loam, 3 to 8 percent slopes	92	(1)
Dutchess silt loam, 8 to 15 percent slopes	118	(1)
Dutchess silt loam, 15 to 25 percent slopes	52	(1)
Dutchess very stony silt loam, 3 to 15 percent slopes	273	(1)
Dutchess very stony silt loam, 15 to 25 percent slopes	121	(1)
Dutchess extremely stony silt loam, 8 to 25 percent slopes	769	0.2
Dutchess extremely stony silt loam, 25 to 55 percent slopes	694	.2
Essex fine sandy loam, 3 to 8 percent slopes	1,043	.2
Essex fine sandy loam, 8 to 15 percent slopes	616	.1
Essex fine sandy loam, 15 to 25 percent slopes	162	(1)
Essex very stony fine sandy loam, 3 to 8 percent slopes	595	.1
Essex very stony fine sandy loam, 8 to 15 percent slopes	1,077	.2
Essex very stony fine sandy loam, 15 to 25 percent slopes	1,283	.3
Essex extremely stony fine sandy loam, 3 to 8 percent slopes	789	.2
Essex extremely stony fine sandy loam, 8 to 25 percent slopes	3,803	.8
Essex extremely stony fine sandy loam, 25 to 45 percent slopes	1,913	.4
Gloucester fine sandy loam, 0 to 3 percent slopes	155	(1)
Gloucester fine sandy loam, 3 to 8 percent slopes	746	.2
Gloucester fine sandy loam, 8 to 15 percent slopes	940	.2
Gloucester fine sandy loam, 15 to 25 percent slopes	229	(1)
Gloucester sandy loam, 3 to 8 percent slopes	718	.2
Gloucester sandy loam, 8 to 15 percent slopes	298	(1)
Gloucester sandy loam, 15 to 25 percent slopes	299	(1)
Gloucester very stony sandy loam, 3 to 8 percent slopes	4,030	.9
Gloucester very stony sandy loam, 8 to 15 percent slopes	6,548	1.5
Gloucester very stony sandy loam, 15 to 25 percent slopes	3,776	.8
Gloucester extremely stony sandy loam, 3 to 8 percent slopes	3,267	.7
Gloucester extremely stony sandy loam, 8 to 25 percent slopes	26,691	6.0
Gloucester extremely stony sandy loam, 25 to 45 percent slopes	9,965	2.2
Hadley silt loam, 0 to 3 percent slopes	693	.2
Hadley silt loam, 3 to 8 percent slopes	106	(1)
Hadley very fine sandy loam, 0 to 3 percent slopes	4,565	1.0
Hadley very fine sandy loam, 3 to 8 percent slopes	504	.1
Hadley very fine sandy loam, overflow, 0 to 3 percent slopes	871	.2
Hartland silt loam, 0 to 3 percent slopes	85	(1)
Hartland silt loam, 3 to 8 percent slopes	201	(1)
Hartland silt loam, 8 to 15 percent slopes	63	(1)
Hartland silt loam, 15 to 35 percent slopes	134	(1)
Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes	318	(1)
Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes	159	(1)
Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes	106	(1)
Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes	212	(1)
Hinckley sandy loam, 0 to 3 percent slopes	2,772	.6
Hinckley sandy loam, 3 to 8 percent slopes	1,513	.3
Hinckley sandy loam, 8 to 15 percent slopes	2,117	.5
Hinckley sandy loam, 15 to 35 percent slopes	5,346	1.2

See footnote at end of table.

TABLE 9.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Hollis fine sandy loam, 3 to 8 percent slopes	100	(1)
Hollis fine sandy loam, 8 to 15 percent slopes	198	(1)
Hollis very rocky fine sandy loam, 3 to 15 percent slopes	354	(1)
Hollis very rocky fine sandy loam, 15 to 25 percent slopes	122	(1)
Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes	3, 564	0. 8
Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes	605	. 1
Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes	428	(1)
Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes	819	. 2
Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes	1, 218	. 3
Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes	2, 842	. 6
Limerick silt loam	2, 442	. 5
Limerick-Saco silt loams	647	. 1
Lyman very rocky loam, 3 to 15 percent slopes	3, 003	. 7
Lyman very rocky loam, 15 to 25 percent slopes	1, 336	. 3
Lyman extremely rocky loam, 3 to 25 percent slopes	17, 716	3. 9
Lyman extremely rocky loam, 25 to 80 percent slopes	42, 480	9. 5
Marlow loam, 3 to 8 percent slopes	98	(1)
Marlow loam, 8 to 15 percent slopes	206	(1)
Marlow loam, 15 to 25 percent slopes	91	(1)
Marlow very stony loam, 3 to 8 percent slopes	289	(1)
Marlow very stony loam, 8 to 15 percent slopes	555	. 1
Marlow very stony loam, 15 to 25 percent slopes	152	(1)
Marlow extremely stony loam, 3 to 8 percent slopes	135	(1)
Marlow extremely stony loam, 8 to 35 percent slopes	644	. 1
Marlow loam, dark subsoil, 3 to 8 percent slopes	2, 870	. 6
Marlow loam, dark subsoil, 8 to 15 percent slopes	1, 323	. 3
Marlow loam, dark subsoil, 15 to 25 percent slopes	329	(1)
Marlow very stony loam, dark subsoil, 3 to 8 percent slopes	1, 926	. 4
Marlow very stony loam, dark subsoil, 8 to 15 percent slopes	2, 280	. 5
Marlow very stony loam, dark subsoil, 15 to 25 percent slopes	1, 386	. 3
Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes	1, 471	. 3
Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes	4, 053	. 9
Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes	623	. 1
Merrimac fine sandy loam, 0 to 3 percent slopes	3, 029	. 7
Merrimac fine sandy loam, 3 to 8 percent slopes	3, 508	. 8
Merrimac fine sandy loam, 8 to 15 percent slopes	2, 356	. 5
Merrimac fine sandy loam, 15 to 25 percent slopes	1, 915	. 4
Merrimac sandy loam, 0 to 3 percent slopes	1, 859	. 4
Merrimac sandy loam, 3 to 8 percent slopes	2, 102	. 5
Merrimac sandy loam, 8 to 15 percent slopes	1, 485	. 3
Merrimac sandy loam, 15 to 35 percent slopes	1, 918	. 4
Muck	2, 274	. 5
Muck, shallow	2, 193	. 5
Nassau very rocky silt loam, 3 to 15 percent slopes	120	(1)
Nassau very rocky silt loam, 15 to 25 percent slopes	109	(1)
Nassau extremely rocky silt loam, 3 to 25 percent slopes	1, 547	0. 3
Nassau extremely rocky silt loam, 25 to 75 percent slopes	3, 187	. 7
Ninigret fine sandy loam, 0 to 3 percent slopes	1, 900	. 4
Ninigret fine sandy loam, 3 to 10 percent slopes	231	(1)
Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes	1, 031	. 2
Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes	499	. 1
Ondawa fine sandy loam	1, 030	. 2
Peat	944	. 2
Peru loam, 0 to 3 percent slopes	298	(1)
Peru loam, 3 to 8 percent slopes	1, 489	. 3
Peru loam, 8 to 15 percent slopes	712	. 2
Peru very stony loam, 3 to 8 percent slopes	1, 477	. 3
Peru very stony loam, 8 to 15 percent slopes	1, 773	. 4
Peru very stony loam, 15 to 25 percent slopes	680	. 2
Peru extremely stony loam, 0 to 8 percent slopes	2, 488	. 6
Peru extremely stony loam, 8 to 25 percent slopes	6, 028	1. 3
Pittstown silt loam, 3 to 8 percent slopes	118	(1)
Podunk fine sandy loam	756	. 2
Raynham silt loam 0 to 3 percent slopes	484	. 1
Ridgebury fine sandy loam, 0 to 3 percent slopes	272	(1)
Ridgebury fine sandy loam, 3 to 8 percent slopes	686	. 2
Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes	8, 709	1. 9
Riverwash	150	(1)
Rumney fine sandy loam	1, 316	. 3
Saco silt loam	3, 049	. 7
Saugatuck loamy sand	637	. 1
Scantic silt loam, 0 to 3 percent slopes	427	(1)
Scantic silt loam, 3 to 8 percent slopes	106	(1)
Scarboro fine sandy loam, brownish subsoil variant	1, 455	. 3
Scituate fine sandy loam, 0 to 3 percent slopes	194	(1)
Scituate fine sandy loam, 3 to 8 percent slopes	552	. 1
Scituate fine sandy loam, 8 to 15 percent slopes	279	(1)
Scituate very stony fine sandy loam, 0 to 3 percent slopes	830	. 2
Scituate very stony fine sandy loam, 3 to 8 percent slopes	2, 112	. 5
Scituate very stony fine sandy loam, 8 to 15 percent slopes	1, 140	. 3
Scituate extremely stony fine sandy loam, 0 to 8 percent slopes	2, 800	. 6
Scituate extremely stony fine sandy loam, 8 to 25 percent slopes	2, 594	. 6
Shapleigh fine sandy loam, 3 to 8 percent slopes	935	. 2
Shapleigh fine sandy loam, 8 to 15 percent slopes	476	. 1
Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes	3, 466	. 8
Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes	1, 659	. 4
Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes	28, 359	6. 4
Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes	17, 466	3. 9
Shelburne loam, 3 to 8 percent slopes	305	(1)
Shelburne loam, 8 to 15 percent slopes	551	. 1
Shelburne loam, 15 to 25 percent slopes	381	(1)
Shelburne very stony loam, 3 to 8 percent slopes	223	(1)
Shelburne very stony loam, 8 to 15 percent slopes	546	. 1
Shelburne very stony loam, 15 to 25 percent slopes	554	. 1
Shelburne extremely stony loam, 3 to 8 percent slopes	215	(1)

See footnote at end of table.

TABLE 9.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Shelburne extremely stony loam, 8 to 25 percent slopes	3, 292	0. 7
Shelburne extremely stony loam, 25 to 50 percent slopes	543	. 1
Stissing silt loam, 0 to 8 percent slopes	54	(1)
Stissing very stony silt loam, 3 to 8 percent slopes	138	(1)
Sudbury fine sandy loam, 0 to 3 percent slopes	2, 946	. 7
Sudbury fine sandy loam, 3 to 8 percent slopes	2, 509	. 6
Suffield silt loam, 3 to 8 percent slopes	160	(1)
Suffield silt loam, 8 to 15 percent slopes, eroded	141	(1)
Suffield silt loam, 15 to 35 percent slopes, eroded	680	. 2
Suncook loamy sand	535	. 1
Sutton fine sandy loam, 3 to 8 percent slopes	155	(1)
Sutton fine sandy loam, 8 to 20 percent slope	116	(1)
Sutton very stony fine sandy loam, 3 to 8 percent slopes	145	(1)
Sutton very stony fine sandy loam, 8 to 15 percent slopes	276	(1)
Sutton extremely stony fine sandy loam, 0 to 8 percent slopes	77	(1)
Sutton extremely stony fine sandy loam, 8 to 25 percent slopes	522	. 1
Swanton very fine sandy loam, 0 to 3 percent slopes	1, 558	. 3
Swanton very fine sandy loam, 3 to 8 percent slopes	196	(1)
Walpole and Wareham fine sandy loams, 0 to 3 percent slopes	5, 850	1. 3
Walpole and Wareham fine sandy loams, 3 to 8 percent slopes	580	. 1
Warwick gravelly fine sandy loam, 0 to 3 percent slopes	1, 910	. 4
Warwick gravelly fine sandy loam, 3 to 8 percent slopes	721	. 2
Warwick gravelly fine sandy loam, 8 to 15 percent slopes	286	(1)
Warwick gravelly fine sandy loam, 15 to 40 percent slopes	1, 528	0. 3
Warwick gravelly loam, 0 to 3 percent slopes	987	. 2
Warwick gravelly loam, 3 to 8 percent slopes	233	(1)
Warwick gravelly loam, 8 to 15 percent slopes	64	(1)
Westminster loam, 3 to 8 percent slopes	212	(1)
Westminster loam, 8 to 15 percent slopes	429	(1)
Westminster loam, 15 to 25 percent slopes	221	(1)
Westminster very rocky loam, 3 to 15 percent slopes	1, 751	. 4
Westminster very rocky loam, 15 to 25 percent slopes	2, 016	. 5
Westminster extremely rocky loam, 3 to 25 percent slopes	20, 738	4. 4
Westminster extremely rocky loam, 25 to 75 percent slopes	602	. 1
Whitman fine sandy loam, 0 to 3 percent slopes	1, 827	. 4
Whitman extremely stony fine sandy loam, 0 to 3 percent slopes	5, 362	1. 2
Windsor loamy fine sand, 0 to 3 percent slopes	3, 080	. 7
Windsor loamy fine sand, 3 to 8 percent slopes	825	. 2
Windsor loamy fine sand, 8 to 15 percent slopes	1, 571	. 4
Windsor loamy fine sand, 15 to 35 percent slopes	1, 372	. 3
Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes	186	(1)
Winooski very fine sandy loam	2, 645	. 6
Water	1, 242	. 3
Subtotal	--------	94. 8
Total of those units less than 0.1 percent	--------	5. 2
Grand total	452, 480	100. 0

[1] Less than 0.1 percent. Items in this category total 5. 2 percent of the county area.

Agawam Series

The Agawam series consists of well-drained fine sandy loams that formed in deep deposits of water-sorted sand. These soils are on terraces bordering the flood plains of the major streams. Most areas are nearly level or gently sloping, but some are moderately sloping to moderately steep. Areas between terrace levels are on short, steep slopes, or escarpments.

The Agawam soils are generally near the moderately well drained Ninigret, the poorly drained Walpole, and the very poorly drained Scarboro soils. In places they are near the well-drained Ondawa and Hadley soils or the excessively drained Windsor soils.

Where the Agawam soils are cultivated, the surface layer is about 11 inches of dark yellowish-brown fine sandy loam that crumbles in the hands. The upper subsoil is yellowish-brown fine sandy loam. In many places a 3- or 4-inch layer of the subsoil, immediately beneath the plow layer, is firm and dense as a result of repeated plowing. Below this plowpan the subsoil is crumbly. The lower subsoil has a lighter color than the upper subsoil and is light olive brown in many places. The texture of this layer is sandier with increasing depth, and the sand grains are loose and separate—not aggregated as they are in the surface layer. The subsoil extends to a depth of 30 to 36 inches. Below this depth is a substratum of olive-gray to grayish-brown loamy fine sand or sand. The Agawam soils are nearly gravel free to a depth of about 42 inches. Below this depth the substratum consists of stratified sand and gravel in some places.

In some areas the surface layer and the upper part of the subsoil are a little coarser or a little finer textured than described here. The range is from sandy loam to very fine sandy loam.

The Agawam soils warm early in the spring and are easily worked. Water passes through their surface layer and subsoil readily because of the sandy texture. These soils are used extensively for corn, tobacco, truck crops, and other cultivated crops. Crops respond favorably to liberal amounts of lime and fertilizer. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation is needed for maximum yields of truck crops.

Agawam fine sandy loam, 0 to 3 percent slopes (AfA).—This nearly level, well-drained soil is in large areas on terraces that border the flood plains of the major streams. Included with this soil in mapping are small areas of sandy loam or very fine sandy loam.

This soil is suitable for intensive farming and produces good yields of most crops under good management. It is suitable for corn, tobacco, and all truck crops that are commonly grown in the county. It is also well suited to alfalfa for hay. (Capability unit I–5; woodland suitability group 5)

Agawam fine sandy loam, 3 to 8 percent slopes (AfB).—This well-drained soil is generally in large areas on the gently sloping parts of terraces that border the flood plains of major streams. Included with this soil in mapping are small areas of sandy loam or very fine sandy loam.

This soil is suitable for corn, tobacco, and all truck crops grown in the county. It is also well suited to alfalfa for hay. It can be farmed intensively, but use of contour planting or stripcropping may be needed on long slopes to control erosion. (Capability unit IIe–5; woodland suitability group 5)

Agawam fine sandy loam, 8 to 15 percent slopes (AfC).—This well-drained soil is on the sloping parts of terraces that border the flood plains of major streams. Much of it is along stream channels and erosion channels that dissect the terraces. In most places, this soil has a thinner surface layer than is typical of the series.

This soil is suitable for corn, tobacco, and truck crops and for alfalfa planted for hay. The combination of slope, excessive runoff, and fine sandy loam texture, however, makes this soil highly erodible. If used for row crops, this soil needs the protection of grass waterways, diversions, or contour stripcropping and winter cover crops. (Capability unit IIIe–5; woodland suitability group 5)

Agawam fine sandy loam, 15 to 25 percent slopes (AfD).—This well-drained soil generally has a thinner surface layer than the soil described for the series. It is on the steep and moderately steep parts of terraces bordering the flood plains of the major streams. Much of it is along drainage channels and on the steep slopes or escarpments between terraces or between the terraces and the flood plains. Included with this soil in mapping are a few small areas that have slopes of 25 to 35 percent.

The degree of slope and consequent hazard of erosion limit the use of this soil to an occasional row crop. A sod crop, trees, or shrubs are needed to protect this soil from erosion. Drop inlets are needed in some places to prevent surface water from concentrating and forming gullies in the terrace escarpments or in the steep sides of drainageways. (Capability unit IVe–5; woodland suitability group 5)

Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes (AgA).—This nearly level, well-drained soil is similar to the one described for the series but the substratum consists of layered silt and very fine sand. The soil is on nearly level terraces that once were glacial lakebeds.

This soil is suitable for truck crops, corn, tobacco, and hay, and it produces good yields if it is managed well. Irrigation may be needed to obtain maximum yields of truck crops. If this soil is used for row crops or for improved hay, some small, wet spots may need drainage. (Capability unit I–5; woodland suitability group 6)

Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes (AgB).—This well-drained soil is similar to the soil described for the series but the substratum consists of layered silt and very fine sand. The soil is on the gently sloping parts of terraces that once were glacial lakebeds.

This soil is suitable for truck crops, corn, and tobacco. On long slopes tilling and reseeding on the contour are needed to control sheet erosion; diversions and winter cover crops may also be needed. If the soil is used for row crops or improved hay, surface drainage is needed to eliminate small wet spots. (Capability unit IIe–5; woodland suitability group 6)

Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes (AgC).—This well-drained soil is similar to the soil described for the series, but the substratum consists of layered silt and very fine sand. It is on the sloping and moderately steep parts of terraces that were once glacial lakebeds. Much of it is along drainage channels and on the steep slopes or escarpments between terrace levels. Included with this soil in mapping are a few small areas that have slopes of 20 to 35 percent.

This soil is suited to truck crops, corn, tobacco, and hay. The hazard of erosion is very severe, however, because of the combination of moderate slopes, excessive runoff, and fine sandy loam texture. Grass waterways, winter cover crops, diversions, or stripcropping are required to protect the soil if it is used for row crops. (Capability unit IIIe–5; woodland suitability group 6)

Belgrade Series

The Belgrade series consists of moderately well drained soils that have formed in lacustrine deposits of very fine sand and silt. These soils are in the Connecticut Valley lowlands. They are nearly level to gently sloping.

The Belgrade soils are near the well-drained Hartland and the poorly drained Raynham soils.

A typical cultivated Belgrade soil has a dark yellowish-brown very fine sandy loam or silt loam surface layer that crumbles when handled. The subsoil is olive-brown very fine sandy loam or silt loam that is quite dense. In the lower part, it is mottled with olive brown, brown, or dark brown, and olive gray. The subsoil extends to a depth of about 24 inches. Below this depth is an olive-brown substratum consisting of very finely stratified silt and very fine sand. It is mottled with about the same colors as the subsoil, but the mottles are more numerous.

Some cultivated areas of Belgrade soils are truncated by moderate to severe sheet erosion; therefore, the depth to mottling varies extremely.

These soils are wet early in spring and often until late in spring. Except in an occasional wet spot, drainage is not needed to make these soils suitable for hay or pasture. Some care is needed in selecting cultivated crops for these soils, as they might be wet enough in a year of high rainfall to cause a crop failure.

Belgrade silt loam, 0 to 3 percent slopes (BaA).—This nearly level, moderately well drained soil is in the Connecticut Valley lowlands, mainly in the south-central part of the town of Deerfield and the north-central part of the town of Whately. In many areas of this soil, the surface layer is slightly thicker and browner than normal. The depth to mottling is also somewhat greater than normal, generally about 20 to 24 inches from the surface.

This soil is suitable for hay and pasture. Drained areas are suitable for silage corn and truck crops. The soil is wet early in spring and often late in spring, and tillage is delayed. Small depressions that retain surface water after rains are sometimes a nuisance and may require drainage by tile lines. (Capability unit IIw–4; woodland suitability group 1)

Belgrade silt loam, 3 to 8 percent slopes (BaB).—This moderately well drained soil is in gently sloping areas of the Connecticut Valley lowlands, mainly in the south-

central part of the town of Deerfield and the north-central part of the town of Whately. Moderate to severe sheet erosion has made the depth to mottling extremely variable in this soil. Included with this soil in mapping are small areas that have slopes of 8 to 15 percent.

This soil is suitable for hay and pasture. Drained areas are suitable for silage corn and truck crops. Drainage is needed to eliminate wet spots. Diversions and grass waterways are needed on long slopes to protect them from sheet erosion. (Capability unit IIw–4; woodland suitability group 1)

Berkshire Series

The Berkshire series consists of well-drained fine sandy loams that have a reddish subsoil. These soils have formed in glacial deposits derived mainly from micaceous schist material. They are in gently sloping to very steep areas high in the Berkshire Hills.

The Berkshire soils are near the shallow Lyman, the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

Many areas of the Berkshire soils that were formerly cultivated have been abandoned and now are forested. A typical Berkshire soil has a 1- to 3-inch layer of loose, partly decomposed leaves and twigs over a fine sandy loam surface layer that is dark reddish brown to dark yellowish brown and about 6 inches thick. This is underlain by a discontinuous layer of gray or light-gray fine sandy loam about 2 inches thick. This layer seems white in contrast to the layers above and below it. It is underlain by a loam subsoil that grades from dark reddish brown in the upper part through yellowish red to yellowish brown in the lower part. The subsoil extends to a depth of about 22 inches. Below this is the substratum, a light olive-brown fine sandy loam. In places the substratum is firm or compact at a depth of 3 to 5 feet.

A typical Berkshire soil is extremely stony. The stones occupy about 10 percent of the surface. Below the surface they comprise about 10 or 15 percent of the soil mass.

In some areas the surface layer contains a little more silt and clay than is typical of Berkshire soils and has a loam texture.

The Berkshire soils have moderate to moderately rapid permeability and a moderate moisture-holding capacity. Permeability of the firm substratum is moderately slow to slow.

Berkshire fine sandy loam, 3 to 8 percent slopes (BbB).—This well-drained soil is in gently sloping areas high in the uplands of the Berkshire Hills in the western part of the county. In some places this soil has a slightly thicker surface layer than is typical of the series. Also, the light-gray and dark reddish-brown layers that are generally beneath the surface layer are not present in some places. There are very few stones on the surface.

Clover hay, pasture, and early maturing silage corn are suitable crops. Alfalfa can be grown but requires careful management and is likely to winterkill. Potatoes are grown on a small acreage of this soil. If this soil is cultivated, diversions, contour farming and grass waterways are needed on long slopes to control sheet erosion.

Much of this soil is forested, and it produces good yields of northern hardwoods, white pine, red pine, and red spruce. Woodland roads should be so located that surface water does not collect in ruts and cause gullies. (Capability unit IIe–3; woodland suitability group 1)

Berkshire fine sandy loam, 8 to 15 percent slopes (BbC).—This well-drained soil is in moderately sloping areas high in the uplands of the Berkshire Hills in the western part of the county. In some places the light-gray and dark reddish-brown layers that normally underlie the surface layer are not present. There are very few stones on the surface.

This soil is suitable for early maturing silage corn and for clover hay and pasture. Potatoes are grown on a small acreage. Controlling erosion on this soil is a problem because of the slope. Diversions, grass waterways, and contour stripcropping are necessary to protect cropland. Hay crops should be reseeded in alternate contour strips.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be so located and maintained that surface water does not collect in ruts and cause gullies. (Capability unit IIIe–3; woodland suitability group 1)

Berkshire fine sandy loam, 15 to 25 percent slopes (BbD).—This well-drained soil is in moderately steep areas high in the uplands of the Berkshire Hills in the western part of the county. In some places the light-gray and dark reddish-brown layers that normally underlie the surface layer are not present. There are very few stones on the surface of this soil. In many places the surface soil and subsoil are thinner than is typical of the series.

This soil is too steep to be used regularly for cultivated crops. It is used mostly for hay, pasture, and woodland, and occasionally, for a cultivated crop. Reseeding should be done in alternate contour strips. If used for row crops, this soil needs the protection of diversions, strips on diversion grades, and grass waterways.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be so located and maintained that they do not collect surface water and cause gullies. Water bars are needed to divert water from most woodland roads and thus prevent washouts. (Capability unit IVe–8; woodland suitability group 1)

Berkshire very stony fine sandy loam, 3 to 8 percent slopes (BcB).—This soil is well drained. It is in gently sloping areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than the soil described for the series. The light-gray and dark reddish-brown layers that generally underlie the surface layer are not present in all places. Stones are scattered about 20 to 100 feet apart on the surface.

Stones limit the use of this soil for tilled crops. It is used for unimproved pasture and woodland. Most areas can be reseeded to improved forage. Clearing the stones from the surface may be practical if more acreage is needed for crops, hay, or improved pasture. If the stones are removed, this soil is suited to the same crops and the same kind of management as Berkshire fine sandy loam, 3 to 8 percent slopes.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to divert water from

the roads and thus prevent washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire very stony fine sandy loam, 8 to 15 percent slopes (BcC).—This soil is well drained. It is in moderately sloping areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than the soil described for the series. The light-gray and dark reddish-brown layers that generally underlie the surface layer are not present in some areas. Stones are scattered about 20 to 100 feet apart on the surface.

Stones limit the use of this soil for tilled crops, and it is used for unimproved pasture and woodland. Most areas can be reseeded to improved forage. Removing the stones may be practical if more acreage is needed for crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Berkshire fine sandy loam, 8 to 15 percent slopes.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to divert water from the roads and thus prevent washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire very stony fine sandy loam, 15 to 25 percent slopes (BcD).—This well-drained soil is in moderately steep areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than the soil described as typical of the series. In some areas the light-gray and dark reddish-brown layers that generally underlie the surface layer are not present. Stones are scattered about 20 to 100 feet apart on the surface.

This soil is used for unimproved pasture and woodland. Some areas can be reseeded to improved forage. Stones and steepness are the major limitations in using this soil. If more acreage is needed for hay and improved pasture, clearing the stones from the surface may be practical. If cleared of stones, this soil is suited to the same crops and the same kind of management as Berkshire fine sandy loam, 15 to 25 percent slopes.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. Water bars are generally needed to divert water from the roads and prevent washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes (BdB).—This soil is well drained. It is in gently sloping areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than is typical of the series. The light-gray and dark reddish-brown layers that generally underlie the surface layer are not present in some places. The stones on the surface of this soil are 10 to 20 inches in diameter and about 2 to 10 feet apart.

Stones limit the use of this soil to unimproved pasture or to woodland. The best use is for woodland. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained, and in some places water bars are needed to divert water from the roads and thus prevent washouts. Generally it is not practical to clear this soil of stones and use it for crops. (Capability unit VIIs–2; woodland suitability group 2)

Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes (BdD).—This well-drained soil is in moderately sloping to moderately steep areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than is typical of the series. In some places the light-gray and dark reddish-brown layers that generally underlie the surface layer are not present. The stones on the surface of this soil are 10 to 20 inches in diameter and 2 to 10 feet apart.

Stones limit the use of this soil to unimproved pasture or to woodland. The best use is for woodland. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber. Clearing the soil of stones to use it for crops generally is not practical. Access roads and skidroads used in logging should be so located that they do not concentrate surface water and cause gullies. (Capability unit VIIs–2; woodland suitability group 2)

Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes (BdF).—This well-drained soil is in steep and very steep areas high in the uplands of the Berkshire Hills in the western part of the county. This soil has a thinner, blacker surface layer than is typical of the series. In most areas the light-gray and dark reddish-brown layers that generally underlie the surface layer are not present. The stones on the surface of this soil are 10 to 20 inches in diameter and 2 to 10 feet apart.

Stones and steepness limit the use of this soil to woodland, wildlife habitats, or recreational areas. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber, but careful planning and special equipment are necessary to harvest the timber in many areas. Access roads and skidroads need to be carefully planned and maintained to control runoff and thereby prevent gullying. (Capability unit VIIs–2; woodland suitability group 2)

Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes (BeB).—This well-drained soil has a darker subsoil than the soil described for the series. Also, in most areas it does not have the light-gray layers that generally underlie the surface layer. The soil is in the gently sloping lower uplands in the Berkshire Hills. There are very few stones on the surface.

The soil is suitable for silage corn, clover hay, and pasture. Alfalfa can be grown but is usually short lived. Potatoes are grown extensively. This soil is likely to erode; therefore, use of diversions and grass waterways on long slopes, or contour farming may be necessary to prevent washing. (Capability unit IIe–3; woodland suitability group 1)

Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes (BeC).—This well-drained soil has a darker subsoil than the soil described for the series, and, in most areas it does not have the light-gray layer. It is in the moderately sloping lower uplands of the Berkshire Hills.

Potatoes are grown extensively on this soil. Silage corn, clover hay, and pasture are also suitable. Alfalfa can be grown but is short lived. The hazard of erosion is severe where the vegetation has been removed. Tillage and reseeding should be done in alternate contour strips to control washing. Diversions and grass waterways are neces-

sary in some places to control excessive runoff. (Capability unit IIIe–3; woodland suitability group 1)

Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes (BeD).—This well-drained soil has a darker subsoil than the soil described for the series, and it does not have the light-gray layer in most areas. It is in moderately steep lower uplands of the Berkshire Hills. There are very few stones on the surface. Included with this soil in mapping are a few small areas that have slopes steeper than 25 percent.

This soil is too steep to be used regularly for cultivated crops. It is used mostly for hay, pasture, and woodland, and occasionally for a cultivated crop. Reseeding should be done in alternate contour strips.

Northern hardwoods, upland oaks, red pine, and white pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to divert water from the roads and thus prevent washouts. (Capability unit IVe–8; woodland suitability group 1)

Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes (BfB).—This soil is well drained. It has a thinner, blacker surface layer and a darker subsoil than the soil described for the series. Also, in most areas this soil does not have the light-gray layer. It is in gently sloping lower uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are scattered 20 to 80 feet apart on the surface.

Surface stones limit the use of this soil to unimproved pasture and woodland. Removing the surface stones may be practical if more acreage is needed for crops, hay, or improved pasture. If surface stones are removed, this soil is suited to the same crops and the same kind of management as Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to divert water from the roads and thus prevent washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes (BfC).—This well-drained soil has a thinner, blacker surface layer and a darker subsoil than is typical of the series, and it does not have the light-gray layer in most places. It is in the moderately sloping lower uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are scattered about 20 to 80 feet apart on the surface.

Surface stones limit the use of this soil to unimproved pasture and to woodland. Removing the surface stones may be practical if more acreage is needed for crops, hay, or improved pasture. If the stones are removed, this soil is suited to the same kind of management as Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to prevent runoff from collecting in ruts of the roads and causing washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes (BfD).—This well-drained soil has a thinner, blacker surface layer and a darker subsoil than is typical of the series, and it does not have the light-gray layer in most places. It is in moderately steep lower uplands of the Berkshire Hills. Stones, 10 to 24 inches in diameter, are scattered 20 to 80 feet apart on the surface.

Stones on the surface of this soil limit its use to unimproved hay, pasture, and woodland. Removing the surface stones may be practical if more acreage is needed for hay or for improved pasture. If stones are removed, this soil is suited to the same kind of management as Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. Generally, water bars are needed to prevent runoff from collecting in ruts and causing washouts. (Capability unit VIs–3; woodland suitability group 1)

Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes (BgB).—This well-drained soil has a thinner, darker surface layer and a darker subsoil than is typical of the series, and it does not have the light-gray layer in most places. The soil is in gently sloping lower uplands of the Berkshire Hills. Surface stones are 10 to 24 inches in diameter and about 2 to 20 feet apart.

Stones limit the use of this soil to unimproved pasture or to woodland, and it is best used for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber. Woodland roads should be carefully located and maintained. In some places water bars are needed to prevent runoff from collecting in ruts and causing washouts. (Capability unit VIIs–2; woodland suitability group 2)

Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes (BgD).—This well-drained soil has a thinner, darker surface layer and a darker subsoil than is typical of the series, and it does not have the light-gray layer in most places. This soil is in gently sloping to moderately steep lower uplands of the Berkshire Hills. Surface stones are 10 to 24 inches in diameter and 2 to 20 feet apart.

Stones limit the use of this soil to unimproved pasture or to woodland, and it is best used for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be carefully located and maintained. In some places water bars are needed to prevent runoff from collecting in ruts and causing washouts. (Capability unit VIIs–2; woodland suitability group 2)

Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes (BgF).—This well-drained soil has a thinner, darker surface layer and a darker subsoil than is typical of the series, and it does not have the light-gray layer in most places. It is in steep and very steep lower uplands of the Berkshire Hills. Surface stones are 10 to 24 inches in diameter and about 2 to 20 feet apart.

Steep slopes and stones limit the use of this soil to woodland, wildlife habitats, and recreational areas. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil, but careful planning and special equipment are generally necessary to harvest the timber. Logging roads need to be carefully planned and maintained to prevent gullying by runoff. (Capability unit VIIs–2; woodland suitability group 2)

Bernardston Series

The Bernardston series consists of well-drained silt loams that formed in compact glacial deposits derived mainly from dark-gray, phyllite material. These soils have a hard layer at a depth of about 20 inches that is difficult to dig with a spade. They are in gently sloping to very steep uplands in the towns of Bernardston and Leyden.

The Bernardston soils are near the shallow Nassau, the well-drained Dutchess, the moderately well drained Pittstown, and the poorly drained Stissing soils.

A typical Bernardston soil has a very dark grayish-brown, very stony silt loam surface layer. This layer is crumbly when handled and is about 2 inches thick. Under the surface layer, the upper part of the subsoil is crumbly, dark-brown, very channery silt loam about 5 inches thick. The lower subsoil is firm, very dark grayish-brown, very channery silt loam that extends to a depth of about 18 inches. Below this is the substratum, a very firm, olive-gray, very channery silt loam.

These dull or dark-colored soils contain many small flat chips of dark phyllite rock derived from the parent material. These rock chips range in size from thin flakes less than one-half inch long to fragments as much as 6 inches long and 1 to 2 inches thick, and they generally make up about 60 percent of the soil material.

The Bernardston soils are moderately permeable in the surface layer and subsoil but slowly permeable in the substratum. These soils retain moisture well. Consequently, they warm slowly in spring. This good moisture retention, however, usually keeps these soils from being droughty during the heat of summer.

Bernardston channery silt loam, 3 to 8 percent slopes (BhB).—This well-drained soil has a thicker surface layer than is typical of the series. It is in gently sloping uplands in the towns of Bernardston and Leyden. There are very few stones on the surface. Included with this soil in mapping are small areas that have slopes of less than 3 percent and small areas of moderately well drained Pittstown soils.

This soil is suitable for silage corn and improved hay or pasture. Good yields of alfalfa can be obtained, but stands are short lived and frequent reseeding is necessary. Stripcropping, diversions, and waterways are needed to control runoff on long slopes that are used for cultivated crops. (Capability unit IIe–2; woodland suitability group 3)

Bernardston channery silt loam, 8 to 15 percent slopes (BhC).—This well-drained soil is in sloping uplands in the towns of Bernardston and Leyden. It has a thicker surface layer than is typical of the series. There are very few stones on the surface. Included with this soil in mapping are small areas of the moderately well drained Pittstown soils.

This soil is suitable for silage corn and improved hay or pasture. Good yields of alfalfa can be obtained, but stands are short lived and frequent reseeding is necessary. Contour stripcropping, diversions, and grass waterways may be needed on long slopes that are used for row crops. The reseeding of hayfields and pasture should be done in alternate contour strips. (Capability unit IIIe–2; woodland suitability group 3)

Bernardston channery silt loam, 15 to 25 percent slopes (BhD).—This well-drained soil is in moderately steep uplands in the towns of Bernardston and Leyden. It has a thicker surface layer than the soil described for the series. There are very few stones on the surface.

This soil is too steep to be used regularly for row crops. It is used mostly for hay or pasture. Erosion can be controlled by reseeding hayfields and pasture in alternate contour strips. If this soil is used for crops, strips on diversion grades, grass waterways and winter cover crops are needed in some areas to control runoff. (Capability unit IVe–2; woodland suitability group 3)

Bernardston very stony silt loam, 3 to 8 percent slopes (BmB).—This well-drained soil is in gently sloping uplands in the towns of Bernardston and Leyden. Surface stones are 10 to 20 inches in diameter and 20 to 100 feet apart. Included with this soil in mapping are small areas of the very stony and extremely stony moderately well drained Pittstown soils.

Stones limit the use of this soil for row crops. It is used mostly for unimproved pasture and for woodland. Clearing the stones from the surface may be practical if more acreage is needed for crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Bernardston channery silt loam, 3 to 8 percent slopes. (Capability unit VIs-2; woodland suitability group 3)

Bernardston very stony silt loam, 8 to 15 percent slopes (BmC).—This well-drained soil is in moderately sloping upland areas in the towns of Bernardston and Leyden. Surface stones are 10 to 20 inches in diameter and 20 to 100 feet apart. Included with this soil in mapping are small areas of the very stony and extremely stony, moderately well drained Pittstown soils.

Stones limit the use of this soil for row crops. It is used mostly for unimproved pasture and for woodland. Removal of the surface stones is practical in some places. If stones are removed, this soil is suited to the same crops and the same kind of management as Bernardston channery silt loam, 8 to 15 percent slopes. (Capability unit VIs–2; woodland suitability group 3)

Bernardston very stony silt loam, 15 to 25 percent slopes (BmD).—This soil is well drained. It occupies moderately steep upland areas in the towns of Bernardston and Leyden. Surface stones are 10 to 20 inches in diameter and 20 to 100 feet apart. Included with this soil in mapping are some areas where the surface stones are more numerous or are larger and cover more than 3 percent of the surface.

Generally, it is not practical to clear the stones from this soil. It is used mostly for unimproved pasture and woodland. Farm and woodland roads should be so located that they do not concentrate surface water and cause gullying. (Capability unit VIs–2; woodland suitability group 3)

Bernardston very stony silt loam, 25 to 55 percent slopes (BmF).—This soil is well drained. It occurs in steep and very steep uplands in the towns of Bernardston and Leyden. Surface stones are 10 to 20 inches in diameter and 20 to 100 feet apart.

The use of this soil is limited to unimproved pasture and woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Logging roads should be so located that they do not con-

centrate surface water and cause gullies. (Capability unit VIIs–2; woodland suitability group 4)

Biddeford Series

The Biddeford series consists of very poorly drained silt loam that formed in old lake deposits of silt and clay. They are in depressions and low areas in the lowlands of the Connecticut Valley.

The Biddeford soils are near the well-drained Suffield, the moderately well drained Buxton, and the poorly drained Scantic soils.

A typical Biddeford soil has a black silt loam surface layer that is crumbly when not saturated. This layer is generally about 4 inches thick. Below it gray silt loam mottled with brown and dark brown extends to a depth of about 15 inches. The clay content of the subsoil increases with depth. The subsoil is underlain by gray, varved clay that has reddish mottles in the upper part.

The Biddeford soils are in small areas generally used for pasture or woodland.

Biddeford silt loam (Bn).—This very poorly drained soil occurs in low areas. In some places it is desirable to drain this soil to eliminate a nuisance spot in a field, but suitable drainage outlets are generally lacking. A high water table and very slow permeability make this soil unsuitable for most farm and nonfarm uses, but these characteristics favor use of the soil as a habitat for wetland wildlife. (Capability unit VIw–4; woodland suitability group 13)

Broadbrook Series

The soils of the Broadbrook series are well-drained very fine sandy loams that formed in deposits of very fine sand underlain by firm glacial till. These soils are in gently sloping to moderately steep uplands throughout the county.

The Broadbrook soils are near the moderately well drained Scituate and Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Broadbrook soil that has been cultivated has a crumbly, dark-brown very fine sandy loam surface layer about 10 inches thick. The subsoil is yellowish-brown very fine sandy loam that becomes paler with depth. It extends to a depth of about 30 inches. Below this depth is the substratum, which is firm, olive-gray gravelly fine sandy loam.

In some areas the surface layer contains a little more silt and clay than is typical of the series, and the texture is loam. The underlying till is generally firm to very firm, and the texture ranges from gravelly fine sandy loam to gravelly loamy sand. Surface stones, 10 to 24 inches in diameter, are common in areas that have not been cleared for cultivation. Although the surface layer and subsoil contain a very small amount of gravel-sized material, the proportion of gravel in the underlying till is as much as 20 to 50 percent in some places. The depth to the substratum is generally about 27 inches but ranges from 20 to 40 inches.

These soils have a high moisture-holding capacity. Except for the stony or steeper areas, these soils are easy to work, and they respond to good management.

Broadbrook very fine sandy loam, 3 to 8 percent slopes (BsB).—This well-drained soil occurs in gently sloping areas throughout the county. In many places this soil has a slightly thicker surface layer and greater depth to the underlying till material than the soil described as typical of the series. There are no stones on the surface.

The soil is well suited to alfalfa and other improved forage crops. It has a high moisture-holding capacity and is easily worked. Crops grown on this soil are responsive to lime and fertilizer, which are necessary to obtain favorable yields. Careful management is required to maintain organic matter and good tilth. The hazard of sheet erosion is severe. Keeping vegetation on this soil as much of the year as possible helps to control erosion by wind or water. Row crops should be grown in contour strips, and reseeding should also be on the contour. Diversions, grass waterways, and winter cover crops are needed in some places to control runoff. (Capability unit IIe–2; woodland suitability group 3)

Broadbook very fine sandy loam, 8 to 15 percent slopes (BsC).—This well-drained, moderately sloping soil occurs throughout the county. There are no stones on the surface.

This soil is well suited to alfalfa and other improved forage. It has a high moisture-holding capacity and is easily worked. Crops grown on this soil respond to lime and fertilizer, which are necessary to obtain favorable yields. Careful management is required to maintain organic matter and good tilth. The hazard of erosion is very severe on this soil. The soil should be protected by vegetation as much of the year as possible. Also, diversions, strips on diversion grades, grass waterways, and winter cover crops are needed to protect this soil from erosion. (Capability unit IIIe–2; woodland suitability group 3)

Broadbrook very fine sandy loam, 15 to 25 percent slopes (BsD).—This soil is well drained. It occurs in moderately steep areas throughout the county. The soil has few, if any, surface stones. Included with this soil in mapping are small areas that have steeper slopes.

Because this soil is moderately steep and subject to severe erosion, it cannot be used regularly for cultivated crops. It can be cultivated occasionally, but it is better suited to hay or pasture. (Capability unit IVe–2; woodland suitability group 3)

Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes (BtC).—This well-drained soil is in moderately sloping to sloping areas throughout the county. It has a thinner, blacker surface layer than the soil described for the series. Stones, 10 to 24 inches in diameter, are scattered 30 to 100 feet apart on the surface.

Stones on the surface interfere with tillage. Consequently, the soil is used mostly for unimproved pasture or for woodland. Woodland roads should be so located that they do not concentrate runoff and cause gullies. Removal of surface stones may be practical if more acreage is needed for cultivated crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Broadbrook very fine sandy loam, 3 to 8 percent slopes, or Broadbrook very fine sandy loam, 8 to 15 percent slopes. (Capability unit VIs-2; woodland suitability group 3)

Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes (BtD).—This soil is well drained and is in moderately steep areas throughout the county. It has a thinner, blacker surface layer than the soil described for the series. Stones, 10 to 24 inches in diameter, are scattered 30 to 100 feet apart on the surface.

Because of stones and moderately steep slopes, this soil is unsuitable for cultivation. It is best used for unimproved pasture or for woodland. When the vegetation is removed, the soil is subject to very severe erosion. Care must be taken to maintain a protective cover. Clearing this soil of surface stones is seldom practical. If the stones are removed, however, the soil can be used in the same way as Broadbrook very fine sandy loam, 15 to 25 percent slopes. (Capability unit VIs-2; woodland suitability group 3)

Buckland Series

The Buckland series consists of moderately well drained fine sandy loams that have an olive subsoil. These soils formed in compact glacial deposits derived mainly from dark-gray schistose material and some impure limestone. At a depth of about 20 inches, these soils have a hard layer that is difficult to dig with a spade. The Buckland soils are in nearly level to moderately steep foothills of the western highlands.

These soils are near the shallow Westminster, the well-drained Shelburne, and the poorly drained and very poorly drained Cabot soils.

A typical Buckland soil that has been cultivated has a crumbly, very dark grayish-brown fine sandy loam surface layer about 7 or 8 inches thick. The subsoil is fine sandy loam that extends to a depth of about 20 inches. The upper half is olive brown, but the lower half is olive gray and contains dark yellowish-brown mottles. Below this is a hard, dark-gray loam substratum that also contains dark yellowish-brown mottles. The subsoil and the substratum contain dark reddish-brown fragments of partly disintegrated limestone. They are more numerous in the substratum.

In some areas the surface layer and subsoil contain a little more silt and clay and have a loam texture. Stones, 10 to 20 inches in diameter, are scattered throughout the Buckland soils.

Water passes somewhat readily through the surface layer and subsoil, except when these layers are saturated. Nevertheless, Buckland soils are wet and seepy because water moves slowly through the dense substratum. These soils are always wet early in spring, often late in spring, and at times in fall.

Buckland fine sandy loam, 0 to 3 percent slopes (BuA).—This soil is nearly level and moderately well drained. It occurs in nearly level areas in the foothills of the western highlands. This soil has slightly more mottling in the subsoil than the soil described for the series, and the mottling is generally nearer the surface. Also, water from surrounding slopes tends to collect on this nearly level soil and to keep it saturated longer. There are very few stones on the surface. Included with this soil are some small, poorly drained areas that have a darker surface layer than normal and are mottled directly under the surface layer.

Water passes readily through the surface layer and subsoil except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. The soil is always wet early in spring, often late in spring, and sometimes in fall. Except in bothersome wet spots, this soil is suitable for hay or pasture without artificial drainage. Ladino clover is especially suitable for hay. Drainage is needed for good growth of silage corn, vegetables, and other row crops. (Capability unit IIw-2; woodland suitability group 1)

Buckland fine sandy loam, 3 to 8 percent slopes (BuB).—This moderately well drained soil occurs in gently sloping foothills of the western highlands. There are very few stones on this soil.

Water passes readily through the surface layer and subsoil except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. The soil is always wet early in spring, often late in spring, and sometimes in fall. Except in bothersome wet spots, this soil is suitable for hay or pasture without artificial drainage. Silage corn is also suitable, and ladino clover is especially suitable for hay and pasture.

Wetness is the major problem, and drainage is needed for alfalfa and row crops. Erosion also is a problem if this soil is not tilled properly. Wherever possible, it should be worked across the slope in graded rows. On some long slopes, diversions and waterways are needed to intercept runoff. (Capability unit IIw-2; woodland suitability group 1)

Buckland fine sandy loam, 8 to 15 percent slopes (BuC).—This soil is moderately well drained. It occurs in moderately sloping foothills of the western highlands. There are very few surface stones on this soil.

Water passes readily through the surface layer and subsoil except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. The soil is always wet early in spring, often late in spring, and sometimes in the fall. Except in bothersome wet spots, this soil is suitable for hay and pasture without artificial drainage. Silage corn is also suitable. Ladino clover is especially suitable for hay or pasture. Drainage is needed for alfalfa and row crops.

Because of steeper slopes and more runoff, this soil is more likely to erode than the less sloping Buckland soil. Therefore, more intensive control of erosion is required. Wherever possible, the soil should be worked across the slope in graded strips. On some long slopes diversions and grass waterways are needed to carry away excess surface water. Diversions on this soil, however, should be closer together than on the less sloping soil. (Capability unit IIIe-22; woodland suitability group 1)

Buckland fine sandy loam, 15 to 25 percent slopes (BuD).—This moderately well drained soil occurs in moderately steep foothills of the western highlands. Very few stones are on the surface.

Water passes readily through the surface layer and subsoil, except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. Except in bothersome seep spots, this soil is suitable for hay or pasture without artificial drainage.

Steep slopes and wetness limit the use of this soil mainly to hay and pasture. It can be cultivated occasionally. The control of water and erosion is even more important on this soil than on the less sloping Buckland soils. (Capability unit IVe-22; woodland suitability group 1)

Buckland very stony fine sandy loam, 3 to 8 percent slopes (BvB).—This moderately well drained, gently slop-

ing soil is in the foothills of the western highlands. It has a thinner, blacker surface layer, in most places, than the soil described for the series. Stones 10 to 24 inches in diameter are scattered 20 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil, except when they are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. The soil is always wet early in spring, often late in spring, and at times in the fall. This soil is suitable for pasture without artificial drainage.

Stones limit the use of this soil for tilled crops. It is used for pasture and woodland. Reseeding to improved forage may be feasible. Clearing the stones from the surface may be practical if more acreage is needed for row crops, hay, and improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Buckland fine sandy loam, 3 to 8 percent slopes. (Capability unit VIs–22; woodland suitability group 1)

Buckland very stony fine sandy loam, 8 to 15 percent slopes (BvC).—This moderately well drained soil has a thinner, blacker surface layer than is typical of the series. It occurs in sloping foothills of the western highlands. Stones 10 to 24 inches in diameter are scattered 20 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil, except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. The soil is suitable for pasture without artificial drainage.

Stones limit the use of this soil for tilled crops. It is used for pasture and woodland. Reseeding to improved pasture is generally feasible. In some places it is practical to clear stones from the surface if more acreage is needed for crops or hay. If stones are removed, this soil is suited to the same crops and the same kind of management as Buckland fine sandy loam, 8 to 15 percent slopes. (Capability unit VIs–22; woodland suitability group 1)

Buckland very stony fine sandy loam, 15 to 25 percent slopes (BvD).—This moderately well drained, moderately steep soil is in the foothills of the western highlands. It has a thinner, blacker surface layer than is typical of the series. Stones are scattered 30 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil except when these layers are saturated. Nevertheless, this soil is wet and seepy because water moves slowly through the dense substratum. This soil is suitable for pasture without artificial drainage.

Stones limit the use of this soil for tilled crops. It is used for pasture and woodland. Some areas can be reseeded to improve forage. Clearing the stones from the surface may be practical if more acreage is needed for improved hay or pasture. If cleared of stones, this soil is suited to the same crops and the same kind of management as Buckland fine sandy loam, 15 to 25 percent slopes. (Capability unit VIs–22; woodland suitability group 1)

Buckland extremely stony fine sandy loam, 3 to 8 percent slopes (BwB).—This moderately well drained soil has a thinner, blacker surface layer than the soil described for the series. It occurs in gently sloping foothills of the western highlands. Stones 10 to 24 inches in diameter are 2 to 10 feet apart on the surface.

Stones limit the use of this soil to unimproved pasture or woodland. It is best used for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Removing the stones generally is not practical. (Capability unit VIIs–2; woodland suitability group 2)

Buckland extremely stony fine sandy loam, 8 to 25 percent slopes (BwC).—This soil has a thinner, blacker surface layer than the soil described for the series. It occurs in sloping and moderately steep foothills of the western highlands. Stones are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have slopes of 25 to 45 percent.

Stones limit the use of this soil to unimproved pasture and woodland. It is best used for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Clearing the soil of stones generally is not practical. Access roads and skid roads used in logging should be so located that they do not collect surface water and cause gullies. (Capability unit VIIs–2; woodland suitability group 2)

Buxton Series

The soils of the Buxton series are moderately well drained silt loams that formed in silt and clay deposits of old lakebeds. These soils are not extensive. They are mostly in nearly level to gently sloping areas of the Connecticut Valley near the well-drained Suffield, the poorly drained Scantic, and the very poorly drained Biddeford soils.

A representative Buxton soil that has been cultivated has a crumbly, dark-brown silt loam surface layer 8 to 10 inches thick. Below this the subsoil extends to a depth of 24 inches. It is crumbly, yellowish-brown silt loam in the upper part, but it is olive colored and contains more clay in the lower part. The lower half of the subsoil contains gray and dark yellowish-brown mottles. The substratum is composed of thin layers of clay separated by somewhat thicker layers of silt. These layers are old lake sediments. They are olive gray, mottled with gray and very dark grayish brown. They are also firm to very firm and hard to dig.

Water moves through the surface layer and upper subsoil somewhat slowly, but the substratum is practically impervious to water. When these soils are saturated, they remain wet for a long time. They are considered "late" soils because they are wet in spring and are often wet in fall. Normally, however, they are suitable for hay and pasture without artificial drainage. Even good yields of silage corn are obtained on these soils if planting is deferred until the soils dry out.

Buxton silt loam, 0 to 3 percent slopes (BxA).—This soil is moderately well drained. It occurs in nearly flat areas that once were lakebeds in the Connecticut Valley lowlands. In most places mottling in the subsoil is a little closer to the surface than is typical. Included with this soil in mapping are some small areas of the well-drained Suffield soils.

Wetness is the main problem in using this soil. In some areas diversion terraces are practical for intercepting surface water from surrounding slopes. Surface drainage may also be desirable to eliminate small wet spots that are nuisances when the soil is used for row crops.

This soil is well suited to hay and pasture. It is also suited to row crops if drained. This soil should not be tilled when wet, because it compacts. (Capability unit IIw–4; woodland suitability group 3)

Buxton silt loam, 3 to 10 percent slopes (BxB).—This soil is moderately well drained. It occurs in gently sloping areas and in a few moderately sloping areas that once were old lakebeds in the Connecticut Valley lowlands. Included with this soil in mapping are some small areas that have steeper slopes.

If this soil is used for row crops, it needs drainage. Alfalfa can be grown, but stands generally do not last so long or produce so well as on better drained soils. This soil is likely to erode; therefore, crops should be planted in graded rows. The soil should not be tilled when wet, as it will compact. (Capability unit IIw–4; woodland suitability group 3)

Cabot Series

The Cabot series consists of poorly drained and very poorly drained fine sandy loams and loams that formed in glacial deposits derived mainly from dark-gray schistose material containing some impure limestone. These soils have a hard layer about 10 to 20 inches from the surface. They are nearly level to gently sloping soils in slight depressions and low areas in the foothills of the western highlands.

The Cabot soils are near the shallow Westminster, the well-drained Shelburne, and the moderately well drained Buckland soils.

A typical poorly drained Cabot soil that has been used for unimproved pasture has a very dark gray fine sandy loam surface layer about 8 inches thick. Under this is a very dark grayish-brown fine sandy loam subsoil that is mottled gray and yellowish brown. The subsoil is underlain at a depth of about 20 inches by the compact substratum. It is dark grayish-brown fine sandy loam containing many gray and dark-brown mottles.

In some areas the surface layer and subsoil contain a little more silt and clay than described here. Also, in some areas these soils have a black, mucky loam or fine sandy loam surface layer 6 to 12 inches thick and are very poorly drained. In these areas the subsoil and substratum are more highly mottled and are olive gray. Some stones, 10 to 20 inches in diameter, are scattered throughout the Cabot soils.

Cabot soils are wet most of the year. They are ponded by runoff from surrounding slopes, and the hard layer restricts the downward movement of water. In many areas natural outlets for surface drainage are lacking or are inadequate, especially in depressions, and extensive excavation may be required to provide good drainage outlets. Without drainage, these soils can be used only for low-producing hay or pastures or for trees. If artificially drained, they can be used for improved hayfields and pastures and even for silage corn.

Cabot fine sandy loam, 0 to 3 percent slopes (CaA).—This soil is poorly drained. It occurs in nearly level areas or in depressions in the foothills of the western highlands. This soil generally is a little wetter than the typical Cabot soil because it is so nearly flat and so difficult to drain. There are very few stones on the surface.

The soil is wet 7 to 9 months of the year, because it is ponded by surface water from surrounding slopes and the hard layer restricts the downward movement of water. Natural outlets may be lacking or inadequate.

Without drainage, this soil can be used only for low-producing hay or pasture or for woodland. If artificially drained, the soil can be used for improved hayfields and pastures and even for silage corn. (Capability unit IIIw–2; woodland suitability group 7)

Cabot fine sandy loam, 3 to 8 percent slopes (CaB).—This poorly drained soil is in gently sloping foothills of the western highlands. There are very few stones on the surface. Included with this soil in mapping are a few small areas that have slopes steeper than 8 percent.

This soil is wet most of the year. It gets surface water from surrounding slopes and also seepage from underground water. The hard layer in this soil is impervious and restricts the downward movement of water. Drainage outlets, however, are generally easily found because the soil is gently sloping.

Without drainage, this soil is limited to low-producing hay or pasture or to woodland. Most areas can be drained, however, and used for improved hay and pasture or for silage corn. (Capability unit IIIw–2; woodland suitability group 7)

Cabot extremely stony fine sandy loam, 0 to 10 percent slopes (CbB).—This poorly drained soil is in depressions or nearly level to gently sloping areas in the foothills of the western highlands. It has a thinner, blacker surface layer than the soil described for the series. Stones on the surface of this soil are 10 to 24 inches in diameter and 10 to 80 feet apart. Included with this soil in mapping are a few small areas that have slopes steeper than 10 percent.

This soil is wet most of the year. Small ponds and seep spots are formed by surface water and subsurface water from surrounding slopes. Removing the stones generally is not feasible. Consequently, they prevent tillage and limit the use of this soil to low-yielding, unimproved pasture or to woodland. (Capability units VIIs–23; woodland suitability group 7)

Cabot loam, black surface, 0 to 3 percent slopes (CcA).—This nearly level, very poorly drained soil is similar to the soil described for the series, but it has a black surface layer that is generally loam, its subsoil and substratum are more olive in color, and it stays wet longer each year. It is in slight depressions and low areas in the foothills of the western highlands. There are few stones on the surface.

This soil is used mostly for woodland; some of it is used for unimproved pasture. The water table is at or near the surface most of the year, and the soil is ponded by runoff from surrounding slopes. The hard layer in this soil prohibits water from moving downward, and drainage is difficult, as natural outlets are generally lacking. Although drainage is generally not feasible, a few areas have been drained and used for improved pasture and hay. (Capability unit Vw–2; woodland suitability group 13)

Cabot very stony loam, black surface, 0 to 3 percent slopes (CdA).—This nearly level, very poorly drained soil is similar to the soil described for the series, but it has a black, mucky surface layer that is generally loam. Also, it has a subsoil and substratum that are more highly mot-

tled and more olive than typical, and it stays wet longer each year. It is in slight depressions and low areas in the foothills of the western highlands. Stones, 1 to 2 feet in diameter, are 5 to 80 feet apart on the surface.

Surface stones and wetness limit the use of this soil to woodland or wildlife habitats. The water table is at or near the surface most of the year, and the soil is ponded by surface water from surrounding slopes. The hard layer in this soil restricts the downward movement of water. Natural drainage outlets generally are lacking. (Capability unit VIIs–24; woodland suitability group 13)

Cabot very stony loam, black surface, 3 to 8 percent slopes (CdB).—This soil is very poorly drained. It is similar to the soil described for the series, but it has a black, mucky surface layer that is generally loam. Also, it has a subsoil and substratum that are more highly mottled and are more olive than typical. This soil is in gently sloping foothills of the western highlands. Stones 1 to 2 feet in diameter are 5 to 80 feet apart on the surface.

Surface stones and wetness limit the use of this soil to woodland or wildlife habitats. The water table is at or near the surface most of the year, and the soil receives surface water from surrounding slopes. Also, subsurface water from these slopes causes seep spots. The hard layer restricts the downward movement of water through this soil. (Capability unit VIIs–24; woodland suitability group 13)

Carver Series

The Carver series consists of excessively drained, loamy coarse sand that formed in sandy deposits on terraces. These soils are in the south-central part of the county. They generally are nearly level to moderately steep, but they are steeply sloping on short escarpments between terrace levels.

The Carver soils are near the excessively drained Windsor and Hinckley, and the moderately well drained Deerfield soils.

Most of the Carver soils are in woods. Under an inch or two of leaf litter, the surface layer is very dark grayish-brown loamy coarse sand about 4 inches thick and is very crumbly. The upper part of the subsoil is dark yellowish-brown loamy coarse sand, also very crumbly. The subsoil below a depth of about 18 inches is yellowish-brown coarse sand. The sand particles in this layer, which extends to about 30 inches, are loose and separate. Below the subsoil is the substratum, consisting of loose coarse sand that is brown and pale brown.

These soils have a uniform texture that is dominantly loamy coarse sand or coarse sand. In addition, the content of fine and very fine pebbles is about 10 percent throughout the profile. In some places layers of fine gravel occur at a depth below 4 feet.

The Carver soils are so droughty that they generally are not used for agriculture. Most of this area is in woodland, and some has been used for suburban housing developments. The woodland consists of a scrubby growth of low-value trees and is especially susceptible to forest fires.

Carver loamy coarse sand, 0 to 3 percent slopes (CeA).—This excessively drained soil occupies nearly level areas on terraces. In some areas it has a thicker, lighter colored surface layer than the soil described for the series. Individual tracts are large.

The soil is so droughty that it generally is not used for agriculture. Most of it is in woodland, but few trees of commercial value grow naturally on it. Without irrigation, this soil is suitable only for woodland or for wildlife habitats. If irrigated, it can be used for tobacco, corn, alfalfa, and most truck crops, followed each year by a winter cover crop.

This soil is rapidly permeable and has a very low moisture-holding capacity. Therefore, frequent irrigation is necessary. Also, frequent applications of lime and fertilizer are necessary, because plant nutrients leach away rapidly. Manure or crop residue is needed to improve tilth, moisture-holding capacity, and yields.

Turf is difficult to establish on this droughty, sandy soil. This soil is a good source of sand. (Capability unit IVs–9; woodland suitability group 12)

Carver loamy coarse sand, 3 to 8 percent slopes (CeB).—This excessively drained soil is on gently sloping terraces. In some areas it has a thicker, lighter colored surface layer than the soil described for the series.

This soil is so droughty that not much of it is used for agriculture. It is mainly in trees, but few trees of commercial value grow naturally on it. Without irrigation, the soil is suitable only for woodland or for wildlife habitats. If the soil is irrigated, it can be used for tobacco, corn, alfalfa, and most truck crops grown in the county.

This soil is rapidly permeable and has a very low moisture-holding capacity. Therefore, frequent irrigation is necessary. Also, frequent applications of lime and fertilizer are necessary, because plant nutrients leach away rapidly. On some long slopes, contour planting, stripcropping, diversions, and grass waterways are necessary to control erosion. Manure or crop residue is needed to improve tilth, moisture-holding capacity, and yields.

Turf is difficult to establish on this droughty, sandy soil. The soil is a good source of sand. (Capability unit IVs–9; woodland suitability group 12)

Carver loamy coarse sand, 8 to 15 percent slopes (CeC).—This excessively drained soil is on moderately sloping terraces. Much of it is along erosion channels that dissect the terraces.

This soil is best used for woodland or for wildlife habitats. It is very droughty and highly susceptible to erosion if the slopes are unprotected. The soil should be protected from erosion by sod or by trees or shrubs. Few trees of commercial value, however, grow naturally on it, and vegetation is difficult to establish and maintain. This soil is a good source of sand. (Capability unit VIIs–9; woodland suitability group 12)

Carver loamy coarse sand, 15 to 25 percent slopes (CeD).—This soil is excessively drained. It occurs in moderately steep areas, mostly on terrace escarpments and along erosion channels that dissect the terraces. Included with this soil in mapping are some areas that have slopes steeper than 25 percent.

This soil should not be used for agricultural purposes. It is best used for woodland or wildlife habitats. Few trees of commercial value grow naturally on it, and vegetation is difficult to establish and maintain. This soil is a good source of sand. (Capability unit VIIs–9; woodland suitability group 12)

Charlton Series

The Charlton series consists of well-drained fine sandy loams that formed in olive-colored glacial deposits. These soils are in gently sloping to very steep areas in the north-central part of the county.

The Charlton soils are near the shallow Hollis, the moderately well drained Sutton, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Charlton soil that has not been tilled has a thin, crumbly, dark-brown fine sandy loam surface layer that is only 3 or 4 inches thick. This layer is covered with a thin litter of leaves and twigs in various stages of decomposition. Underlying the surface layer is a subsoil of dark yellowish-brown fine sandy loam. It extends to a depth of about 20 inches, and the color fades with depth to yellowish brown. The substratum is olive fine sandy loam. In places the substratum is firm or compact at a depth of 3 to 5 feet.

In some areas, the surface layer contains a little more silt and clay than is typical and the texture is loam. In other places the subsoil and substratum contain a little more sand than the typical soil, and the texture is sandy loam. Stones, 10 to 24 inches in diameter, are scattered on the surface and throughout a typical Charlton soil.

The Charlton soils have moderately rapid to rapid permeability and a moderate moisture-holding capacity. The permeability of the firm substratum, where it occurs, is moderately slow to slow. The nonstony and less sloping areas of these soils are well suited to most of the row crops grown in the county and to alfalfa and other improved forage.

Charlton fine sandy loam, 3 to 8 percent slopes (CkB).—This well-drained soil occurs in gently sloping uplands in the north-central part of the county. It has a thicker surface layer than is typical of the series. There are very few stones on the surface of this soil. Included with it in mapping are some small areas that have slopes of less than 3 percent.

This soil is well suited to most row crops commonly grown in the county and to alfalfa and other improved forage. The soil is likely to erode, however, especially on long slopes that are used for row crops. Diversions, grass waterways, contour stripcropping, and winter cover crops may be needed to control erosion. (Capability unit IIe–3; woodland suitability group 6)

Charlton fine sandy loam, 8 to 20 percent slopes (CkC).—This well-drained soil has a thicker surface layer than is typical of the series. It occurs in moderately sloping and moderately steep uplands in the north-central part of the county. There are very few stones on the surface. Included with this soil in mapping are some areas that have slopes greater than 20 percent.

This soil is well suited to most of the row crops commonly grown in the county and to alfalfa and other improved forage. The soil is likely to erode, however, especially on long slopes that are used for row crops. Diversions, winter cover crops, grass waterways, or contour stripcropping, alone or in combination, may be required to control erosion. (Capability unit IIIe–3; woodland suitability group 6).

Charlton very stony fine sandy loam, 3 to 15 percent slopes (CmC).—This soil is well drained. It occurs in gently sloping to moderately sloping uplands in the north-central part of the county. Stones 10 to 24 inches in diameter are 20 to 80 feet apart on the surface.

Stones interfere with tillage, and the soil is used mostly for woodland and pasture. Removing the surface stones generally is practical if more acreage is needed for row crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops as Charlton fine sandy loam, 3 to 8 percent slopes, or Charlton fine sandy loam, 8 to 20 percent slopes, and the same kind of management is required. (Capability unit VIs–3; woodland suitability group 6)

Charlton very stony fine sandy loam, 15 to 25 percent slopes (CmD).—This well-drained soil occurs in moderately steep uplands in the north-central part of the county. Stones, 10 to 24 inches in diameter, are 20 to 80 feet apart on the surface.

Stoniness is the major problem and limits the use of this soil to unimproved pasture or woodland. Removing the stones may be practical if more acreage is needed for crops. If stones are removed and the soil is used for crops, control of erosion is the main problem.

Diversions, grass waterways, and reseeding in strips on diversion grades generally are required to control erosion. (Capability unit VIs–3; woodland suitability group 6)

Charlton extremely stony fine sandy loam, 3 to 8 percent slopes (CnB).—This soil is well drained. It occurs in gently sloping uplands in the north-central part of the county. Stones 10 to 24 inches in diameter are 2 to 20 feet apart on the surface.

Extreme stoniness limits the use of this soil to unimproved pasture and to woodland. Upland oaks, red pine, and white pine produce fairly good yields of timber on this soil. Generally, it is not practical to remove the stones from the surface for row crops. (Capability unit VIIs–2; woodland suitability group 4)

Charlton extremely stony fine sandy loam, 8 to 25 percent slopes (CnD).—This soil is well drained. It occurs in moderately sloping and moderately steep uplands in the north-central part of the county. Stones 10 to 24 inches in diameter are 2 to 20 feet apart on the surface.

Stoniness limits the use of this soil to woodland and, in some places, to unimproved pasture. Upland oaks, white pine, and red pine produce fairly good yields of timber on this soil. Lanes, roads, and skidways should be so located that they do not concentrate surface water, because this soil erodes if the vegetation is destroyed. (Capability unit VIIs–2; woodland suitability group 4)

Charlton extremely stony fine sandy loam, 25 to 45 percent slopes (CnE).—This soil is well drained. It occurs in steep and very steep uplands in the north-central part of the county. Stones 10 to 24 inches in diameter are scattered 2 to 20 feet apart over the surface. Included with this soil in mapping are some areas where slopes are steeper than 45 percent.

This soil is best used for woodland or wildlife habitats. It produces fairly good yields of upland oaks, white pine, and red pine. If the vegetation is removed, however, the soil erodes readily because of the steep slopes. Therefore, access roads and skidroads should be carefully located to prevent surface water from concentrating. (Capability unit VIIs–2; woodland suitability group 4)

Cheshire Series

The soils of the Cheshire series are well-drained fine sandy loams that formed in glacial deposits derived principally from red sedimentary rocks. These soils have a red subsoil. They are gently sloping to steep and are in the central part of the county.

The Cheshire soils are near the shallow Holyoke and Sunderland soils.

A typical Cheshire soil that has not been tilled has a very thin, crumbly, very dark gray fine sandy loam surface layer that is only 1 to 2 inches thick. Generally it is covered with 2 or 3 inches of forest litter in different stages of decomposition. Beneath the surface layer a reddish subsoil extends to a depth of about 30 inches. It is fine sandy loam in the upper part but becomes coarser and gravelly with depth. Below this is a substratum of reddish gravelly sandy loam.

The Cheshire soils have stones 10 to 24 inches in diameter on the surface and throughout the profile.

These soils have a moderate moisture-holding capacity and moderately rapid to rapid permeability. The nonstony, less sloping areas are well suited to most of the row crops grown in the county, and to alfalfa and clover hay.

Cheshire fine sandy loam, 3 to 8 percent slopes (CoB).—This well-drained soil occurs in gently sloping areas in the central part of the county. In tilled areas the surface layer is crumbly, dark-brown fine sandy loam about 8 inches thick. There are very few stones on the surface. Included with this soil in mapping are some small areas where slopes are less than 3 percent and some areas that have a hard layer less than 30 inches from the surface.

This soil is well suited to most of the row crops grown in the county. It is also suited to alfalfa and clover hay. Erosion on long slopes is the major problem, but it can be controlled by diversions, grass waterways, or stripcropping. (Capability unit IIe–3; woodland suitability group 6)

Cheshire fine sandy loam, 8 to 15 percent slopes (CoC).—This well-drained, moderately sloping soil is in the central part of the county. In tilled areas the surface layer is dark brown and about 8 inches thick. There are very few stones on the surface. Included with this soil in mapping are some areas that have a hard layer less than 30 inches from the surface.

This soil is well suited to most of the row crops grown in the county, and to alfalfa and clover hay. It erodes readily, however, and if used for row crops, it requires protection from surface water. Surface water can be controlled by using diversions, winter cover crops, or grass waterways, or by contour stripcropping. (Capability unit IIIe–3; woodland suitability group 6)

Cheshire fine sandy loam, 15 to 25 percent slopes (CoD).—This soil is well drained. It is in moderately steep areas in the central part of the county. In tilled areas the surface layer is dark brown and about 8 inches thick. There are very few stones on the surface of this soil. Included with it in mapping are some small areas that have slopes steeper than 25 percent and some areas that have a hard layer less than 30 inches from the surface.

This soil is suited to most of the row crops grown in the county. Because of the degree of slope, however, this soil should be kept in a close-growing crop as much as possible and used for a row crop only occasionally. It erodes readily if used for row crops, and grass waterways, diversions, and stripcropping are needed to control surface water. The reseeding of hayfields should be done in alternate strips to control erosion. (Capability unit IVe–8; woodland suitability group 6)

Cheshire very stony fine sandy loam, 3 to 8 percent slopes (CpB).—This well-drained soil is in gently sloping areas in the central part of the county. In some places this soil has a thicker surface layer than the typical soil described. Stones 10 to 20 inches in diameter are 20 to 80 feet apart on the surface. Included with this soil in mapping are some small areas in which slopes are less than 3 percent, and some areas that have a hard layer within 30 inches of the surface.

Stones limit the use of this soil for row crops, but most of the pasture can be reseeded to improved forage. Removing the stones may be practical if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Cheshire fine sandy loam, 3 to 8 percent slopes. (Capability unit VIs–3; woodland suitability group 6)

Cheshire very stony fine sandy loam, 8 to 15 percent slopes (CpC).—This well-drained soil occurs in moderately sloping areas in the central part of the county. In some places this soil has a thicker surface layer than the typical soil described. Stones 10 to 20 inches in diameter are 20 to 80 feet apart on the surface. Included with this soil in mapping are some areas that have a hard layer within 30 inches of the surface.

Stones limit the use of this soil for row crops, but most pastures can be reseeded to improved forage. Removing the stones may be practical if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Cheshire fine sandy loam, 8 to 15 percent slopes. (Capability unit VIs–3; woodland suitability group 6)

Cheshire very stony fine sandy loam, 15 to 25 percent slopes (CpD).—This well-drained soil is in moderately steep areas in the central part of the county. In some places this soil has a thicker surface layer than the typical Cheshire soil described. Stones 10 to 20 inches in diameter are 20 to 80 feet apart on the surface. Included with this soil in mapping are some areas that have a hard layer within 30 inches of the surface.

Surface stones and steep slopes limit the use of this soil for row crops. It is best used for pasture or woodland. Removing the stones may be practical if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Cheshire fine sandy loam, 15 to 25 percent slopes. (Capability unit VIs–3; woodland suitability group 6)

Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes (CrB).—This well-drained soil occurs in gently sloping areas in the central part of the county. There are stones 10 to 20 inches in diameter and 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas where slopes are less than 3 percent and some areas that have a hardpan within 30 inches of the surface.

Stones limit the use of this soil to unimproved pasture and to woodland. Upland oaks, white pine, red pine, and other desirable trees produce good yields of timber on this soil. In most areas it is not practical to clear this soil

of stones and use it for crops. (Capability unit VIIs–2; woodland suitability group 4)

Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes (CrD).—This well-drained soil occurs in moderately sloping and moderately steep areas in the central part of the county. Stones 10 to 20 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have a hard layer less than 30 inches from the surface.

Surface stones limit the use of this soil to unimproved pasture and to woodland. Upland oaks, white pine, red pine, and other desirable trees produce good yields of timber on this soil, but access roads and skidtrails must be carefully located to control runoff and thereby prevent gullying. In most areas it is not practical to clear this soil of stones and use it for crops. (Capability unit VIIs–2; woodland suitability group 4)

Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes (CrE).—This well-drained soil occurs in steep and very steep areas in the central part of the county. Stones 10 to 20 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have a hard layer within 30 inches of the surface.

Steep slopes and stones limit the use of this soil to woodland or wildlife habitats. Upland oaks, white pine, red pine, and other desirable trees make fairly good growth on this soil, but in many areas careful planning and special equipment are necessary for harvesting the timber. Access roads and skidroads should be carefully planned and maintained to control runoff and thereby prevent gullying. (Capability unit VIIs–2; woodland suitability group 4)

Colrain Series

The soils of the Colrain series are well-drained fine sandy loams that formed in glacial deposits derived principally from dark-gray schistose material and impure limestone. They are in gently sloping to very steep foothills of the western highlands.

The Colrain soils are near the shallow Westminster, the moderately well drained Buckland, and the poorly drained and very poorly drained Cabot soils.

A typical Colrain soil that has been tilled has a surface layer of very dark grayish-brown fine sandy loam. It is about 8 inches thick and very crumbly. Underlying it is a subsoil of dark yellowish-brown fine sandy loam that extends to a depth of about 24 inches. The lower part of the subsoil contains a few dark reddish-brown fragments of partly decomposed limestone. The substratum is very dark grayish-brown gravelly sandy loam that contains many fragments of partly decomposed limestone.

Stones 12 to 24 inches in diameter are scattered throughout the Colrain soils and, in many places, on the surface. In some areas these soils contain boulders 2 to 5 feet in diameter.

The nonstony, less sloping areas of Colrain soils are well suited to apple orchards, silage corn, and alfalfa or clover hay.

Colrain fine sandy loam, 3 to 8 percent slopes (CsB).—This soil is well drained. It is in gently sloping foothills of the western highlands. Most of the stones have been removed from the surface of this soil. Included with it in mapping are some areas that have slopes of less than 3 percent.

This soil has moderately rapid to rapid permeability in the subsoil and has a fairly high moisture-holding capacity. It is well suited to apple orchards, silage corn, and alfalfa or clover hay. If this soil is used for cultivated crops, contour farming is needed, and on long slopes diversions, grass waterways, or stripcropping is needed to control sheet erosion. (Capability unit IIe–3; woodland suitability group 1)

Colrain fine sandy loam, 8 to 15 percent slopes (CsC).—This well-drained soil is in typical moderately sloping foothills of the western highlands. Most of the surface stones have been removed.

This soil has moderately rapid to rapid permeability in the subsoil and a high moisture-holding capacity. It is well suited to apple orchards, silage corn, and alfalfa or clover hay. Control of erosion is a problem on this soil because of the slope. Diversions, grass waterways, contour stripcropping, and winter cover crops are needed to protect the soil. Hayfields should be reseeded in alternate contour strips. (Capability unit IIIe–3; woodland suitability group 1)

Colrain fine sandy loam, 15 to 25 percent slopes (CsD).—This well-drained soil is in moderately steep foothills of the western highlands. Most of the surface stones have been removed. Included with this soil in mapping are some areas that have slopes steeper than 25 percent.

This soil is too steep for most cultivated crops. It is used mostly for hay and pasture, but a row crop is grown occasionally. Reseeding of hay or pasture should be done in alternate contour strips. (Capability unit IVe–8; woodland suitability group 1)

Colrain very stony fine sandy loam, 3 to 8 percent slopes (CvB).—This well-drained soil is in gently sloping foothills of the western highlands. In most areas it has a thinner, darker surface layer than is typical of the series. Stones 10 to 24 inches in diameter cover as much as 3 percent of the surface.

This soil has moderately rapid to rapid permeability in the subsoil and has a fairly high moisture-holding capacity. Stones limit its use to pasture and woodland. Removing the surface stones may be practical if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Colrain fine sandy loam, 3 to 8 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be so located that surface water does not collect in ruts and cause washouts. (Capability unit VIs–3; woodland suitability group 1)

Colrain very stony fine sandy loam, 8 to 15 percent slopes (CvC).—This soil is well drained. In most places it has a thinner, darker surface layer than is typical of the series. It occupies moderately sloping foothills of the western highlands. Stones cover as much as 3 percent of its surface.

This soil has moderately rapid to rapid permeability in the subsoil and a fairly high moisture-holding capacity. Stones on the surface limit its use to hay, pasture, and woodland. In some places it may be practical to remove the surface stones if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and

the same kind of management as Colrain fine sandy loam, 8 to 15 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be so located that surface water does not collect in wheel ruts and cause washouts. (Capability unit VIs–3; woodland suitability group 1)

Colrain very stony fine sandy loam, 15 to 25 percent slopes (CvD).—This soil is well drained. In most places it has a thinner, darker surface layer than the soil described for the series. It occurs in moderately steep foothills of the western highlands. Stones occupy as much as 3 percent of its surface.

This soil has moderately rapid to rapid permeability in the subsoil and a fairly high moisture-holding capacity. Moderately steep slopes and stones limit its use mostly to unimproved pasture and woodland, although some areas can be reseeded to improved pasture. Clearing the stones from this soil may be practical if more acreage is needed for improved hay and pasture. If it is cleared, this soil is suited to the same crops and the same kind of management as Colrain fine sandy loam, 15 to 25 percent slopes.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads and skidways should be so located and maintained that surface water does not collect on unprotected soil and cause gullies. Water bars are needed to divert water from some woodland roads and thus protect them from washout. (Capability unit VIs–3; woodland suitability group 1)

Colrain extremely stony fine sandy loam, 3 to 8 percent slopes (CxB).—This well-drained soil has a thinner, darker surface layer than the typical soil described. It is in gently sloping foothills of the western highlands. Stones 10 to 24 inches in diameter cover more than 3 percent of the surface.

This soil has moderately rapid to rapid permeability in the subsoil and a fairly high moisture-holding capacity. Because of stones, this soil is limited to unimproved pasture or woodland; its best use is for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be so located and maintained that surface water does not collect in ruts and cause gullies. Generally, it is not practical to clear this soil of stones and use it for crops. (Capability unit VIIs–2; woodland suitability group 2)

Colrain extremely stony fine sandy loam, 8 to 25 percent slopes (CxD).—This well-drained soil has a thinner, darker surface layer than the soil described for the series. It is in moderately sloping and moderately steep foothills of the western highlands. Stones cover more than 3 percent of its surface.

This soil has moderately rapid to rapid permeability in the subsoil and a fairly high moisture-holding capacity. Because of stones, this soil is limited to unimproved pasture or woodland; its best use is for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be located and maintained to prevent surface water from collecting in ruts and causing gullies. Generally, it is not practical to remove stones from this soil and use it for crops. (Capability unit VIIs–2; woodland suitability group 2)

Colrain extremely stony fine sandy loam, 25 to 50 percent slopes (CxF).—This well-drained soil has a thinner, darker surface layer than the soil described for the series. It is in steep and very steep foothills in the western highlands. Stones cover more than 3 percent of its surface. Included with this soil in mapping are a few areas where slopes are steeper than 50 percent.

This soil has moderately rapid to rapid permeability in the subsoil and a fairly high moisture-holding capacity. Steep and very steep slopes and surface stones limit the use of this soil to woodland, wildlife habitats, or recreational purposes. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Roads and trails used in logging should be carefully located and maintained to prevent gullying by runoff. Water bars are needed to divert water from most woodland roads and thus prevent washouts. (Capability unit VIIs–2; woodland suitability group 2)

Deerfield Series

The Deerfield series consists of moderately well drained loamy fine sands that formed in deep deposits of water-sorted sand. These soils are in depressions and low areas on terraces that border the major streams. They are nearly level and in a few places are gently sloping.

The Deerfield soils generally are near the excessively drained Windsor, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

Where the Deerfield soils are cultivated, the surface layer is crumbly, very dark grayish-brown loamy fine sand about 10 inches thick. The upper 2 inches of the subsoil is yellowish-brown loamy fine sand. The lower subsoil, from a depth of 12 to 28 inches, is light olive-brown loamy sand or fine sand and contains reddish-brown mottles. Below this is an olive loamy sand or sand substratum that contains strong-brown and light olive-brown mottles. The content of gravel is small.

In some areas the surface layer is a little finer or coarser textured than described here. The range of texture is from fine sandy loam to loamy sand.

Deerfield loamy fine sand, 0 to 3 percent slopes (DfA).—This nearly level soil is in depressions and low areas on stream terraces. Included with it in mapping are some areas that have slopes greater than 3 percent.

Water passes very readily through this soil except when it is saturated. A high water table makes it wet in the spring. The soil does not retain moisture, however, and it may be droughty during prolonged dry periods.

This soil is used extensively for corn, tobacco, and other cultivated crops, but drainage is needed to produce good yields. Surface drainage also is desirable to eliminate small wet spots in some fields used for row crops. Irrigation may be needed during long dry periods. Liberal applications of lime and fertilizer are necessary for favorable yields. Organic matter added in the form of manure or crop residue helps to maintain good tilth and to improve the moisture-holding capacity. The soil is suitable for hay and pasture without drainage. This soil is a good source of sand. (Capability unit IIIw–9; woodland suitability group 6)

Dutchess Series

The Dutchess series consists of well-drained silt loams that formed in loose glacial deposits derived mainly from dark-gray to black slate and phyllite. These soils are in gently sloping to very steep uplands in the towns of Bernardston and Leyden.

Most areas of Dutchess soils are near the shallow Nassau, the well-drained Bernardston, the moderately well drained Pittstown, and the poorly drained Stissing soils.

These soils are dull or dark colored, a feature derived from the parent material. They also contain a moderate amount of small flat chips of a dark, slaty kind of rock, as well as some fine and medium gravel. This coarse material makes up about 10 to 20 percent of the soil material.

A typical Dutchess soil that has not been cultivated has a 1- to 3-inch layer of loose and partly decomposed litter and twigs over a nearly black silt loam surface layer that is 2 or 3 inches thick. Underlying this is the silt loam subsoil that is brown or dark brown in the upper part, but the color fades to dark grayish brown in the lower part. The subsoil is crumbly when handled and extends to a depth of about 20 inches. Below this is the substratum, an olive-gray silt loam.

A typical Dutchess soil is extremely stony on the surface, and in some places stones 10 to 18 inches in diameter are only 10 to 15 feet apart. In places bedrock is 36 to 48 inches from the surface.

The Dutchess soils have moderate to moderately rapid permeability and a high moisture-holding capacity. They are not susceptible to drought during the summer. The nonstony, less sloping areas of these soils are well suited to silage corn and to alfalfa and other improved forage crops.

Dutchess silt loam, 3 to 8 percent slopes (DuB).—This well-drained soil is in gently sloping uplands in the towns of Bernardston and Leyden. It has a thicker, lighter colored surface layer than is typical of the series, and most of the surface stones have been removed.

This soil has a high moisture-holding capacity. It is not susceptible to drought during the summer. The soil is well suited to silage corn and to alfalfa and other improved forage crops. Long slopes should be stripcropped if they are used for cultivated crops. Diversions and grass waterways are needed in some areas to control surface water on cultivated fields. (Capability unit IIe–3; woodland suitability group 3)

Dutchess silt loam, 8 to 15 percent slopes (DuC).—This well-drained soil has a thicker, lighter colored surface layer than is typical of the series. It occurs in moderately sloping uplands in the towns of Bernardston and Leyden. Most of the surface stones have been removed.

This soil has a high moisture-holding capacity. It is not susceptible to drought during the summer. The soil is well suited to silage corn and to alfalfa and other improved forage crops. Controlling erosion is a problem because of the slopes. The soil should be stripcropped on the contour if it is used for cultivated crops, and during reseeding, all tillage should be done on the contour in alternate strips. Diversions and grass waterways are generally necessary to control surface water on cultivated fields and on some hayfields. (Capability unit IIIe–3; woodland suitability group 3)

Dutchess silt loam, 15 to 25 percent slopes (DuD).—This well-drained soil has a thicker, lighter colored surface layer than the typical Dutchess soil. It occurs in moderately steep uplands in the towns of Bernardston and Leyden. Most of the surface stones have been removed. Included with this soil in mapping are a few small areas that have slopes greater than 25 percent.

This soil has a high moisture-holding capacity. It is not susceptible to drought during the summer months. The soil is too steep to be used regularly for row crops; most of it is used for hay and pasture. This soil is subject to severe erosion, and all tillage and reseeding should be in alternate contour strips. These strips should be narrower than those on Dutchess silt loam, 8 to 15 percent slopes. Diversions and grass waterways are necessary in some places to control surface water. (Capability unit IVe–8; woodland suitability group 3)

Dutchess very stony silt loam, 3 to 15 percent slopes (DvC).—This well-drained soil occurs in gently sloping and moderately sloping uplands in the towns of Bernardston and Leyden. In places where this soil has been tilled, the surface layer is thicker than is typical of the series. Stones 10 to 20 inches in diameter are scattered 20 to 100 feet apart on the surface.

This soil has a high moisture-holding capacity. It is not susceptible to drought during the summer. Stones limit the use of this soil for row crops, but some areas can be reseeded to improved pasture. Clearing the stones from the surface may be practical if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Dutchess silt loam, 3 to 8 percent slopes or Dutchess silt loam, 8 to 15 percent slopes. (Capability unit VIs–3; woodland suitability group 3)

Dutchess very stony silt loam, 15 to 25 percent slopes (DvD).—This soil is well drained. It occurs in moderately steep uplands in the towns of Bernardston and Leyden. Surface stones 10 to 24 inches in diameter are 20 to 100 feet apart.

This soil has a high moisture-holding capacity. It is not susceptible to drought during the summer. Stones limit the use of this soil to pasture and woodland. Generally, it is not practical to clear the stones from this soil. If stones are removed, this soil is suited to the same kind of management as Dutchess silt loam, 15 to 25 percent slopes. Farm and woodland roads should be so located that they do not concentrate surface water and cause gullying. (Capability unit VIs–3; woodland suitability group 3)

Dutchess extremely stony silt loam, 8 to 25 percent slopes (DxD).—This soil is well drained. It occurs in moderately sloping and moderately steep uplands in the towns of Bernardston and Leyden. Surface stones 10 to 24 inches in diameter are 2 to 10 feet apart. Included with this soil in mapping are some areas that have slopes less than 8 percent.

This soil has a high moisture-holding capacity. Stones limit the use of this soil to unimproved pasture or to woodland. It is best used for woodland, as removing the surface stones is not practical in most areas.

Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Access roads and skidroads should be so located that they do not concentrate surface water and cause gullying. Water

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bars are needed to divert water from some woodland roads and thus prevent washouts. (Capability unit VIIs–2; woodland suitability group 4)

Dutchess extremely stony silt loam, 25 to 55 percent slopes (DxF).—This soil is well drained. It occurs in steep and very steep uplands in the towns of Bernardston and Leyden. Stones 10 to 24 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some small steep areas that are less stony.

This soil has moderate to slow permeability. It is suited to woodland, but it is so steep that extreme care must be taken to control erosion during and after logging. Northern hardwoods, upland oaks, red pine, and white pine produce fair to good yields of timber, but careful planning and special equipment are necessary to harvest the timber on much of this soil. All access roads and skidroads should be carefully planned, protected, and maintained to prevent gullying. (Capability unit VIIs–2; woodland suitability group 4).

Essex Series

The Essex series consists of well-drained fine sandy loams that formed in compact glacial deposits derived mainly from granite and gneiss. These soils have a hard layer at a depth of about 24 inches that is hard to dig with a spade. They are in gently sloping to very steep uplands east of the Connecticut River.

These soils are near the shallow Shapleigh, the well-drained Gloucester, the moderately well drained Scituate, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Essex soil that has been cultivated has a crumbly, dark-brown or very dark grayish-brown fine sandy loam surface layer about 7 inches thick. The subsoil is dark yellowish-brown fine sandy loam that is lighter in color and coarser in texture with increasing depth. The lower subsoil is yellowish-brown coarse sandy loam or loamy sand. Below a depth of 24 inches, the olive-gray gravelly loamy sand substratum is very firm.

The Essex soils are very stony to extremely stony on the surface. Stones 10 to 24 inches in diameter are only 5 to 10 feet apart on the surface in some places and are common throughout the soil. Boulders 2 to 5 feet in diameter are also common on the surface.

In some areas the surface layer has a little finer or coarser texture than is typical. The texture ranges from loam to sandy loam.

Water readily passes through the surface layer and subsoil. The permeability of the substratum is moderately slow to slow. Essex soils remain wet during the spring and dry out later than similar soils that do not have the firm substratum. Except for an occasional wet spot, they do not have to be artificially drained. The nonstony, less sloping areas of these soils are suited to dairy farming and to orchards.

Essex fine sandy loam, 3 to 8 percent slopes (EfB).—This soil is well drained. It occurs in gently sloping uplands east of the Connecticut River. Most of the surface stones have been removed, but in some areas there are a few surface stones 10 to 24 inches in diameter. Included are some areas that have slopes of less than 3 percent.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. This soil remains wet during early spring and dries out later than a similar soil that does not have the firm substratum. This soil is best suited to dairy farming and to orchards. Except for an occasional wet spot, the soil does not have to be artificially drained. It is subject to erosion, however, especially on long slopes that are used for row crops. On long slopes diversions, grass waterways, or stripcropping are necessary to control erosion. All tillage and reseeding should be on the contour. During dry periods irrigation may be necessary for maximum yields. (Capabality unit IIe–2; woodland suitability group 6)

Essex fine sandy loam, 8 to 15 percent slopes (EfC).—This well-drained soil occurs in moderately sloping uplands east of the Connecticut River. Only an occasional stone is on the surface.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. This soil remains wet during the spring and dries out later than a similar soil that does not have the compact substratum. The soil is best suited to dairy farming and to orchards. Controlling runoff and the resulting erosion is the major problem in using this soil for crops. In some areas diversions, grass waterways, and contour stripcropping, alone or in combination, are needed to control runoff. Reseeding should be done in alternate contour strips. (Capability unit IIIe–2; woodland suitability group 6)

Essex fine sandy loam, 15 to 25 percent slopes (EfD).—This soil is well drained. It occurs in moderately steep uplands east of the Connecticut River. Only an occasional stone is on the surface.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. This soil is not generally used for row crops. Most of it is used for hay and pasture. Hayfields and pastures should be reseeded in alternate contour strips to control erosion. If used for row crops, diversions, grass waterways, and strips on diversion grades are needed in some places to control surface water. Grazing should be carefully regulated to prevent the loss of the protective vegetation. Wherever possible this soil should be limed and fertilized liberally to maintain a vigorous sod. (Capability unit IVe–2; woodland suitability group 6)

Essex very stony fine sandy loam, 3 to 8 percent slopes (EvB).—This soil is well drained. In most places it has a thinner, darker surface layer than the typical soil described. It occurs in gently sloping uplands east of the Connecticut River. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

Water readily passes through the surface layer and subsoil, but slowly through the substratum. This soil remains wet during the first part of spring. It dries out later than a similar soil that does not have the compact substratum. Stones interfere with tillage. Therefore, this soil is used mostly for pasture or woodland. Removing the surface stones generally is practical if more acreage is needed for row crops. If stones are removed, the soil is suited to the same crops and the same kind of management as Essex fine sandy loam, 3 to 8 percent slopes. (Capability unit VIs–2; woodland suitability group 6)

Essex very stony fine sandy loam, 8 to 15 percent slopes (EvC).—This soil is well drained. In most places it has a thinner, darker surface layer than the typical soil described. It occurs in sloping uplands east of the

Connecticut River. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

Water passes readily through the surface layer and the subsoil, but slowly through the substratum. This soil remains wet during the first part of spring. It dries out later than a similar soil that does not have a compact substratum. Stones interfere with tillage. This soil is used mostly for pasture or for woodland. Sometimes it is practical to remove the stones if more acreage is needed for crops. If they are removed, this soil is suited to the same crops and the same kind of management as Essex fine sandy loam, 8 to 15 percent slopes. (Capability unit VIs–2; woodland suitability group 6)

Essex very stony fine sandy loam, 15 to 25 percent slopes (EvD).—This well-drained soil has a thinner, darker surface layer than the typical soil described. It occurs in moderately steep uplands east of the Connecticut River. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. Although it may be possible to remove the stones from the surface, this soil is more commonly used for pasture or woodland. If surface stones are removed, the soil is suited to the same kind of crops and management as Essex fine sandy loam, 15 to 25 percent slopes. Farm and woodland roads should be so located and protected that they do not collect surface water and cause gullying. (Capability unit VIs–2; woodland suitability group 6)

Essex extremely stony fine sandy loam, 3 to 8 percent slopes (ExB).—This well-drained soil has a thinner, darker surface layer than the soil described for the series. It occurs in gently sloping uplands east of the Connecticut River. Stones 10 to 24 inches in diameter are scattered 5 to 10 feet apart on the surface.

Water readily passes through the surface layer and subsoil, but slowly through the substratum. Extreme stoniness limits the use of this soil to unimproved pasture or to woodland. Removing the stones generally is not practical.

Upland oaks, northern hardwoods, red pine, and white pine produce fairly good yields of timber on this soil. Access roads and skidroads should be so located that they do not concentrate runoff and cause gullying. (Capability unit VIIs–2; woodland suitability group 4)

Essex extremely stony fine sandy loam, 8 to 25 percent slopes (ExC).—This well-drained soil has a thinner, darker surface layer than the soil described for the series. It occurs in moderately sloping and moderately steep uplands east of the Connecticut River. Stones 10 to 24 inches in diameter are scattered 5 to 10 feet apart on the surface.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. This soil is used mainly for grazing or woodland. Generally it is not practical to remove the stones.

Upland oaks, northern hardwoods, red pine, and white pine produce fairly good yields of timber on this soil. Erosion of woodland roads and skidways is the major problem. These roads should be carefully located and maintained. Water bars are necessary in many places to divert water from the roads and thereby prevent gullying. (Capability unit VIIs–2; woodland suitability group 4)

Essex extremely stony fine sandy loam, 25 to 45 percent slopes (ExE).—This well-drained soil occurs in steep and very steep uplands east of the Connecticut River. It has a thinner, darker surface layer than the typical soil described. Stones 10 to 24 inches in diameter are scattered 5 to 10 feet apart on the surface.

Water passes readily through the surface layer and subsoil, but slowly through the substratum. This soil is used mainly for woodland. Upland oaks, northern hardwoods, white pine, and red pine produce fairly good yields of timber on this soil, but in many areas careful planning and special equipment are necessary to harvest the crop. The steep slopes erode readily if the surface cover is destroyed. Skidroads and access roads must be carefully planned, protected, and maintained so that they do not concentrate surface water and cause washouts. (Capability unit VIIs–2; woodland suitability group 4)

Gloucester Series

The Gloucester series consists of well-drained, slightly droughty fine sandy loams and sandy loams that formed in loose glacial deposits derived from granite, gneiss, and quartzite. They are in nearly level to very steep uplands east of the Connecticut River.

These soils are near the shallow Shapleigh, the well-drained Essex, the moderately well drained Scituate, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Gloucester soil in a forested area that has never been cultivated has a half-inch or 2-inch layer of loose, partly decomposed litter over a surface layer of very dark grayish-brown, sandy loam about 4 inches thick. The subsoil is strong-brown sandy loam to a depth of about 15 inches; below this it is yellowish-brown, loamy, gravelly, coarse sand to a depth of about 23 inches. The substratum is light brownish-gray or light-gray loamy sand to coarse sand. In places it is firm or compact at a depth of 3 to 5 feet. Stones 10 to 18 inches in diameter are common throughout the soil.

A typical Gloucester soil is extremely stony on the surface. In some places stones 10 to 24 inches in diameter are only 5 to 10 feet apart. Boulders 2 to 5 feet in diameter are also common on the surface. In some areas the surface layer and upper subsoil have a slightly finer or coarser texture than is typical of the series. The texture ranges from fine sandy loam to loamy sand. The texture in the lower subsoil and in the substratum ranges from coarse sandy loam to sand.

These soils have moderately rapid to rapid permeability, and the rate of infiltration is rapid. Their moisture-holding capacity is moderate to low, and they are droughty during prolonged dry periods. Permeability of the firm substratum, where it occurs, is moderately slow to slow.

Gloucester fine sandy loam, 0 to 3 percent slopes (GfA).—This is a nearly level, somewhat excessively drained soil in uplands east of the Connecticut River. It is underlain by stony loamy sand or stony sandy till. The surface layer and upper subsoil are fine sandy loam rather than sandy loam, which is typical of the series. In most places the surface layer is thicker than typical, and in these areas most of the stones have been removed from

the surface. The lower subsoil is coarse sandy loam in some places.

Droughtiness is a problem. This soil has only a fair moisture-holding capacity in the upper part. Therefore, irrigation is needed during long, dry periods. The soil is suitable for most row crops and for forage crops. It is also suitable for orchards where there is adequate air drainage. Fertility can best be maintained by frequent light applications of fertilizer and lime. Organic matter can be maintained by applying manure or plowing down green-manure crops or crop residue. (Capability unit I–5; woodland suitability group 6)

Gloucester fine sandy loam, 3 to 8 percent slopes (GfB).—This gently sloping, somewhat excessively drained soil occurs in the uplands east of the Connecticut River. It is underlain by stony loamy sand or stony, sandy till. The surface layer and upper subsoil are fine sandy loam rather than sandy loam, which is typical of the series. Also, in most places the surface layer is thicker than is typical, and in these, most of the surface stones have been removed. The lower subsoil is coarse sandy loam in some places.

Droughtiness is a problem, because this soil has only a fair moisture-holding capacity in the upper part. Irrigation is needed during dry periods. The soil is suitable for most row crops and for forage crops. Where the air drainage is sufficient, the soil is suitable for orchards. If row crops are grown on the longer slopes, erosion is a hazard. Fertility can best be maintained by frequent light applications of fertilizer and lime. Organic matter can be maintained by applying manure or plowing down green-manure crops or crop residue. (Capability unit IIe–3; woodland suitability group 6)

Gloucester fine sandy loam, 8 to 15 percent slopes (GfC).—This moderately sloping, somewhat excessively drained soil is underlain by stony loamy sand or stony, sandy till. It occurs in the uplands east of the Connecticut River. This soil is similar to the soil described for the series, but it has a fine sandy loam surface layer and upper subsoil. In most places the surface layer is thicker than typical and most of the surface stones have been removed. Also, the lower subsoil is coarse sandy loam in some places.

In the upper part of this soil, the moisture-holding capacity is only fair, and irrigation is needed during dry periods. This soil is suitable for most row crops, for forage crops, and for orchards. Erosion is the major problem. Tillage and reseeding should be on the contour and in alternate strips. Diversions, grass waterways, or contour stripcropping are necessary in some places to control surface water. Fertility can best be maintained by frequent light applications of fertilizer and lime. Organic matter can be maintained by applying manure or plowing down green-manure crops or crop residue. (Capability unit IIIe–3; woodland suitability group 6)

Gloucester fine sandy loam, 15 to 25 percent slopes (GfD).—This moderately steep, somewhat excessively drained soil occurs in the uplands east of the Connecticut River. It is underlain by stony loamy sand or stony, sandy till. This soil is similar to the soil described for the series, but it has a fine sandy loam surface layer and upper subsoil, and in most places the surface layer is thicker. Most of the surface stones have been removed. The lower subsoil is coarse sandy loam in some places.

Steepness limits the use of this soil mainly to hay and pasture, but a cultivated crop can be grown occasionally. Reseeding should be done on the contour and in alternate strips. Fertility can best be maintained by frequent light applications of fertilizer and lime. (Capability unit IVe–8; woodland suitability group 6)

Gloucester sandy loam, 3 to 8 percent slopes (GmB).—This somewhat excessively drained soil is in the gently sloping uplands east of the Connecticut River. It is typical of the series, except that the surface layer is thicker in most places. Most of the surface stones have been removed.

Droughtiness is the major problem. Without irrigation, the soil is best suited to deep-rooted, drought-resistant crops. If irrigated, however, it is suited to forage crops and most row crops. Fertility can best be maintained by frequent light applications of fertilizer and lime. Organic matter can be maintained by applying manure and plowing down green-manure crops and crop residue.

Turf is difficult to establish and maintain on this sandy soil. (Capability unit IIs–8; woodland suitability group 6)

Gloucester sandy loam, 8 to 15 percent slopes (GmC).—This soil is somewhat excessively drained. It occurs in moderately sloping uplands east of the Connecticut River. This soil is typical of the series, though it has a thicker surface layer in most places. Most of the surface stones have been removed.

Droughtiness is the major problem. If irrigated, this soil is suited to most row crops and to forage crops. If it is not irrigated, it is best suited to deep-rooted, drought-resistant crops. Diversions, grass waterways, and contour stripcropping are generally needed if these soils are used for row crops. Lime and fertilizer are best applied frequently in small amounts. Organic matter can be maintained by applying manure and plowing down green-manure crops and crop residue. Much of this soil is in woodland. (Capability unit IIIe–3; woodland suitability group 6)

Gloucester sandy loam, 15 to 25 percent slopes (GmD).—This somewhat excessively drained soil occurs in moderately steep uplands east of the Connecticut River. In most places it has a thicker surface layer than the typical soil described. Most of the surface stones have been removed.

This soil erodes readily and is too steep to be used regularly for row crops. Adequate vegetation must be maintained on hayfields and pastures to prevent washing. Most of this soil is forested. (Capability unit IVe–8; woodland suitability group 6)

Gloucester very stony sandy loam, 3 to 8 percent slopes (GvB).—This somewhat excessively drained soil occurs in gently sloping areas east of the Connecticut River. Stones 10 to 24 inches in diameter are 10 to 80 feet apart on the surface. In some places it has a thicker surface layer than the soil described for the series. Included with this soil in mapping are some areas that have slopes less than 3 percent and some areas that have a fine sandy loam surface layer and upper subsoil.

Surface stones limit the use of this soil to pasture or woodland. Removing the surface stones is practical in some places if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Gloucester sandy loam, 3 to 8

percent slopes. (Capability unit VIs-3; woodland suitability group 6)

Gloucester very stony sandy loam, 8 to 15 percent slopes (GvC).—This somewhat excessively drained soil occurs in moderately sloping areas east of the Connecticut River. Stones 10 to 24 inches in diameter are 10 to 80 feet apart on the surface. In some places this soil has a thicker surface layer than the soil described for the series. Included with this soil in mapping are some areas that have a fine sandy loam surface layer and upper subsoil.

Surface stones limit the use of this soil to pasture or woodland. Removing the surface stones may be practical in some places if more acreage is needed for crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Gloucester sandy loam, 8 to 15 percent slopes. (Capability unit VIs-3; woodland suitability group 6)

Gloucester very stony sandy loam, 15 to 25 percent slopes (GvD).—This somewhat excessively drained soil is in moderately steep uplands east of the Connecticut River. Stones 10 to 24 inches in diameter are 10 to 80 feet apart on the surface. Included with this soil in mapping are some areas that have a fine sandy loam surface soil and upper subsoil.

Most of this soil is used for woodland. Small areas have been cleared and are used mainly for pasture. Farm and woodland roads should be carefully located and protected so that they do not collect surface water and cause gullying. (Capability unit VIs-3; woodland suitability group 6)

Gloucester extremely stony sandy loam, 3 to 8 percent slopes (GxB).—This soil is somewhat excessively drained. It occurs in gently sloping areas east of the Connecticut River. Stones 10 to 24 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have a fine sandy loam surface layer and upper subsoil.

Surface stones limit the use of this soil to woodland or unimproved pasture. Generally, it is not practical to remove the stones from this soil. Upland oaks, red pine, and white pine produce fair yields of timber on this soil. Access roads and skidroads should be so located that they do not concentrate runoff and cause gullying. (Capability unit VIIs-2; woodland suitability group 4)

Gloucester extremely stony sandy loam, 8 to 25 percent slopes (GxC).—This somewhat excessively drained soil occurs in moderately sloping and moderately steep areas east of the Connecticut River. Stones 10 to 24 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have a fine sandy loam surface layer and upper subsoil.

Surface stones limit the use of this soil to woodland and unimproved pasture. Removing the stones generally is not practical. Upland oaks, red pine, and white pine produce fair yields of timber on this soil. Access roads and skidroads should be so located that they do not concentrate runoff and cause gullying. (Capability unit VIIs-2; woodland suitability group 4)

Gloucester extremely stony sandy loam, 25 to 45 percent slopes (GxE).—This soil is somewhat excessively drained. It occurs in steep and very steep areas east of the Connecticut River. Stones 10 to 24 inches in diameter are 2 to 10 feet apart on the surface. Included with this soil in mapping are some areas that have a fine sandy loam surface layer and upper subsoil. Also included are some areas where slopes are steeper than 45 percent.

Steep slopes and surface stones limit the use of this soil to woodland. Upland oaks, red pine, and white pine produce fair yields of timber on this soil, but in some places harvesting the trees requires careful planning and special equipment. The hazard of erosion is very severe if the vegetation is removed. Extreme care must be taken to protect this soil from gully erosion caused by the surface water that collects in skidroads and access roads. (Capability unit VIIs-2; woodland suitability group 4)

Hadley Series

The Hadley series consists of well-drained very fine sandy loams and silt loams that formed in deep deposits of recent alluvial sediments. These soils occur on bottom lands along the larger, slower rivers and streams. Most areas of these soils are seldom damaged by floods, but some of the lower areas are flooded at least once a year.

Most Hadley soils are nearly level or gently sloping, but they have steeper slopes or escarpments between different levels of the bottom land and along the rivers or streams.

Most areas of the Hadley soils are near the moderately well drained Winooski, the poorly drained Limerick, and the very poorly drained Saco soils. Some areas are near the well-drained Agawam and the excessively drained Windsor soils.

A typical, cultivated Hadley soil has a very dark grayish-brown very fine sandy loam surface layer about 12 inches thick. It crumbles easily when handled. Below this is a dark grayish-brown to olive very fine sandy loam or silt loam.

In some areas the texture throughout the profile is a little coarser or finer than described here. The range is from very fine sandy loam to silt loam. The texture may be uniform throughout the profile, or the substratum may consist of stratified very fine sandy loam, loamy very fine sand, and silt loam. In some areas there is a compact layer about 4 inches thick just below the surface layer. This layer has been compacted by continuous use of heavy machinery.

The Hadley soils warm fairly early in the spring and are easily worked. They are moderately permeable and have a high moisture-holding capacity. These soils are used extensively and are cultivated continuously. They are suitable for tobacco (fig. 6), corn, forage crops, and all truck crops commonly grown in the county. Liberal applications of lime and fertilizer are needed to produce favorable yields. Organic matter in the form of manure or crop residue should be used to maintain good tilth. Irrigation may be necessary to obtain the best yields of truck crops. There is some risk of erosion, especially on gentle slopes and along the banks of streams and rivers.

Hadley silt loam, 0 to 3 percent slopes (HaA).—This nearly level, well-drained soil is underlain by deep alluvial deposits of very fine sand and silt. It occurs in large areas on bottom lands along the larger, slower moving rivers and streams. The surface layer and upper subsoil are silt loam. The lower subsoil and substratum may range from silt loam to loamy very fine sand. This soil is seldom damaged by floods. Included with it in mapping are some adjoining steep streambanks and short steep breaks between levels of bottom land.

Figure 6.—**Field tobacco growing on Hadley soil.**

This soil warms fairly early in the spring and is easily worked. It is moderately permeable and has a high moisture-holding capacity. Runoff is slow. This soil is used intensively. It is suited to tobacco, corn, forage crops, and all truck crops grown in the county. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation may be necessary to obtain maximum yields of truck crops. The hazard of erosion is severe on the adjoining steep banks, which should be protected from runoff. This soil is a good source of topsoil. (Capability unit I–6; woodland suitability group 3)

Hadley silt loam, 3 to 8 percent slopes (HaB).—This gently sloping, well-drained soil is underlain by deep alluvial deposits of very fine sand and silt. It occurs on bottom lands along the larger, slower moving rivers and streams. The surface layer and upper subsoil are silt loam. The lower subsoil and substratum range from silt loam to loamy very fine sand. This soil is seldom damaged by flooding. Included with it in mapping are some steep areas, mostly along streams or old erosion channels.

This soil warms fairly early in the spring and is easily worked. It is moderately permeable and has a high moisture-holding capacity. Runoff is moderate. This soil is used intensively. It is suited to tobacco, corn, forage crops, and all truck crops grown in the county. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation may be necessary to obtain maximum yields of truck crops. This soil is likely to erode. In some places the row crops should be grown on the contour to control runoff and erosion. Adjoining streambanks and steep breaks between levels of this soil should also be protected from runoff. This soil is a good source of topsoil. (Capability unit IIe–6; woodland suitability group 3)

Hadley very fine sandy loam, 0 to 3 percent slopes (HbA).—This soil is well drained. It occurs on nearly level bottom lands along the larger, slower moving rivers and streams. Most areas are large. The texture of the surface layer and underlying material ranges from loamy very fine sand to silt loam. This soil is seldom damaged by flooding. Included with it in mapping are some steep areas, mostly along streams or old erosion channels.

This soil warms fairly early in the spring and is easily worked. It is moderately permeable and has a high moisture-holding capacity. Runoff is slow. This soil is used intensively. It is suited to tobacco, silage corn, forage crops, and all truck crops grown in the county. Lime and fertilizer, in liberal amounts, are required to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation is often necessary to obtain maximum yields of truck crops. Erosion is likely to be severe on the steep banks next to this soil, and they should be protected from runoff. This soil is a good source of topsoil. (Capability unit I–6; woodland suitability group 3)

Hadley very fine sandy loam, 3 to 8 percent slopes (HbB).—This well-drained soil occurs on gently sloping bottom lands along the larger, slow-flowing rivers and streams. The texture of the surface layer and underlying material ranges from loamy very fine sand to silt loam. This soil is seldom damaged by floods. Included with this soil in mapping are some steep areas, mainly along streams or old erosion channels.

This soil warms fairly early in the spring, and is easily worked. It is moderately permeable and has a high moisture-holding capacity. Runoff is moderate. This soil is used intensively. It is suited to tobacco, silage corn, forage crops, and all truck crops grown in the county. Lime and fertilizer are required in liberal amounts to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation is often necessary to obtain best yields of truck crops. This soil is likely to erode, and in some areas the row crops should be grown on the contour to control runoff and erosion. Adjoining streambanks and escarpments also should be protected from runoff. (Capability unit IIe–6; woodland suitability group 3)

Hadley very fine sandy loam, overflow, 0 to 3 percent slopes (HcA).—This nearly level soil is well drained. It occurs on the lower bottom land along the larger, slower moving rivers and streams. The surface layer and upper part of the underlying material are generally very fine sandy loam, but in some places they are silt loam. Below this the texture may range from loamy very fine sand to silt loam. This soil is subject to frequent flooding. Flooding usually occurs in the spring when the snow melts in the surrounding hills, but occasionally a heavy rain or a hurricane causes flooding late in summer or early in fall. Included with this soil in mapping are some areas that have steeper slopes, mostly along streams or old erosion channels.

This soil is suited to most truck crops if they can be grown after the spring floods. It is also suited to hay and pasture. It is moderately permeable and has a high moisture-holding capacity. Runoff is slow. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Organic matter in the form of manure or crop residue should be used to maintain good tilth. If possible, this soil should be protected by a cover crop during periods of flooding. The risk of erosion is severe on the steep banks adjoining this soil, and they should be protected from runoff. (Capability unit IIw–61; woodland suitability group 3)

Hartland Series

The Hartland series consists of well-drained silt loams and very fine sandy loams that formed in lacustrine deposits of stratified very fine sand and silt. These soils are in the Connecticut Valley lowlands. They are nearly level to steep.

The Hartland soils are near the moderately well drained Belgrade and the poorly drained Raynham soils. Some areas are near the well-drained Agawam and Agawam, silty substratum soils.

A typical profile of Hartland silt loam that has been cultivated has a very dark grayish-brown to olive-brown silt loam surface layer about 9 inches thick. This layer crumbles readily when handled. The subsoil is olive-brown to olive silt loam that is quite dense. It extends to a depth of about 20 inches. Underlying this is an olive or light olive-brown substratum that consists of stratified silt and very fine sand.

The texture of the surface layer and subsoil generally is silt loam, but in some areas it is very fine sandy loam. Generally, in areas that are cultivated continuously there is a plowpan 3 to 5 inches thick just below the surface layer. These soils contain little or no material coarser than very fine sand. There may be very thin layers of clay in the substratum. Sheet erosion is moderate in sloping cultivated areas. The soil material removed by erosion has collected at the foot of some of the slopes. Consequently, the depth to the stratified silt and very fine sand may vary.

The Hartland soils warm fairly early in the spring and are easily worked. The risk of sheet erosion on cultivated areas is very high. These soils are moderately permeable in the surface layer and subsoil but moderately slowly permeable in the substratum. They hold moisture well and are used extensively for truck crops, corn, and forage crops. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. A cover crop should be maintained on these soils during as much of the year as possible to reduce the hazard of erosion by water or wind.

Hartland silt loam, 0 to 3 percent slopes (HdA).—This soil is well drained. It occurs on nearly level lowlands in the Connecticut Valley. In some places this soil has a thicker surface layer than is typical of the series and is therefore deeper to the stratified very fine sand and silt.

This soil is used extensively for corn, truck crops, and forage crops. Organic matter in the form of manure or crop residue helps to maintain good tilth. This soil holds moisture well and produces high yields if properly limed and fertilized. (Capability unit I–6; woodland suitability group 3)

Hartland silt loam, 3 to 8 percent slopes (HdB).—This soil is well drained. It occurs on gently sloping lowlands in the Connecticut Valley.

This soil is suited to corn, truck crops, and forage crops. It holds moisture well, and produces good yield if prop-

erly limed and fertilized. Where long slopes occur, tillage and reseeding should be on the contour to protect this soil from erosion. In some areas cropland terraces or diversions are also needed to control runoff and erosion. (Capability unit IIe–4; woodland suitability group 3)

Hartland silt loam, 8 to 15 percent slopes (HdC).—This well-drained soil is in moderately sloping lowlands of the Connecticut Valley.

The soil is suited to corn, truck crops, and forage crops. It is subject to severe erosion, however, because of the combination of moderate slopes, excessive runoff, and silt texture. If the soil is used for row crops, erosion can be controlled by diversions, grass waterways, and stripcropping. (Capability unit IIIe–4; woodland suitability group 3)

Hartland silt loam, 15 to 35 percent slopes (HdD).—This well-drained soil occurs in moderately steep and steep lowlands of the Connecticut Valley. It has a thinner surface layer than is typical of the series. Included with this soil in mapping are some steeper areas, mostly on the sides of old erosion channels.

Because of the slope, the hazard of erosion is great if the soil is used for cultivated crops. It is suited to hay, pasture, or woodland. Reseeding in alternate contour strips wherever possible helps to control erosion. Keeping the soil in sod as much as possible also reduces the hazard of erosion. (Capability unit VIe–4; woodland suitability group 3)

Hinckley Series

The Hinckley series consists of excessively drained, shallow gravelly soils that developed in stratified sand and gravel. The sand and gravel were derived mainly from granite, gneiss, and quartzite in varying proportions. These soils are on nearly level to steep kames, eskers, and glacial outwash terraces. The Hinckley soils are generally near the excessively drained Windsor, the somewhat excessively drained Merrimac, the moderately well drained Deerfield and Sudbury, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

Many areas of Hinckley soils that were formerly cultivated or in pasture have been abandoned and are now in forest. A typical Hinckley soil that has been used in this sequence has a dark-brown sandy loam surface layer about 5 inches thick. The subsoil is dark yellowish-brown gravelly sandy loam that fades in color and is coarser with depth. This layer extends to a depth of about 16 inches. Beneath the subsoil is the substratum, which is light olive-brown, coarsely stratified sand, gravel, and cobbles.

In some areas the surface layer and upper subsoil are a little finer or coarser in texture. The range in texture is from gravelly very fine sandy loam to loamy sand. The depth to the layer of stratified sand, gravel, and cobbles ranges from 12 to 24 inches. Gravel and cobbles generally make up about 10 to 25 percent of the surface layer and 25 to 75 percent of the other layers.

These soils are droughty. The moisture-holding capacity is low. Some areas are used for crops, but yields usually are low unless the soils are irrigated. These soils are fairly well suited to alfalfa. They are rapidly permeable, and plant nutrients leach out rapidly. Therefore, frequent light applications of lime and fertilizer are necessary to obtain good yields. Liberal amounts of organic matter in the form of manure or crop residue should be plowed down.

Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes (HgA).—This droughty soil is underlain by stratified sand, gravel, and cobbles. It occurs in nearly level areas, mainly on the high terrace in the southeastern part of the town of Sunderland. Except for the surface layer and upper subsoil, this soil is typical of the series. The surface layer and upper subsoil, to a depth of 8 to 12 inches, are gravelly very fine sandy loam. In places the surface layer is thicker than is typical.

This soil has rapid permeability and a low moisture-holding capacity; but the surface layer retains enough moisture for some early truck crops without irrigation. Irrigation is necessary in most years to obtain good yields of late-maturing row crops or forage crops. (Capability unit IIIs–9; woodland suitability group 8)

Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes (HgB).—This droughty soil is underlain by stratified sand, gravel, and cobbles at a depth of 18 inches or less. Most of it occurs on the gently sloping high terrace in the southeastern part of Sunderland. The surface layer and subsoil, to a depth of 8 to 12 inches, are gravelly fine sandy loam. The surface layer, in places, is thicker than typical. With these exceptions, the soil is similar to the one described for the series.

This soil is rapidly permeable and has a low moisture-holding capacity. Nevertheless, the very fine sandy loam in the upper layers retains enough moisture to produce some early truck crops without irrigation. Irrigation is necessary in most years to obtain good yields of late truck crops and forage crops. (Capability unit IIIs–9; woodland suitability group 8)

Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes (HgC).—This droughty soil is underlain by stratified sand, gravel, and cobbles. It occurs in moderately sloping areas, mainly on the high terrace in the southeastern part of the town of Sunderland. The surface layer is gravelly very fine sandy loam and may contain some cobbles. Otherwise, this soil is typical of the series.

This soil has rapid permeability and low moisture-holding capacity. It is also droughty and sloping. Therefore, cultivating it regularly is impractical. It is suitable for occasional cultivation, and for hay or pasture if deep-rooted plants are used. Irrigation is necessary to obtain favorable yields of crops. (Capability unit IVs–9; woodland suitability group 8)

Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes (HgD).—This droughty soil is underlain by stratified sand, gravel, and cobbles. It occurs in moderately steep areas, mainly on the edge of the high terrace in the southeastern part of the town of Sunderland. The surface layer is gravelly very fine sandy loam. It may contain some cobbles, and it is only 3 to 5 inches thick. Otherwise, it is similar to the soil described for the series. Included with this soil in mapping are some areas that have slopes steeper than 25 percent.

This soil is droughty and is too steep for cultivated crops. It is subject to erosion and should be protected by sod or by trees or shrubs. It is best used for woodland or wildlife habitats. (Capability unit VIs–9; woodland suitability group 8)

Hinckley sandy loam, 0 to 3 percent slopes (HkA).—This droughty soil occurs in nearly level areas on terraces. It is similar to the soil described for the series, but most areas are a little deeper to the coarse material, and the surface texture ranges from fine sandy loam to loamy sand and may be gravelly in places.

This soil has rapid permeability and low moisture-holding capacity. Because of droughtiness, this soil is poorly suited to general crops, hay, or pasture unless it is irrigated. Without irrigation it is best suited for use as woodland or wildlife habitats. (Capability unit IIIs–9; woodland suitability group 8)

Hinckley sandy loam, 3 to 8 percent slopes (HkB).—This droughty soil occurs on gently sloping terraces, kames, and eskers in the valleys. The texture of the surface layer ranges from fine sandy loam to loamy sand and may be gravelly in places.

This soil is rapidly permeable and has a low moisture-holding capacity. Because of droughtiness, the soil is poorly suited to general crops, hay, or pasture unless it is irrigated. This soil is best suited as woodland or wildlife habitats. (Capability unit IIIs–9; woodland suitability group 8)

Hinckley sandy loam, 8 to 15 percent slopes (HkC).—This droughty soil occurs on moderately sloping terraces, kames, and eskers in the valleys. The texture of the surface layer ranges from fine sandy loam to loamy sand and may be gravelly in places.

This soil has rapid permeability, rapid infiltration, and a low moisture-holding capacity. The degree of slope subjects unprotected areas to some erosion, even though this soil absorbs water readily. Because of irregular slopes, droughtiness, and the risk of erosion, this soil is poorly suited to general crops, hay, or pasture unless it is irrigated. It is better suited as woodland or wildlife habitats. (Capability unit IVs–9; woodland suitability group 8)

Hinckley sandy loam, 15 to 35 percent slopes (HkD).—This droughty soil is on terrace escarpments, on moderately steep and steep kames and eskers, or on the sides of old erosion channels that dissect terraces in the valleys. The surface layer is thinner than is typical, and the texture ranges from fine sandy loam to loamy sand. Included with this soil in mapping are some areas that have slopes steeper than 35 percent and are gravelly in places.

This soil has rapid permeability and rapid infiltration. The moisture-holding capacity is low. Because of steep slopes and droughtiness, the soil is not suitable for cultivation. It is subject to erosion and should be protected by a good sod or by trees or shrubs. It is best used for woodland or for wildlife. (Capability unit VIs–9; woodland suitability group 8)

Hollis Series

The Hollis soils are somewhat excessively drained, shallow, fine sandy loams underlain by bedrock. They formed in a thin layer of glacial material derived mainly from granite, gneiss, and schist. These soils are in gently sloping to very steep areas in the north-central part of the county.

The Hollis soils are near the deep, well-drained Charlton, the moderately well drained Sutton, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Hollis soil that has not been tilled has a very thin, crumbly, very dark brown fine sandy loam surface layer that is only 1 to 2 inches thick. This is covered by 1 to 2 inches of forest litter in various stages of decomposition. The subsoil is dark yellowish-brown gravelly fine sandy loam that extends to a depth of about 16 inches and is paler in color with increasing depth. Below the subsoil is the bedrock, generally granitic gneiss or schist. Outcrops of bedrock are from 30 to 300 feet apart, and stones and boulders are also scattered over the surface in many places.

The depth to bedrock generally is about 16 inches. The range, however, is from bare outcrop to a depth of 2 feet or more. The surface texture ranges from fine sandy loam to loam, and the texture of the subsoil, from fine sandy loam to sandy loam. In some areas from 5 to 40 percent of the subsoil material is made up of rock fragments less than 10 inches in diameter.

Hollis fine sandy loam, 3 to 8 percent slopes (HmB).—This shallow, slightly droughty soil occurs in gently sloping uplands in the north-central part of the county. The surface layer is much thicker than is typical of the series. Rock outcrops are 100 to 300 feet apart, and the depth to bedrock is slightly greater than in the typical profile.

This soil has moderately rapid to rapid permeability and a moderate moisture-holding capacity. Most of it is in woodland or pasture. A few areas have been cleared and are used for cultivated crops or improved hay. Because of the shallowness, this soil is droughty during dry periods. Tillage and reseeding should be on the contour, if possible, to control erosion. (Capability unit IIe–7; woodland suitability group 10)

Hollis fine sandy loam, 8 to 15 percent slopes (HmC).—This shallow, slightly droughty soil occurs in moderately sloping uplands in the north-central part of the county. The surface layer is much thicker than is typical of the series. Rock outcrops are 100 to 300 feet apart, and the depth to bedrock is slightly greater than in the typical profile.

This soil has moderately rapid to rapid permeability and a moderate moisture-holding capacity. Most of it is in woodland or pasture. A few areas have been cleared and are used for cultivated crops or improved hay. This soil is shallow and therefore droughty during dry periods. If it is used for cultivated crops, the risk of erosion is severe and conservation practices are required in some areas to control runoff. Tillage and reseeding should be on the contour, if possible, to control erosion. The shallow depth to bedrock and some rock outcrops prevent the use of diversions in some cultivated areas. In such areas stripcropping is the only means of controlling erosion. (Capability unit IIIe–7; woodland suitability group 10)

Hollis very rocky fine sandy loam, 3 to 15 percent slopes (HnC).—This shallow, slightly droughty soil occurs in gently sloping and moderately sloping uplands in the north-central part of the county. In areas where this soil is tilled, the surface layer is thicker than is typical of the series. Rock outcrops are 50 to 100 feet apart. Stones and some boulders are also on the surface in most places.

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This soil has moderately rapid to rapid permeability and a moderate moisture-holding capacity. The outcrops interfere with tillage, but some small areas of this soil are used for cultivated crops. Because the soil is shallow and has many rock outcrops, most areas are used for hay, pasture, or woodland. (Capability unit VIs–7; woodland suitability group 10)

Hollis very rocky fine sandy loam, 15 to 25 percent slopes (HnD).—This shallow, slightly droughty soil occurs in moderately steep uplands in the north-central part of the county. Rock outcrops are 50 to 90 feet apart. Stones and some boulders are also on the surface.

This soil has moderately rapid to rapid permeability and a moderate moisture-holding capacity. It is too steep to use for row crops. It is generally used for unimproved pasture or woodland. Fair yields of timber are produced on this soil. Access roads and skidroads should be carefully planned to prevent surface water from concentrating and causing gullies. (Capability unit VIs–7; woodland suitability group 10)

Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes (HoD).—This shallow, slightly droughty soil occurs in gently sloping, moderately sloping, and moderately steep uplands in the north-central part of the county. Rock outcrops are generally 10 to 50 feet apart. Many stones and some boulders are also on the surface.

This soil has moderately rapid to rapid permeability and a moderate moisture-holding capacity. Because of extreme rockiness, its use is limited to woodland and, in some places, to unimproved pasture. Upland oaks, white pine, and red pine produce poor yields of timber on this soil. Roads and skidways should be so located that they do not concentrate surface water and cause washouts. (Capability unit VIIs–7; woodland suitability group 11)

Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes (HoF).—This shallow, slightly droughty soil is in steep and very steep uplands in the north-central part of the county. Rock outcrops are generally 5 to 50 feet apart. Included are some areas that have exposed bedrock on more than 50 percent of the surface area. Many stones and boulders are also on the surface.

This soil has moderately rapid to rapid permeability and a high moisture-holding capacity. It is used mostly for woodland or for wildlife habitats. Upland oaks, red pine, and white pine produce poor yields of timber, and in some places careful planning and special equipment are necessary to harvest the crop. The risk of erosion is high if the vegetation is removed. Access roads and skidways should be carefully located to prevent water from concentrating on unprotected soil and thereby causing erosion. (Capability unit VIIs–7; woodland suitability group 11)

Holyoke Series

The soils of the Holyoke series are droughty, shallow, very fine sandy loams underlain by bedrock. They formed in wind-deposited silts and very fine sands. These soils are gently sloping to very steep. They are in the central part of the county.

The Holyoke soils are near the shallow Sunderland and the deep, well-drained Cheshire soils.

A typical Holyoke soil that is in an abandoned pasture has a dark-brown very fine sandy loam surface layer about 3 inches thick. Beneath the surface layer is a brown to dark-brown very fine sandy loam subsoil. It extends to a depth of about 14 inches. Below this is basalt or diabase bedrock.

Outcrops of bedrock are generally 50 to 200 feet apart. The depth to bedrock ranges from the exposed outcrop to about 24 inches. The texture ranges from very fine sandy loam to loam.

In Franklin County the Holyoke soils have been mapped only as an undifferentiated unit with the Sunderland soils.

Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes (HvC).—These shallow soils are not separated in mapping, as they are intermingled and have little or no difference in use and management. They occur in gently sloping and moderately sloping areas in the central part of the county. Rock outcrops are 100 to 300 feet apart, and many stones and boulders are on the surface. Included in the mapping are some areas that are less rocky.

These soils have moderately rapid permeability. They are used mostly for woodland or unimproved pasture, although a few of the less rocky areas are used for cultivated crops or hay. They have a moderate moisture-holding capacity, but they are shallow and therefore droughty during long, dry periods.

Upland oaks, northern hardwoods, red pine, white pine, and other suitable species produce fair yields of timber on this soil. Access roads and skidways in woodland should be so located that water does not concentrate and cause gullying. (Capability unit VIs–7; woodland suitability group 10)

Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes (HvD).—These soils are not separated in mapping, as they are intermingled and the differences in their use and management are slight. They are moderately steep and are in the central part of the county. Rock outcrops are 100 to 300 feet apart, and there are many stones and boulders on the surface. The soils are relatively shallow. Included with these soils in mapping are some less rocky areas.

These soils have moderately rapid permeability. They have a moderately high moisture-holding capacity, but they are shallow and therefore droughty during long dry periods. They are too steep and rocky to use for crops and are generally used for woodland or unimproved pasture. Upland oaks, northern hardwoods, red pine, white pine, and other suitable species produce fair yields of timber on these soils. Access roads and skidroads should be so located that surface water does not concentrate and cause washouts. (Capability unit VIs–7; woodland suitability group 10)

Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes (HxD).—These very shallow soils are not separated in mapping, as they are intermingled and have little or no difference in their use and management. They occur in moderately sloping and moderately steep areas in the central part of the county. Outcrops of bedrock are less than 100 feet apart, and many stones and boulders are also on the surface. Included in mapping are some areas that have slopes of less than 8 percent.

These soils have moderately rapid permeability. They have a moderate moisture-holding capacity, but they are very shallow and therefore droughty during dry periods. They are used mainly for woodland. Upland oaks, north-

ern hardwoods, red pine, white pine, and other suitable species produce poor yields of timber on these soils. The soils are subject to severe erosion if the vegetation is removed. For this reason access roads and skidroads must be so located that they do not concentrate surface water on unprotected soil. In some places water bars are needed to divert water from the roads and thus prevent washouts. (Capability unit VIIs–7; woodland suitability group 11)

Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes (HxF).—These very shallow soils are not separated in mapping, as they are intermingled and the differences in their use and management are slight. They occur in steep and very steep areas in the central part of the county. Outcrops of bedrock are less than 100 feet apart, and stones and boulders are common on the surface. Included with these soils in mapping are areas in which slopes are steeper than 90 percent and some areas where outcrops of bedrock occupy more than 50 percent of the surface. Some of these areas are sheer rock escarpments.

These soils have moderately rapid permeability. They have a moderate moisture-holding capacity, but they are very shallow and therefore droughty. They are best used for woodland or wildlife habitats. Trees make only poor growth, however, and are very difficult to harvest in many places. The soils are subject to very severe erosion if the vegetation is removed. Access roads and skidways need to be very carefully located and protected with water bars to prevent washouts. (Capability unit VIIs–7; woodland suitability group 11)

Limerick Series

The Limerick series consists of poorly drained silt loams that formed in deep deposits of alluvial sediments. They are in depressions on flood plains along rivers and streams and are flooded occasionally to frequently.

The Limerick soils are near the well-drained Hadley, the moderately well drained Winooski, and the very poorly drained Saco soils. In places they are near the well-drained Agawam or the excessively drained Windsor soils.

A typical, cultivated Limerick soil has a very dark grayish-brown silt loam surface layer about 12 inches thick. It crumbles easily when handled. Below this is an olive or olive-gray silt loam that has red, brown, and gray mottles. This is underlain by silt loam interbedded with very fine sand at a depth of 26 inches. This material is also mottled with red, brown, and gray. In some places it contains gravelly layers.

The texture in some areas is a little coarser than is typical. It ranges from silt loam to very fine sandy loam and loam. The depth to the interbedded silt loam and very fine sand is generally 15 to 30 inches but is as much as 36 inches in places.

In Franklin County some areas of Limerick silt loam are mapped in a complex with Saco silt loam. In these areas the two soils can be identified but are too intricately mixed to justify being mapped separately.

Limerick silt loam (Lk).—Limerick silt loam dries out late in spring or early in summer because it has a high water table and is ponded by floodwaters. Runoff is slow. The moisture-holding capacity is high.

This soil is easily worked after it has dried out, but the high water table and occasional to frequent flooding limit its use. Undrained areas are mostly in unimproved pasture or brushy woodland. Drainage is needed for good growth of silage corn and improved forage. The soil can be drained if suitable outlets are available. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Where a river or stream flows through this soil, there is a risk of bank erosion and protective measures may be necessary. (Capability unit IIIw–6; woodland suitability group 7)

Limerick-Saco silt loams (Ls).—These soils are poorly drained and very poorly drained. They occur in small areas on the flood plains of many streams and rivers in the county and are too intermingled to be mapped separately. They are frequently flooded. Included in mapping are some small areas of better drained soils and some areas of fine sandy loam.

These soils generally are in woodland or unimproved pasture, or they are idle. (Capability unit VIw–6; Limerick part in woodland suitability group 7; Saco part in woodland suitability group 13)

Lyman Series

The soils of the Lyman series are slightly droughty, shallow loams that have formed in glacial deposits derived mainly from schist. They are in gently sloping to very steep uplands in the extreme western part of the county.

The Lyman soils are near the well-drained Berkshire or Marlow, the moderately well drained Peru, the poorly drained Ridgebury, or the very poorly drained Whitman soils.

A typical Lyman soil that has not been tilled has a very thin, crumbly, nearly black loam surface layer that is only 1 or 2 inches thick. This is covered by 2 or 3 inches of forest litter in various stages of decomposition. The surface layer is underlain by a discontinuous layer of reddish-gray fine sandy loam 2 or 3 inches thick. This layer seems gray or white, in contrast to the layers above and below it. It is underlain by a loam subsoil that is very dusky red in the upper part and grades through dark red to yellowish red and then to dark yellowish brown in the lower part. The subsoil extends to a depth of about 19 inches. Below this is the bedrock, a dark-gray mica schist.

Bedrock outcrops are generally less than 100 feet apart. Stones on the surface are 1 to 2 feet in diameter and are commonly less than 50 feet apart. The content of fine gravel is generally about 10 percent. The depth to bedrock ranges from the bare rock outcrop to 24 inches or more. The texture of the surface layer and subsoil ranges from loam to fine sandy loam.

Lyman very rocky loam, 3 to 15 percent slopes (LvC).—This soil is shallow and slightly droughty. It occurs in gently sloping and moderately sloping uplands in the extreme western part of the county. The surface layer is thicker than normal in some areas that have been tilled. Outcrops of rock are 50 to 100 feet apart. Many stones and some boulders are also on the surface. Included with this soil in mapping are some areas with fewer rock outcrops.

This soil has moderate to moderately rapid permeability and a high moisture-holding capacity. Although outcrops of bedrock interfere with tillage to some extent, some small areas are used for cultivated crops. Most of this soil is used for pasture or woodland and is well suited to these uses.

Northern hardwoods, white pine, red spruce, and red pine produce fair yields of timber on this soil. Access roads should be so located that they do not collect surface water, which washes out the roads. (Capability unit VIs-7; woodland suitability group 10)

Lyman very rocky loam, 15 to 25 percent slopes (LvD).—This soil occurs in moderately steep areas in the extreme western part of the county. Outcrops of rock are 50 to 100 feet apart. Stones and some boulders are also on the surface. Included with this soil in mapping are some areas where rock outcrops are more than 100 feet apart.

This soil has moderate to moderately rapid permeability and a high moisture-holding capacity. It is too steep and rocky to use for row crops and is generally used for woodland or unimproved pasture. Northern hardwoods, white pine, red spruce, and red pine produce fair yields of timber on this soil. Access roads and skidroads should be carefully located to prevent surface water from concentrating and gullying unprotected areas. In some places water bars are necessary to divert water from woodland roads and thus prevent washouts. (Capability unit VIs-7; woodland suitability group 10)

Lyman extremely rocky loam, 3 to 25 percent slopes (LxC).—This soil is shallow and slightly droughty. It occurs in gently sloping, moderately sloping, and moderately steep uplands in the extreme western part of the county. Outcrops of rock are 10 to 50 feet apart. Surface stones and boulders are also common. Included with this soil in mapping are some areas in which rock outcrops occupy more than 50 percent of the surface.

This soil has moderate to moderately rapid permeability and a high moisture-holding capacity. Extreme rockiness limits its use to woodland and, in some places, to unimproved pasture. Northern hardwoods, white pine, red spruce, and red pine produce poor yields of timber. The soil is subject to severe erosion if the vegetation is removed. For this reason access roads and skidroads should be carefully located to prevent concentration of surface water on unprotected soil. In some places water bars are needed to divert water from woodland roads and thereby prevent washouts. (Capability unit VIIs-7; woodland suitability group 11)

Lyman extremely rocky loam, 25 to 80 percent slopes (LxF).—This soil occurs in steep and very steep uplands in the western part of the county. Outcrops of rock are 10 to 50 feet apart. Stones and boulders are also common on the surface. Included with this soil in mapping are some areas where outcrops of rock occupy more than 50 percent of the surface.

This soil has moderate to moderately rapid permeability and a high moisture-holding capacity. Because it is shallow, however, it is droughty during dry periods. It is used mostly for woodland, but some areas are too steep and inaccessible for logging operations. In a few areas there are nearly sheer bedrock escarpments. Access roads and skidways must be very carefully located to prevent surface water from concentrating on unprotected soil. In most areas water bars are needed to divert runoff from roads and thus prevent washouts. (Capability unit VIIs-7; woodland suitability group 11)

Marlow Series

The soils of the Marlow series are well-drained loams that have a reddish or brownish subsoil. These soils formed in compact glacial deposits. They are in gently sloping to very steep areas in the Berkshire Hills.

The Marlow soils are near the shallow Lyman and Westminster, the well-drained Berkshire, the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

Many areas of Marlow soils that once were cultivated have been abandoned and are now in forest. A typical profile of a Marlow soil that has been abandoned has a crumbly, dark yellowish-brown loam surface layer about 8 inches thick. This is underlain by a discontinuous layer of fine sandy loam that is as much as 2 inches thick in places. This layer is gray, generally tinged with red or brown, and it seems white in contrast to the layers above and below it. It is underlain by a loam subsoil that is dark reddish brown in the upper part and grades through reddish brown and yellowish red to olive brown in the lower part. The subsoil extends to a depth of about 24 inches. Below this is the substratum, a very firm, olive or olive-brown loam. A typical Marlow soil has a very stony surface.

In some areas, these soils contain a little more sand and the texture is fine sandy loam throughout the profile. The depth to the very firm or firm substratum ranges from 20 to 30 inches. The content of gravel, cobbles, and stones in the soil material is generally less than 20 percent.

Water passes moderately well through the surface layer and subsoil except when these layers are saturated. It passes through the substratum slowly. The Marlow soils retain moisture well and are slow to warm in the spring. Except for an occasional wet spot, artificial drainage is not necessary.

Marlow loam, 3 to 8 percent slopes (MaB).—This soil is well drained. It is in gently sloping areas high in the uplands of the Berkshire Hills. There are very few stones on the surface of this soil.

This soil is suitable for early maturing varieties of silage corn, clover hay, and pasture. Potatoes are grown in a few areas. Alfalfa does not winter well. If the soil is cultivated, row crops should be on the contour and followed by winter cover crops. On long slopes, diversions, grass waterways, and stripcropping are needed to control erosion. Liberal applications of fertilizer and lime are needed to obtain favorable yields.

Much of this soil is in woodland, and good yields of northern hardwoods, white pine, red spruce, and red pine are produced. Woodland roads should be so located that surface water does not collect in ruts and cause washouts. (Capability unit IIe-2; woodland suitability group 3)

Marlow loam, 8 to 15 percent slopes (MaC).—This well-drained loam is in moderately sloping areas high in the Berkshire Hills. Very few stones are on the surface.

This soil is suitable for early maturing varieties of silage corn, clover hay, and pasture. Potatoes are grown in a few areas. Alfalfa does not winter well. Controlling erosion is a problem if this soil is used for cultivated crops. Diversions, grass waterways, contour strips, and winter

cover crops are needed to control surface runoff and erosion. Liberal applications of fertilizer and lime are needed to obtain profitable yields.

Much of this soil is wooded, and it produces good yields of northern hardwoods, white pine, red spruce, and red pine. Woodland roads should be so located and maintained that water does not collect in ruts and cause gullies. (Capability unit IIIe–2; woodland suitability group 3)

Marlow loam, 15 to 25 percent slopes (MaD).—This soil is well drained. It is in moderately steep areas high in the Berkshire Hills. Few stones are on its surface.

Runoff is high on these slopes. Accelerated erosion is a problem wherever this soil is exposed. It is suitable for limited cultivation and for hay, pasture, or woodland. If the soil is used for row crops, runoff and erosion should be controlled by diversions, grass waterways, and strips on diversion grades. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be so located and maintained that water does not collect in ruts and cause gullies. (Capability unit IVe–2; woodland suitability group 3)

Marlow very stony loam, 3 to 8 percent slopes (MbB).—This well-drained soil occupies gently sloping areas high in the uplands of the Berkshire Hills. Most areas of this soil have a thinner, darker surface layer than is typical of the series. Stones 1 to 2 feet in diameter are 30 to 80 feet apart on the surface.

Stones limit the use of this soil for tilled crops. It is used for pasture and woodland. Clearing the stones from the surface may be practical if more acreage is needed for crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and kind of management as Marlow loam, 3 to 8 percent slopes. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Woodland roads should be so located that runoff does not collect in ruts and cause washouts. (Capability unit VIs–2; woodland suitability group 3)

Marlow very stony loam, 8 to 15 percent slopes (MbC).—Most areas of this soil have a thinner and darker surface layer than the soil described as typical of the series. It occupies moderately sloping areas high in the Berkshire Hills. Stones are 30 to 80 feet apart on the surface.

Stones limit the use of this soil for cultivated crops. Removal of surface stones may be practical in some places if more acreage is needed for crops, hay, or improved pasture. If stones are removed, the soil is suited to the same crops and kind of management as Marlow loam, 8 to 15 percent slopes. This soil is well suited to pasture or woodland. Adapted tree species produce good yields of timber. (Capability unit VIs–2; woodland suitability group 3)

Marlow very stony loam, 15 to 25 percent slopes (MbD).—This soil is well drained. It is in moderately steep areas high in the uplands of the Berkshire Hills. This soil has a thinner, darker surface layer than the typical soil described. Stones 1 to 2 feet in diameter are 30 to 80 feet apart on the surface.

The moderately steep slopes and surface stones limit the use of this soil to unimproved pasture and to woodland. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Access roads and skidways should be carefully located to prevent surface water from collecting on unprotected soil and causing washouts. (Capability unit VIs–2; woodland suitability group 3)

Marlow extremely stony loam, 3 to 8 percent slopes (McB).—This soil is well drained. It is in gently sloping areas high in the uplands of the Berkshire Hills. Except for a thinner and darker surface layer, this soil is similar to the soil described for the series. Stones, 10 to 24 inches in diameter, are less than 30 feet apart on the surface. Some boulders are also on the surface.

The surface stones limit the use of this soil to unimproved pasture or woodland. It is best used as woodland. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber. Woodland roads should be so located and maintained that they do not collect surface water and cause gullying. (Capability unit VIIs–2; woodland suitability group 4)

Marlow extremely stony loam, 8 to 35 percent slopes (McD).—This soil is typical of the series except that it has a thinner, darker surface layer. It is in moderately sloping to steep areas high in the Berkshire Hills. The stones and boulders on the surface are less than 30 feet apart.

Extreme stoniness limits the use of this soil to unimproved pasture and woodland. The soil is best suited to woodland, and adapted trees produce good yields of timber. (Capability unit VIIs–2; woodland suitability group 4)

Marlow loam, dark subsoil, 3 to 8 percent slopes (MdB).—This soil is well drained. It has a darker subsoil than the soil described for the series. It occupies gently sloping uplands in the Berkshire Hills, generally at a lower elevation than the typical Marlow soil. There are very few stones on the surface of this soil. In some places where potatoes have been grown on it for a long time, the surface layer and most of the brown subsoil have been eroded away and the soil is olive gray.

This soil is well suited to potatoes, hay, pasture, and woodland. Most of the potatoes produced in the western uplands of the county are grown on this soil.

When the soil is cultivated, row crops should be on the contour and should be followed by winter cover crops. Diversions, grass waterways, and contour stripcropping are needed on long slopes to control runoff and erosion. (Capability unit IIe–2; woodland suitability group 3)

Marlow loam, dark subsoil, 8 to 15 percent slopes (MdC).—This well-drained soil is similar to the soil described for the series but has a darker subsoil. It is in moderately sloping areas in the Berkshire Hills, but generally at lower elevations than the typical Marlow soil. Very few stones are on the surface. Some areas of this soil have been used for many years to produce potatoes, and most of the brown subsoil has been eroded away. The remaining soil material is olive gray.

This soil is suitable for potatoes, hay, pasture, and woodland. It is used extensively for potatoes. Runoff is moderate to rapid, and the soil is subject to severe erosion if it is cultivated. Diversions, grass waterways, contour strips, and winter cover crops are needed to control surface runoff and erosion. (Capability unit IIIe–2; woodland suitability group 3)

Marlow loam, dark subsoil, 15 to 25 percent slopes (MdD).—This well-drained soil has a darker subsoil than the soil described for the series. It is in moderately steep areas in the Berkshire Hills, generally at lower eleva-

tions than the typical Marlow soils. Few stones are on the surface.

This soil is suitable for limited cultivation and can be used for hay, pasture, and woodland. Runoff is rapid on these moderately steep slopes, and accelerated erosion is a problem wherever this soil is unprotected by vegetation. Diversions, grass waterways, and strips on diversion grades are needed to control surface runoff and erosion in cultivated areas.

Northern hardwoods, white pine, and red pine produce good yields of timber on this soil. Farm roads and woodland roads should be located on the least sloping areas and should be protected by water bars to prevent washouts. (Capability unit IVe–2; woodland suitability group 3)

Marlow very stony loam, dark subsoil, 3 to 8 percent slopes (MeB).—This well-drained soil has a darker subsoil than the soil described for the series. In most areas it also has a thinner, darker surface layer. It is in gently sloping uplands of the Berkshire Hills and is generally at lower elevations than the typical Marlow soil. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

Stones are the major problem and limit the use of this soil for row crops. The soil is used for pasture and woodland. Clearing the stones from the surface may be practical if more acreage is needed for crops, hay, and improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Marlow loam, dark subsoil, 3 to 8 percent slopes.

Northern hardwoods, white pine, and red pine produce good yields of timber on this soil. Woodland roads should be so located that surface water does not collect in ruts and cause washouts. (Capability unit VIs–2; woodland suitability group 3)

Marlow very stony loam, dark subsoil, 8 to 15 percent slopes (MeC).—This soil has a darker subsoil than the soil described for the series. In most areas it also has a thinner and darker surface layer. It occupies moderately sloping areas in the Berkshire Hills, generally at lower elevations than the typical Marlow soil. Stones are 20 to 100 feet apart on the surface.

Stones and moderate slopes are the major problems and limit the use of this soil for crops. This soil is suitable for unimproved pasture or woodland. Clearing stones from the surface may be practical if more acreage is needed for hay or pasture. If stones are removed, the soil is suited to the same crops and kind of management as Marlow loam, dark subsoil, 8 to 15 percent slopes.

Northern hardwoods, white pine, and red pine produce good yields of timber. Woodland roads should be so located that surface water does not collect in ruts and cause washouts. (Capability unit VIs–2; woodland suitability group 3)

Marlow very stony loam, dark subsoil, 15 to 25 percent slopes (MeD).—This soil has a darker subsoil than the soil described for the series. It also has a thinner and darker surface layer. It occupies moderately steep areas in the Berkshire Hills, generally at lower elevations than the typical Marlow soil. Stones are 20 to 100 feet apart on the surface of this soil.

The combination of stones and moderately steep slopes limit the use of this soil to unimproved pasture and woodland. Northern hardwoods, red pine, and white pine produce good yields of timber. Access roads and skidways should be carefully located and maintained to prevent surface water from gullying unprotected soil. (Capability unit VIs–2; woodland suitability group 3)

Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes (MfB).—This well-drained soil has a thinner, darker surface layer and a darker subsoil and substratum than the soil described for the series. It is on gently sloping uplands in the Berkshire Hills and is generally at lower elevations than the typical Marlow soil. Stones 10 to 24 inches in diameter are 2 to 20 feet apart on the surface.

Stoniness limits the use of this soil to unimproved pasture and woodland. The soil is best suited to woodland, and adapted trees produce good yields of timber. (Capability unit VIIs–2; woodland suitability group 4)

Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes (MfD).—This soil is similar to the typical Marlow soil but has a thinner, darker surface layer and a darker subsoil. It is in moderately sloping to moderately steep areas in the Berkshire Hills, generally at lower elevations than the typical Marlow soil. Stones are 2 to 20 feet apart on the surface.

This extremely stony soil is best suited to woodland, and adapted trees produce good yields of timber. This soil is susceptible to erosion if the vegetation is destroyed. Access roads should be so located that they do not concentrate surface runoff water and cause washouts. (Capability unit VIIs–2; woodland suitability group 4)

Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes (MfE).—This soil has a thinner, darker surface layer and a darker subsoil than the soil described for the series. It is in steep and very steep areas in the Berkshire Hills, generally at lower elevations than the typical Marlow soil. Stones are 2 to 20 feet apart on the surface. Included with this soil in mapping are some areas that have slopes steeper than 45 percent.

Stones and steep slopes limit the use of this soil to woodland or to wildlife habitats. (Capability unit VIIs–2; woodland suitability group 4)

Merrimac Series

The Merrimac series consists of well-drained, slightly droughty fine sandy loams or sandy loams that formed in deep deposits of stratified sand and gravel. The sand and gravel were derived mainly from granite, gneiss, and quartzite. These soils are on nearly level to steep kames, eskers, and glacial outwash terraces.

The Merrimac soils generally are near the excessively drained Hinckley or Windsor, the well-drained Agawam, the moderately well drained Sudbury, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

A typical profile of the Merrimac soils has a crumbly, very dark grayish-brown fine sandy loam surface layer about 10 inches thick. The subsoil is brown to dark-brown sandy loam that fades to a yellowish brown with depth. It extends to a depth of about 24 inches. Below this is the substratum, which is yellowish-brown, coarsely stratified sand and gravel and some cobbles.

In many areas, the surface layer and upper subsoil are a little coarser textured than is typical of the series. The texture ranges from fine sandy loam to sandy loam and in some places may be gravelly. The lower subsoil is loamy

sand in some places. There is some gravel in the subsoil and, in places, a few cobbles. The depth to the stratified sand and gravel ranges from 20 to 36 inches. The substratum of Merrimac soils west of the Connecticut River generally contains much micaceous material.

Merrimac fine sandy loam, 0 to 3 percent slopes (MgA).—This soil is well drained. It is in nearly level areas on terraces. In some places the texture of the lower subsoil is loamy sand. Also, in some areas the subsoil and substratum are redder than normal. In some areas west of the Connecticut River, there are "ghosts" of partly decomposed limestone in the subsoil and substratum. The substratum in these areas is less acid than the substratum of a typical Merrimac soil.

This soil has moderately rapid to rapid permeability and moderate moisture-holding capacity. Water moves downward very rapidly through the underlying sand and gravel. The soil is suitable for intensive farming and produces good yields under good management. It dries out early in the spring and is easily worked. This soil is suitable for tobacco, corn, forage crops, and all truck crops commonly grown in the county and is well suited to alfalfa. A row crop should be followed by a winter cover crop. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation is needed in most years to obtain maximum yields of truck crops. (Capability unit I–5; woodland suitability group 5)

Merrimac fine sandy loam, 3 to 8 percent slopes (MgB).—This well-drained soil is on gently sloping terraces. In some places, the texture of the lower subsoil is loamy sand. Also, in some areas the subsoil and substratum are redder than normal. In some areas west of the Connecticut River, there are "ghosts" of partly decomposed limestone in the subsoil and substratum. The substratum in these areas is less acid than the substratum of a typical Merrimac soil.

This soil has moderately rapid to rapid permeability and moderate moisture-holding capacity. Water moves very rapidly downward through the underlying sand and gravel. This soil is suitable for intensive farming and produces good yields under good management. It dries out early in the spring and is easily worked. It is suited to tobacco, corn, forage crops, and all truck crops commonly grown in the county and is well suited to alfalfa. A row crop should be followed by a winter cover crop. Liberal amounts of lime and fertilizer are needed to obtain good yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. In most years irrigation is needed for maximum yields of truck crops. On long slopes diversions or contour planting may be needed to control erosion. (Capability unit IIe–5; woodland suitability group 5)

Merrimac fine sandy loam, 8 to 15 percent slopes (MgC).—This soil is well drained. It is in moderately sloping areas on terraces, kames, and eskers. In some places the texture of the lower subsoil is loamy sand, and in some areas the subsoil and substratum are redder than normal. In some areas west of the Connecticut River, there are "ghosts" of partly decomposed limestone in the subsoil and substratum. The substratum in these areas is less acid than the substratum of a typical Merrimac soil.

This soil has moderately rapid to rapid permeability and fair moisture-holding capacity. Water moves downward very rapidly through the underlying sand and gravel. The soil dries out early in the spring and is easily worked. It is suitable for tobacco, corn, forage crops, and all truck crops grown in the county and is well suited to alfalfa. The combination of slope, excessive runoff, and fine sandy loam texture makes the risk of erosion very high if the soil is cultivated. Row crops should be planted in contour strips and green manure grown 1 year in 3. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. Irrigation is needed in most years to produce maximum yields of truck crops. (Capability unit IIIe–5; woodland suitability group 5)

Merrimac fine sandy loam, 15 to 25 percent slopes (MgD).—This well-drained soil is in moderately steep areas along the edge of foothills, on escarpments between terraces, and on the sides of kames and eskers. The surface layer is somewhat thinner than is typical of the series. The lower subsoil is loamy sand in some places, and in some areas the subsoil and substratum have redder colors than normal. Also, in some areas west of the Connecticut River, there are "ghosts" of partly decomposed limestone in the subsoil and substratum. In these areas the substratum is less acid than in a typical Merrimac soil.

This soil has moderately rapid to rapid permeability and fair moisture-holding capacity. It dries out early in the spring. Because it needs protection from erosion, row crops should be planted in contour strips with alternate strips in grass or grass-legume. Drop inlets may be required to prevent runoff from concentrating and causing gullies in the escarpments. (Capability unit IVe–5; woodland suitability group 5)

Merrimac sandy loam, 0 to 3 percent slopes (MmA).—This slightly droughty sandy loam is underlain by deep deposits of stratified sand and gravel. It occupies nearly level areas on terraces. The surface layer and upper subsoil are sandy loam. The lower subsoil is coarse sandy loam or loamy sand. Included are some areas that have redder colors in the subsoil and substratum.

This soil has moderately rapid to rapid permeability. It has a moderate to low water-holding capacity and needs irrigation in most years if row crops are to be grown successfully. It is suited to most row crops if properly managed. Row crops should be followed by a winter cover crop, and a green-manure crop should be grown 1 year in 3. Frequent applications of fertilizer and lime are necessary, because water moves through this soil rapidly and leaches out the plant food. Organic matter in the form of manure or crop residue helps to maintain good tilth.

Water moves rapidly downward through this soil. If it is used for lawns, airfields, or recreation areas, care is required to establish and maintain turf because of the droughtiness. (Capability unit IIs–8; woodland suitability group 5)

Merrimac sandy loam, 3 to 8 percent slopes (MmB).—This slightly droughty sandy loam is underlain by deep deposits of stratified sand and gravel. It is in gently sloping areas on terraces. The surface layer and upper subsoil are sandy loam. The lower subsoil is coarse sandy

loam or loamy sand. In some areas the subsoil and substratum are redder than normal.

This soil has moderately rapid to rapid permeability and a moderate to low moisture-holding capacity. It is suited to most row crops, but it needs irrigation most years if row crops are to be grown successfully. Also, it is suited to alfalfa and other forage crops. Row crops should be planted on the contour. Frequent applications of fertilizer and lime are necessary because the rapid movement of water through this soil leaches out plant food. Organic matter in the form of manure or crop residue helps to maintain good tilth. On long slopes conservation practices are needed to control erosion.

Water passes rapidly downward through this soil. Because of the resulting droughtiness, care is needed to establish and maintain turf on lawns or recreation areas. (Capability unit IIs–8; woodland suitability group 5)

Merrimac sandy loam, 8 to 15 percent slopes (MmC).—This slightly droughty sandy loam is underlain by deep deposits of stratified sand and gravel. It is in moderately sloping areas on terraces, kames, and eskers. The surface layer and upper subsoil are sandy loam. The lower subsoil is coarse sandy loam or loamy sand. In some areas the subsoil and substratum are redder than normal.

This soil has moderately rapid to rapid permeability. Water moves rapidly downward through this soil, but unprotected slopes are subject to erosion. Row crops should be in contour strips and should be followed by winter cover crops. Irregular slopes in places make contour farming very difficult. This soil is well suited to pasture and hay, including alfalfa, but irrigation is necessary in most years to obtain good yields. (Capability unit IIIe–3; woodland suitability group 5)

Merrimac sandy loam, 15 to 35 percent slopes (MmE).—This slightly droughty sandy loam is underlain by deep deposits of stratified sand and gravel. It is on moderately steep and steep terraces, kames, and eskers. The surface layer and upper subsoil are sandy loam. The lower subsoil is coarse sandy loam or loamy sand. Some areas have redder layers in the subsoil and substratum. Included with this soil in mapping are some areas where slopes are steeper than 35 percent.

This soil has moderately rapid to rapid permeability. It is suitable for limited cultivation, long-term sod, woodland, or wildlife habitats. When row crops are grown, the soil needs protection from erosion by diversions, grass waterways, and strips on diversion grades. Areas of this soil that are steeper than 25 percent are best suited to woodland. Woodland roads and skidways must be carefully located to prevent surface water from concentrating and causing washouts. (Capability unit IVe–8; woodland suitability group 5)

Muck

Muck consists of very poorly drained soils that formed in an accumulation of plant material that is fairly well decomposed. These soils are in depressions or in former pond sites widely scattered throughout the county. The water level is at or near the surface most of the time.

Generally, the plant material has accumulated under forest growth, and fragments of tree trunks and limbs are common in the organic material. The upper part is generally black and has decomposed to the extent that plant remains cannot be readily identified. This layer generally is 4 to 12 inches thick or more. Below this the muck may contain some fragments of organic material that has not completely decomposed, especially tree trunks and limbs. The organic deposit is underlain by mineral soil at a depth of 1 foot to 4 feet or more.

Muck (Mu).—This very poorly drained organic soil is in depressions and old pond sites scattered throughout the county. The deposit of organic material generally ranges from 3 to 15 feet or more in depth, but in some small areas the organic material is shallower.

A high water table keeps this soil wet most of the time. It is generally very difficult to drain and is suitable mainly for wildlife habitats or recreation areas. Many areas are covered by sedges, alders, and other water-loving plants. (Capability unit VIIw–1; woodland suitability group 13)

Muck, shallow (Ms).—This very poorly drained organic soil is in depressions and old pond sites scattered throughout the county. The organic material generally ranges from 1 to 3 feet in depth, but some small areas are deeper and others are shallower.

A high water table keeps this soil wet most of the time. It generally is very difficult to drain and is suitable mainly for wildlife habitats or recreation areas. Many areas are covered by sedges, alders, and other water-loving plants. (Capability unit VIIw–1; woodland suitability group 13)

Nassau Series

The Nassau series consists of slightly droughty, shallow silt loams that formed in a thin glacial deposit derived mainly from slate and phyllite. They are in gently sloping to very steep areas in the towns of Bernardston and Leyden.

The Nassau soils are near the well-drained Dutchess and Bernardston, the moderately well drained Pittstown, and the poorly drained Stissing soils.

These soils are dull or dark colored, a characteristic that is inherited from the dark parent material. They also contain many small, flat chips of a dark, slaty rock. These rock chips range in size from thin flakes less than ½ inch long to fragments that are as much as 6 inches long and 1 to 2 inches thick. They generally make up about 50 percent of the soil material.

A typical Nassau soil has a very dark brown silt loam surface layer about 2 inches thick. The subsoil is dark yellowish-brown very channery silt loam that fades to an olive brown with depth. It extends to a depth of about 15 inches and is underlain by very dark gray or black, slaty bedrock.

The texture of the surface layer and the subsoil is silt loam or heavy loam. Outcrops of bedrock commonly occur 25 to 75 feet apart. The depth to bedrock ranges from the bare outcrop to about 24 inches.

Nassau very rocky silt loam, 3 to 15 percent slopes (NaC).—This soil is slightly droughty and is shallow. It is in gently sloping and moderately sloping uplands in the towns of Bernardston and Leyden. Outcrops of bedrock generally are 50 to 100 feet apart. Stones and some boulders are also common on the surface. This soil is generally slightly deeper to bedrock than that described as

typical. Included with this soil in mapping are some areas in which outcrops are more than 100 feet apart.

This soil has moderately rapid permeability and a high moisture-holding capacity. Bedrock outcrops interfere with tillage, but some small areas are used for hay and cultivated crops. This soil is best suited to pasture or woodland.

Northern hardwoods, upland oaks, white pine, and red pine produce fair yields of timber on this soil. Access roads should be so located that they do not concentrate surface water and cause gullying. (Capability unit VIs–7; woodland suitability group 10)

Nassau very rocky silt loam, 15 to 25 percent slopes (NaD).—This soil is slightly droughty and is shallow. It is in moderately steep uplands in the towns of Bernardston and Leyden. Outcrops of bedrock generally are 50 to 100 feet apart. Stones and some boulders are also common on the surface. This soil is generally slightly deeper to bedrock than that described as typical. Included with this soil in mapping are some areas in which outcrops are more than 100 feet apart.

This soil has moderately rapid permeability and a high moisture-holding capacity. Because of rockiness and steepness, it is best suited to woodland or unimproved pasture. Northern hardwoods, upland oaks, white pine, and red pine produce fair yields of timber on this soil. Access roads and skidways should be carefully planned, located, and maintained to prevent gullying by runoff. (Capability unit VIs–7; woodland suitability group 10)

Nassau extremely rocky silt loam, 3 to 25 percent slopes (NeC).—This soil is slightly droughty and is shallow. It is in gently sloping, moderately sloping, and moderately steep uplands in the towns of Bernardston and Leyden. Outcrops of bedrock generally are less than 50 feet apart. In some places rock outcrops cover more than 50 percent of the surface. Many stones and some boulders are also on the surface.

This soil has moderately rapid permeability and a high moisture-holding capacity, but it may be droughty during dry periods because it is shallow. Use of this soil is limited to woodland and, in some places, to unimproved pasture. It is well suited to woodland and to wildlife habitats. Northern hardwoods, upland oaks, white pine, and red pine produce poor yields of timber. The risk of erosion is severe if the vegetation is removed. Access roads and skidways should be carefully located to prevent gullying by runoff. (Capability unit VIIs–7; woodland suitability group 11)

Nassau extremely rocky silt loam, 25 to 75 percent slopes (NeF).—This soil is slightly droughty and is shallow. It is in steep and very steep uplands in the towns of Bernardston and Leyden. Outcrops of bedrock generally are less than 50 feet apart, and in some places they cover more than 50 percent of the surface. Many stones and boulders are also on the surface.

This soil has moderately rapid permeability and a high moisture-holding capacity, but it may be droughty during dry periods because it is shallow. This soil is used mostly for woodland, but some areas are too steep and inaccessible for logging. Access roads and skidways must be very carefully located and maintained to prevent surface water from concentrating on unprotected soil. In most places water bars are needed to divert water from the roads and protect them from washouts. (Capability unit VIIs–7; woodland suitability group 11)

Ninigret Series

The Ninigret series consists of moderately well drained fine sandy loams that formed in deep deposits of water-sorted sand. They are on terraces bordering the major streams and are mostly nearly level or gently sloping. Some are moderately sloping.

Ninigret soils generally are near the well-drained Agawam, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils. Some areas are near the well-drained Ondawa and Hadley and the excessively drained Windsor soils.

In cultivated areas a typical Ninigret soil has a crumbly, dark-brown fine sandy loam surface layer about 10 inches thick. The upper subsoil is yellowish-brown fine sandy loam. The lower subsoil is yellowish-brown to light olive-brown loamy fine sand with gray and yellowish-red mottles. Below this is a gray to pale-red substratum of fine to medium sand that is mottled with yellowish red. There is very little gravel in this soil.

In some areas the surface layer and upper subsoil are a little finer or coarser textured than described here. The texture ranges from very fine sandy loam to sandy loam.

Water passes through the Ninigret soils rapidly, except when they are saturated. Because of a high water table, these soils are wet in the spring. They are used extensively for truck crops, corn, tobacco, and other cultivated crops. Drainage is needed to assure high yields, and irrigation may also be needed during long dry periods. Hay crops and pasture can generally be grown in some areas without drainage. Liberal applications of lime and fertilizer are needed to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth.

Ninigret fine sandy loam, 0 to 3 percent slopes (NfA).—This moderately well drained soil is on nearly level terraces bordering the major streams. Included with this soil in mapping are small areas of sandy loam or very fine sandy loam.

Wetness is the major problem. Drained areas are used extensively for truck crops, tobacco, corn, and forage crops. Undrained areas are suitable for hay, pasture, and silage corn. Surface drainage may be desirable to eliminate small wet spots that are nuisances in cultivated areas. (Capability unit IIw–5; woodland suitability group 3)

Ninigret fine sandy loam, 3 to 10 percent slopes (NfB).—This soil is moderately well drained. It is on gently sloping terraces bordering the major streams. Included with this soil in mapping are small areas of sandy loam or very fine sandy loam. Also included are a few areas that have slopes greater than 10 percent.

Wetness is the major problem. Drainage is needed for row crops. On long slopes used for crops, erosion is also a problem, and conservation practices are needed to control it. Row crops should be in graded rows. In places, diversions and grass waterways are needed to control runoff and erosion. After drainage this soil is suited to truck crops, tobacco, and silage corn. (Capability unit IIw–5; woodland suitability group 3)

Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes (NgA).—This moderately well drained soil is similar to the soil described for the series, but the substratum consists of layered silt and very fine sand. This soil is on nearly level terraces bordering the major streams in areas that were once glacial lakebeds. In some places the texture of the surface layer and subsoil are a little coarser than normal. Included are a few small wet spots in depressions.

The substratum has moderately slow to slow permeability and this soil is therefore slow to dry out in spring. The soil is well suited to forage crops. It is also suited to row crops if it is drained and if planting is delayed until the soil has dried out. (Capability unit IIw-5; woodland suitability group 3)

Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes (NgB).—This moderately well drained soil is similar to the soil described for the series, but the substratum consists of layered silt and very fine sand. This soil is on gently sloping terraces bordering the major streams in areas that were once glacial lakebeds. In some places the texture of the surface layer and subsoil are a little coarser than normal. Included are some areas that have slopes greater than 8 percent.

The substratum has moderately slow to slow permeability. Therefore, this soil is slow to dry out in the spring. It is well suited to forage crops. It is also suited to row crops if it is drained and if planting is delayed until after the soil has dried out. Row crops should be in graded rows. In places, diversions and grass waterways are needed to control surface runoff and erosion. (Capability unit IIw-5; woodland suitability group 3)

Ondawa Series

The Ondawa series consists of well-drained fine sandy loams that formed in recently deposited alluvial material. They occur along the smaller streams or rivers, especially along fast-flowing streams in valleys. Most areas are flooded only once in 5 or 6 years, but some areas are flooded at least once a year, usually in the spring. Most Ondawa soils are nearly level.

Ondawa soils are near the moderately well drained Podunk, the poorly drained Rumney, and the very poorly drained Saco soils.

A typical cultivated Ondawa soil has a crumbly, very dark grayish-brown surface layer of fine sandy loam about 8 inches thick. Below this is a dark yellowish-brown to olive-brown fine sandy loam. Below a depth of 20 inches, the texture is loamy sand in some places, and there may be some gravel.

In some places the texture of the surface layer and the layer directly below is a little coarser than is typical of the series. The texture ranges from fine sandy loam to sandy loam.

Ondawa fine sandy loam (Of).—This soil dries out early in the spring, except where it is flooded. The soil is easy to work. It has moderately rapid to rapid permeability and only a fair moisture-holding capacity. Runoff is slow. This soil is suited to row crops, forage crops, and pasture. A row crop should be followed by a winter cover crop. Liberal amounts of lime and fertilizer are needed to obtain profitable yields. Organic matter, used in the form of manure or crop residue, helps to maintain good tilth. Irrigation may be necessary to obtain maximum yields of truck crops. There is some risk of bank erosion along the rivers and streams. This soil is a good source of sand and topsoil. (Capability unit 1-6; woodland suitability group 5)

Peat

Peat consists of very poorly drained soils that formed in an accumulation of organic material. This material is only partly decomposed. Peat soils are widely scattered throughout the county. They are in depressions, in former pond sites, or in areas surrounding small ponds. The water table is at or near the surface most of the year.

A typical Peat soil has a black muck surface layer about 7 inches thick. This is covered by litter consisting of leaves, twigs, sedges, and reeds. Below the muck surface is an accumulation of dark reddish-brown organic remains from rushes, sedges, and some woody vegetation. These are only partially decomposed, and most of them can be identified as parts of plants. This material is underlain by mineral soil at a depth of about 4 feet, but the depth ranges from one foot to several feet. The composition of the organic deposit also varies extremely.

Peat (Pa).—This soil has a high water table that keeps it saturated most of the time. Most areas are difficult to drain and are suitable only for wildlife habitats, for low-grade woodland, or for recreational uses. Many areas are covered by sedges, alders, and other water-loving shrubs and ferns. (Capability unit VIIw-1; woodland suitability group 13)

Peru Series

The soils of the Peru series are moderately well drained loams that formed in compact glacial deposits derived mainly from gray mica schist with some granite. These soils have a hard layer at a depth of about 24 inches that is difficult to dig with a spade. They are in nearly level to moderately steep areas, mainly in the Berkshire Hills.

The Peru soils are near the shallow Lyman, the well-drained Berkshire and Marlow, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

A typical Peru soil that has been cultivated has a crumbly, very dark grayish-brown loam surface layer about 7 inches thick. The upper subsoil is dark-brown loam that fades in color with depth. At a depth below 16 to 20 inches the subsoil is dark yellowish-brown to olive-brown loam that has yellowish-red mottles. It extends to a depth of about 24 inches. The substratum is very firm, olive fine sandy loam that has yellowish-red or red mottles.

Most areas of these soils are very stony or extremely stony unless they have been cleared for farming. The texture ranges from loam to fine sandy loam. The depth to mottling may range from 12 to 24 inches, and the depth to the hard layer from 18 to 30 inches.

The Peru soils are always wet early in the spring, sometimes late in the spring, and sometimes in the fall.

Peru loam, 0 to 3 percent slopes (PbA).—This moderately well drained soil is in nearly level uplands of the Berkshire Hills. It has a slightly thicker surface layer than the soil described for the series and is mottled nearer the surface. Most of the stones have been removed.

Water passes readily through the surface layer and subsoil, but the substratum has moderately slow to slow permeability. This soil has a fairly high moisture-holding capacity. Wetness is the major problem. Except in bothersome wet spots, this soil does not need drainage for hay or pasture. Drainage is needed to obtain best yields of silage corn, potatoes, and similar crops. (Capability unit IIw–2; woodland suitability group 1)

Peru loam, 3 to 8 percent slopes (PbB).—This moderately well drained soil is in gently sloping uplands of the Berkshire Hills. Most of the surface stones have been removed.

Water passes readily through the surface layer and subsoil. The substratum has moderately slow to slow permeability. This soil has a fairly high moisture-holding capacity. Although wetness is the major problem, this soil erodes if it is not tilled properly. Except in bothersome wet spots, artificial drainage is not needed for hay or pasture. Drainage is needed to obtain best yields of such crops as silage corn and potatoes. Wherever possible, working across the slope in graded strips will help to control erosion. (Capability unit IIw–2; woodland suitability group 1)

Peru loam, 8 to 15 percent slopes (PbC).—This moderately well drained soil is in moderately sloping uplands of the Berkshire Hills. Most of the surface stones have been removed. Included are some areas that have slopes steeper than 15 percent.

Water passes readily through the surface layer and subsoil, but the substratum has moderately slow to slow permeability. This soil has a fairly high-moisture holding capacity. Except in bothersome wet spots, this soil is suitable for hay or pasture without drainage. It should be drained for silage corn, potatoes, and similar crops. The risk of erosion is very severe where the vegetation has been removed. Wherever possible, working the soil across the slope in graded strips helps to control erosion. On some long slopes, diversions and grass waterways are needed to carry away excess water and to control erosion. (Capability unit IIIe–22; woodland suitability group 1)

Peru very stony loam, 3 to 8 percent slopes (PcB).—In most places this moderately well drained soil has a thinner, darker surface layer than the typical soil described. It is in gently sloping uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are 30 to 100 feet apart on the surface. Included with this soil in mapping are some areas that have slopes less than 3 percent.

Water passes readily through the surface layer and subsoil, except when these layers are saturated, but the substratum has moderately slow to slow permeability. This soil has a fairly high moisture-holding capacity.

The surface stones interfere with tillage and limit the use of this soil to hay, pasture, and woodland. Most areas can be reseeded to improved forage. Clearing the stones from the surface may be practical if more acreage is needed for row crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Peru loam, 3 to 8 percent slopes.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. (Capability unit VIs–22; woodland suitability group 1)

Peru very stony loam, 8 to 15 percent slopes (PcC).—In most places this moderately well drained soil has a thinner, blacker surface layer than the typical soil described. It is in moderately sloping uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are 30 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil, the substratum has moderately slow to slow permeability. This soil has a fairly high moisture-holding capacity.

The surface stones interfere with tillage and limit the use of this soil to pasture and woodland. Clearing the stones from the surface may be practical if more acreage is needed for row crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Peru loam, 8 to 15 percent slopes.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. (Capability unit VIs–22; woodland suitability group 1)

Peru very stony loam, 15 to 25 percent slopes (PcD).—This moderately well drained soil has a thinner, darker surface layer than the typical soil described. It is in moderately steep uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are 30 to 100 feet apart on the surface.

Water passes readily through the surface layer and subsoil. The permeability of the substratum, however, is moderately slow to slow, and the moisture-holding capacity is fairly high.

This soil is used for pasture and woodland. Stones and steepness of slope are the major problems. Clearing the stones from the surface is generally not practical.

Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. Access roads and skidways should be so planned and maintained that they do not collect water and cause gullying. (Capability unit VIs–22; woodland suitability group 1)

Peru extremely stony loam, 0 to 8 percent slopes (PeB).—This moderately well drained soil has a thinner, blacker surface layer than the soil described for the series. It is in nearly level and gently sloping uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are less than 30 feet apart on the surface.

Water passes readily through the surface layer and subsoil. The substratum, however, has moderately slow to slow permeability, and the soil has a fairly high moisture-holding capacity. Generally, it is not practical to clear this soil of stones and use it for crops. The surface stones limit the use of this soil to unimproved pasture or woodland. It is best used for woodland. Northern hardwoods, white pine, red spruce, and red pine produce good yields of timber on this soil. (Capability unit VIIs–2; woodland suitability group 2)

Peru extremely stony loam, 8 to 25 percent slopes (PeC).—This moderately well drained soil has a thinner, blacker surface layer than the soil described for the series. It is in sloping and moderately steep uplands of the Berkshire Hills. Stones 10 to 24 inches in diameter are less than 30 feet apart on the surface.

Water passes readily through the surface layer and subsoil. The substratum, however, is moderately slowly to slowly permeable, and the soil has a fairly high moisture-holding capacity. The surface stones limit the use of this soil to unimproved pasture or woodland. It is best used for woodland. Northern hardwoods, white pine, red

spruce, and red pine produce good yields of timber on this soil. Access roads and skidways should be carefully located to prevent surface water from collecting and causing gullies. (Capability unit VIIs–2; woodland suitability group 2)

Pittstown Series

The soils of the Pittstown series are moderately well drained silt loams that formed in compact glacial deposits derived mainly from dark-gray phyllite. These soils have a hard layer about 20 inches from the surface that is difficult to dig with a spade. They are mainly in gently sloping uplands in the towns of Bernardston and Leyden.

The Pittstown soils are near the shallow Nassau, the well-drained Dutchess and Bernardston, and the poorly drained Stissing soils.

A typical Pittstown soil that has been cultivated has a crumbly, very dark brown silt loam surface layer about 9 inches thick. The subsoil is olive-brown to olive silt loam that extends to a depth of about 20 inches. The upper part of the subsoil is crumbly, but the lower part is somewhat firm. Below this is the substratum, which is firm to very firm, dark gray to olive-gray silt loam that contains dark yellowish-brown or dark reddish-brown mottles.

These soils derived their dark color from their parent material. From 5 to 15 percent of the soil consists of phyllite chips less than one-half inch long. Many larger phyllite fragments are also in these soils.

Pittstown silt loam, 3 to 8 percent slopes (PnB)—This soil is in gently sloping uplands in the towns of Bernardston and Leyden. Few stones are on the surface. Some areas that have slopes greater than 8 percent and some less than 3 percent were included in mapping.

The soil is slowly permeable in the substratum. It retains moisture well; consequently it warms slowly in the spring. This soil is wet and seepy because water moves slowly through the dense substratum. It is always wet early in the spring, often late in the spring, and at times in the fall.

This soil is suited to hay and pasture. Wetness is the major problem, but erosion is also a problem if the soil is not properly tilled. Drainage is needed for row crops. Wherever possible, working across the slope in graded rows helps to control erosion. Diversions and grass waterways may be needed on long slopes to intercept and carry away excess surface water. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic material added in the form of manure or crop residue helps to maintain good tilth. (Capability unit IIw–2; woodland suitability group 1)

Podunk Series

The Podunk series consists of moderately well drained fine sandy loams that formed in recently deposited material along most of the major, swift-flowing streams. These soils may be flooded every year. Most Podunk soils are nearly level.

These soils are near the well-drained Ondawa, the poorly drained Rumney, and the very poorly drained Saco soils.

A typical Podunk soil that has been cultivated has a crumbly, dark yellowish-brown fine sandy loam surface layer about 7 inches thick. Below this is a brown to light brownish-gray fine sandy loam that becomes coarser with depth. The texture is fine to medium sand below a depth of about 16 inches. This sand contains yellowish-red mottles at a depth of about 20 inches or more.

In some places the texture of the surface layer and the underlying layer is slightly coarser than is typical of the series. The texture ranges from fine sandy loam to sandy loam. At a depth greater than 2 feet, there may be some gravel. In some places mottling is present at a depth of about 12 inches.

Podunk fine sandy loam (Po).—This soil is moderately well drained. It is along most of the major streams and may be flooded every year.

Except when the soil is saturated, water passes readily through it. A high water table keeps this soil wet late in the spring and also following long, rainy periods, but it is easy to work after it has dried out. Row crops can be grown if early planting is not required. Otherwise, this soil is best suited to hay and pasture.

Drainage is needed for row crops. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. There is some risk of bank erosion along the rivers and streams. (Capability unit IIw–6; woodland suitability group 3)

Raynham Series

The Raynham series consists of poorly drained silt loams and very fine sandy loams that formed in stratified deposits of very fine sand and silt. They are in nearly level depressions in the Connecticut Valley lowlands.

The Raynham soils are near the well-drained Hartland and the moderately well drained Belgrade soils.

A typical Raynham soil that has not been cultivated has a dark grayish-brown or very dark gray silt loam surface layer about 5 inches thick. The subsoil is dark grayish-brown to olive silt loam that is quite dense and is mottled with gray and brown or dark brown. It extends to a depth of about 22 inches. Below this is an olive substratum consisting of very finely stratified silt and very fine sand. The substratum is mottled with gray, red, and dark brown.

These soils are covered in some places by a deposit of silty material that has washed from adjacent slopes. In some areas the texture of the surface layer and subsoil is very fine sandy loam. Also, in some areas the substratum contains very thin layers of clay.

Raynham silt loam, 0 to 3 percent slopes (RaA).—This soil is poorly drained. It is on nearly level or level lowlands in the Connecticut Valley. Included with this soil in mapping are a few areas that have slopes steeper than 3 percent.

This soil is wet late in the spring, sometimes early in the summer, and often in the fall. The wetness is caused mostly by a high water table. This soil is suitable for hay and pasture if moisture-tolerant plants are grown. Fair to good yields can be obtained if the soil is artificially drained and lime and fertilizer are applied. Land smoothing in places will eliminate low wet spots and improve surface drainage. If row crops are grown after the soil has been drained, winter cover crops and green manure crops will improve soil tilth. This soil is also suitable for

woodland. (Capability unit IIIw–5; woodland suitability group 7)

Ridgebury Series

The Ridgebury series consists of poorly drained fine sandy loams that formed in compact glacial deposits derived mainly from granite, gneiss, or schist. They have a hard layer about 18 inches from the surface. They are in depressions and gently sloping areas of uplands. A few areas are moderately sloping.

Ridgebury soils are near the shallow Lyman, Hollis, and Shapleigh soils, the well-drained Berkshire, Marlow, Charlton, Essex, and Gloucester soils, the moderately well drained Peru, Sutton, and Scituate soils, and the very poorly drained Whitman soils.

A typical Ridgebury soil that is forested has a nearly black, crumbly, extremely stony fine sandy loam surface layer about 7 inches thick. Underlying this is an olive-gray fine sandy loam to sandy loam subsoil that contains yellowish-brown or dark-brown mottles. The subsoil is underlain at a depth of about 14 inches by the compact substratum. It is light-gray to gray sandy loam or loamy sand with many strong-brown or dark-brown mottles.

In some areas, the texture is a little finer or a little coarser than is typical of the series. In the surface layer and the subsoil, the texture ranges from loam to sandy loam. In the substratum the range is from sandy loam to loamy sand. Stones 10 to 24 inches in diameter are 5 to 50 feet apart on the surface in most places. Stones are also scattered throughout the soil. The depth to the compact substratum ranges from 13 to 30 inches.

Ridgebury soils are wet 7 to 9 months of the year. They have a high water table and also get surface water and seepage from higher areas. The hard layer in these soils prohibits downward movement of water. Natural outlets for surface drainage are lacking or inadequate in some places.

Ridgebury fine sandy loam, 0 to 3 percent slopes (RdA).—This soil is poorly drained. It is in nearly level areas or depressions in uplands throughout the county. Most areas are a little wetter than normal because they have no natural drainage outlets. There are few stones on the surface of this soil.

This soil is wet 7 to 9 months of the year. It has a high water table and gets surface water and seepage from surrounding slopes. Also, the hard layer in this soil has moderately slow to slow permeability and restricts the downward movement of water. Consequently, it is ponded in depressions for short periods. Without drainage, use of this soil is limited to low-producing hay or pasture and to woodland. If artificially drained, the soil can be used for improved hay or pasture and, in some places, for silage corn. (Capability unit IIIw–2; woodland suitability group 7)

Ridgebury fine sandy loam, 3 to 8 percent slopes (RdB).—This poorly drained soil is in gently sloping uplands throughout the county. Very few stones are on the surface. Included with the soil in mapping are a few areas that have slopes steeper than 8 percent.

This soil is wet 7 to 9 months of the year. It has a high water table and gets surface water and seepage from surrounding slopes. The hard layer in this soil has moderately slow to slow permeability and restricts the downward movement of water. Without drainage, use of this soil is limited to low-producing hay or pasture and to woodland. Most areas can be drained and seeded for improved hay and pasture and in some places, to silage corn. Drainage outlets generally are available because the soil is gently sloping. If the soil is used for cultivation, row crops should be in graded rows. (Capability unit IIIw–2; woodland suitability group 7)

Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes (RgB).—This poorly drained soil has the same layers as described for the typical Ridgebury soil. It occurs in depressional areas or in nearly level and gently sloping areas scattered throughout the uplands of the county. Stones on the surface are 10 to 24 inches in diameter and 5 to 50 feet apart.

This soil is wet 7 to 9 months of the year. It has a high water table and receives surface water and seepage from surrounding slopes. Generally, it is not practical to remove the stones from this soil and use it for crops. It is used mostly for woodland. (Capability unit VIIs–23; woodland suitability group 7)

Riverwash (Rs)

Riverwash is a miscellaneous land type consisting of an assortment of sand, gravel, cobbles, and, in some areas, stones. In places there are boulders in the mixture. This land is flooded frequently. Many areas are flooded several times a year, and the material is reworked with each flooding. It occurs along streams just above the normal waterline, or as islands or peninsulas in the stream, and is essentially bare of vegetation. This land type is in small areas in most all parts of the county and has no agricultural value. It may be a good source of gravel and sometimes a source of sand. (Capability unit VIIIs–2)

Rumney Series

The soils of the Rumney series are poorly drained fine sandy loams that formed in recently deposited material along most of the major swift-flowing streams. They are frequently flooded. Most of these soils are nearly level and are in depressions near streams.

The Rumney soils are generally near the well drained Ondawa, the moderately well drained Podunk, or the very poorly drained Saco soils.

A typical Rumney soil that has not been cultivated has a dark olive-gray fine sandy loam surface layer about 3 inches thick. It is crumbly except when saturated with water. Underlying the surface layer is gray to olive-gray fine sandy loam that has dark yellowish-brown mottles to a depth of about 20 inches. Below this depth is olive to gray loamy sand or sand. In some places below the 20-inch depth, there are gravelly or silty layers.

In some places the surface layer and underlying layer are sandy loam.

Rumney fine sandy loam (Ru).—This soil is poorly drained. It is near the major swift-flowing streams and is frequently flooded. In some places the texture of the surface layer and underlying layer is loamy sand and the surface layer is thicker than the typical soil described.

A high water table and ponded floodwaters keep this soil wet most of the year. Runoff is slow. Some areas can

be drained artificially and used for improved hay and silage corn. Without drainage this soil can be used for woodland and for hay and pasture if moisture-tolerant plants are grown. It can be drained by bedding, land smoothing, and use of tile or open ditches if suitable outlets can be found. Where a river or stream flows through this soil, there is some risk of bank erosion, and protective measures may be necessary. Lime and fertilizer are needed to obtain favorable yields. (Capability unit IIIw-6; woodland suitability group 7)

Saco Series

The Saco series consists of very poorly drained soils that formed in alluvium on flood plains. They occur in depressions or low flat areas on flood plains and are subject to frequent flooding.

The Saco soils are near the well-drained Hadley and Ondawa, the moderately well drained Winooski and Podunk, or the poorly drained Limerick and Rumney soils. In Franklin County some areas of Saco soils are mapped with the Limerick soils as Limerick-Saco silt loam.

A typical Saco soil has a nearly black silt loam surface layer about 8 inches thick. Below this is dark-gray to greenish-gray silt loam that is relatively free of mottles.

The texture of the surface layer and underlying material varies extremely. It ranges from silt loam to sandy loam.

Saco silt loam (Sa).—This soil is very poorly drained. It occurs in depressions or low flat areas on flood plains and is subject to frequent flooding. In some places the texture of the surface layer and the underlying layers is loamy sand or gravelly sand.

This soil is wet most of the year because of a high water table and ponded floodwaters. Runoff is very slow. Most areas of this soil cannot be drained, because outlets are not available. The soil is used mostly for woodland and for wildlife habitats. Unimproved pastures provide a limited amount of grazing during dry periods. (Capability unit VIw-6; woodland suitability group 13)

Saugatuck Series

The Saugatuck series consists of poorly drained soils that formed in deep deposits of sand. They are in low flat areas or depressions in terraces where a high water table keeps them wet much of the year.

These soils generally are near the excessively drained Windsor, the moderately well drained Deerfield, and the very poorly drained Scarboro soils. Some areas are near the poorly drained Walpole and Wareham soils.

A typical forested Saugatuck soil has a black loamy sand surface layer that is covered by forest litter in various stages of decomposition. Beneath the surface layer is dark-gray loamy sand about 8 inches thick. This is underlain by a cemented subsoil, which is dark-red and black sand in the upper part and dark reddish-brown sand that fades with depth to a brownish yellow in the lower part. The subsoil is very hard to dig with a spade and extends to a depth of about 20 inches. Below this depth is the substratum, a light olive-brown to light olive-gray sand.

The texture of the surface layer is generally loamy sand, but in some areas it is sand. Some areas have gravel strata below a depth of 3 feet.

Saugatuck loamy sand (Sb).—This poorly drained soil is in low flat areas or depressions on the terraces.

This soil is kept wet much of the year by a high water table and very slow runoff. The hard, cemented subsoil prevents downward movement of water. Water tends to become ponded during rainy periods. This soil is very difficult to drain. Most of it is wooded with moisture-tolerant trees, growing mainly on little mounds or hummocks. (Capability unit Vw-9; woodland suitability group 9)

Scantic Series

The soils of the Scantic series are poorly drained silt loams that formed in silt and clay deposits in old lake beds. They are in nearly level to gently sloping areas of the Connecticut Valley.

The Scantic soils are near the well-drained Suffield, the moderately well drained Buxton, and the very poorly drained Biddeford soils.

A typical Scantic soil that has been cultivated has a very dark grayish-brown silt loam surface layer about 9 inches thick. This layer is crumbly when it is not wet. The upper part of the subsoil is olive-gray silt loam that contains dark-brown or brown mottles. The lower part is gray or olive-gray silty clay loam that grades to mottled silty clay with depth. This is underlain, at a depth of about 24 inches, by gray and very dark-gray varved silt and clay mottled with brown to dark brown.

The texture of the surface layer may range from loam to silty clay loam. The substratum is firm and hard to dig in some places.

Water moves through these soils very slowly. When they become saturated they remain wet for long periods. They are wet much of the year.

These soils are suited to hay and pasture if moisture-tolerant legumes and grasses are used. They are also suited to woodland. Although the Scantic soils are difficult to drain internally, land grading and open drainage ditches will remove surface water and allow these soils to dry out more quickly. Diversions may be needed to intercept water from surrounding slopes. Use of lime and fertilizer and other good management practices are needed to obtain good yields of forage. Native pastures provide a limited amount of grazing during dry periods. Unless these soils are dry when tilled, they compact.

Scantic silt loam, 0 to 3 percent slopes (ScA).—This soil is poorly drained. It is in nearly flat areas and in some depressions in the Connecticut Valley lowlands. In forested areas the surface layer is generally thinner than normal.

The moisture-holding capacity of this soil is high. Water ponds in some depressions. (Capability unit IVw-4; woodland suitability group 9)

Scantic silt loam, 3 to 8 percent slopes (ScB).—This soil is poorly drained. It is in gently sloping areas in the Connecticut Valley lowlands. In forested areas the surface layer is generally thinner than typical. Included with this soil in mapping are some areas in which slopes are steeper than 8 percent.

The moisture-holding capacity of this soil is high. The risk of erosion is high if the vegetation is destroyed. If the soil is drained and cultivated, row crops should be in

graded rows to improve surface drainage. (Capability unit IVw-4; woodland suitability group 9)

Scarboro Series, Brownish Subsoil Variant

The Scarboro series, brownish subsoil variant, consists of very poorly drained fine sandy loams that formed in deep deposits of sands or stratified sand and gravel. These soils occur in depressions in terraces or low flat areas and are kept wet most of the time by a high water table.

These soils generally are near the excessively drained Hinckley or Windsor soils, the well-drained Merrimac, Agawam, and Warwick soils, the moderately well drained Sudbury, Ninigret, and Deerfield soils, and the poorly drained Walpole and Wareham soils.

A typical, cultivated Scarboro soil has a black fine sandy loam surface layer about 10 inches thick. The subsoil generally is dark grayish-brown sand that has many dark reddish-brown mottles. It extends to a depth of about 25 inches. Below this is the substratum, a dark-gray sand or stratified sand and gravel with dark reddish-brown mottles that decrease in number with increasing depth.

The texture throughout the profile varies extremely. The surface layer may range from loam to sandy loam. The subsoil may range from gravelly loamy sand to fine sand and, in the upper part it may be fine sandy loam. The substratum may have a texture ranging from sand to stratified sand or stratified sand and gravel. The proportion of gravel in the soil ranges from less than 5 percent to 80 percent.

Scarboro fine sandy loam, brownish subsoil variant (Sd).—This soil is very poorly drained. It occurs in depressions in terraces or in low flat areas and is kept wet most of the time by a high water table.

This soil is rapidly permeable, and can be drained if suitable outlets are available. If drained, this soil is suited to hay and pasture, but lime and fertilizer are needed to obtain good yields. If the soil is not drained, it can be used for limited grazing, for woodland, or for wildlife habitats. (Capability unit Vw-5; woodland suitability group 13)

Scituate Series

The Scituate series consists of moderately well drained soils that formed in compact glacial deposits derived mainly from granite and gneiss. At a depth of about 24 inches these soils have a hard layer that is difficult to dig with a spade. They are in level to moderately steep uplands in the eastern part of the county.

The Scituate soils are near the shallow Shapleigh, the well-drained Gloucester and Essex, and the poorly drained Ridgebury soils.

A typical cultivated Scituate soil has a crumbly, very dark brown fine sandy loam surface layer about 8 inches thick. The upper subsoil is dark yellowish-brown fine sandy loam. The lower subsoil is loose, olive-brown coarse sandy loam that contains dark yellowish-brown mottles to a depth of about 25 inches. Below this, the substratum is firm or very firm gravelly sandy loam to gravelly loamy sand. It is olive brown or olive gray with dark yellowish-brown to dark-brown mottles.

Many of the Scituate soils are extremely stony on the surface and have many stones throughout their profile. Stones 10 to 24 inches in diameter are 5 to 60 feet apart on the surface in areas not cleared for cultivation. The texture of the surface layer and the upper subsoil ranges from fine sandy loam to loamy sand. In the lower subsoil and the substratum, the texture ranges from coarse sandy loam to gravelly loamy sand.

Water passes readily through the surface layer and upper subsoil, but slowly through the compact substratum. The Scituate soils are wet early in spring, often late in spring, and sometimes in fall.

Scituate fine sandy loam, 0 to 3 percent slopes (SeA).—This moderately well drained soil is in nearly level uplands in the eastern part of the county. It has slightly more mottling in the lower subsoil than the soil described as typical of the series, and the mottling is generally nearer the surface. Most of the surface stones have been removed.

Surface water from surrounding slopes collects on this nearly level soil and keeps it wet. The soil is suited to silage corn, hay, and pasture, but drainage is needed to improve yields. (Capability unit IIw–2; woodland suitability group 6)

Scituate fine sandy loam, 3 to 8 percent slopes (SeB).—This moderately well drained soil is in gently sloping uplands in the eastern part of the county. Most of the stones have been removed from the surface of this soil.

Wetness is the major problem, but erosion is also a problem if this soil is not properly tilled. Hay, pasture, and silage corn are suitable for this soil, but drainage is needed to improve yields. If row crops are grown, they should be in graded rows to improve surface drainage. (Capability unit IIw–2; woodland suitability group 6)

Scituate fine sandy loam, 8 to 15 percent slopes (SeC).—This moderately well drained soil is in moderately sloping uplands in the eastern part of the county. Most surface stones have been removed.

This soil is suited to silage corn, hay, and pasture, but erosion control measures are needed. Diversions and grass waterways help to control erosion on long slopes. Graded rows help to control surface water, and drainage improves crop yields. (Capability unit IIIe–22; woodland suitability group 6)

Scituate very stony fine sandy loam, 0 to 3 percent slopes (SfA).—In most places this moderately well drained soil has a thinner, darker surface layer than the soil described for the series. It is in nearly flat uplands in the eastern part of the county. Stones 10 to 24 inches in diameter are 20 to 80 feet apart on the surface.

Stones limit the use of this soil for tilled crops, and it is generally not practical to clear the soil for cultivation. It is used for pasture and woodland. It may be practical to clear the stones from the surface in some areas if more acreage is needed for row crops, hay, or improved pasture. (Capability unit Vs–22; woodland suitability group 6)

Scituate very stony fine sandy loam, 3 to 8 percent slopes (SfB).—In most places this moderately well drained soil has a thinner, darker surface layer than the soil described for the series. It is in gently sloping uplands in the eastern part of the county. Surface stones are 20 to 80 feet apart.

Stones limit the use of this soil to pasture and woodland, and in some areas it is practical to remove surface stones if more acreage is needed for cultivated crops, hay, or

improved pasture. If stones are removed, this soil is suited to the same crops and the same kind of management as Scituate fine sandy loam, 3 to 8 percent slopes. (Capability unit VIs–22; woodland suitability group 6)

Scituate very stony fine sandy loam, 8 to 15 percent slopes (SfC).—In many places this moderately well drained soil has a thinner, darker surface layer than the soil described for the series. It is in moderately sloping uplands in the eastern part of the county. Stones are 20 to 80 feet apart on the surface. Included with this soil in mapping are some areas that have slopes steeper than 15 percent.

Stoniness and degree of slope limit the use of this soil to pasture and woodland. It is generally not feasible to remove the stones and use this soil for crops. (Capability unit VIs–22; woodland suitability group 6)

Scituate extremely stony fine sandy loam, 0 to 8 percent slopes (SgB).—This moderately well drained soil has a thinner, darker surface layer than the typical soil described. It is in nearly level and gently sloping uplands in the eastern part of the county. Stones on the surface are 2 to 20 feet apart.

Surface stones limit the use of this soil to woodland and unimproved pasture. Upland oaks, northern hardwoods, red pine, and white pine produce good yields of timber on this soil. Access roads and skid roads should be so located and maintained that they do not concentrate surface water and cause gullies. Clearing this soil of stones to use it for crops generally is not practical. (Capability unit VIIs–2; woodland suitability group 4)

Scituate extremely stony fine sandy loam, 8 to 25 percent slopes (SgC).—This moderately well drained soil has a thinner, darker surface layer than the typical soil described. It occurs in moderately sloping and moderately steep uplands in the eastern part of the county. Stones are 2 to 20 feet apart on the surface.

Stoniness limits the use of this soil to woodland. Adapted trees produce good yields of timber. (Capability unit VIIs–2; woodland suitability group 4)

Shapleigh Series

The Shapleigh series consists of somewhat excessively drained fine sandy loams underlain by bedrock. These soils formed in a thin layer of glacial material derived mainly from granite and quartzite. They are in gently sloping to very steep areas in the eastern part of the county.

The Shapleigh soils are near the well-drained Gloucester and Essex, the moderately well drained Scituate, and the poorly drained Ridgebury soils.

A typical cultivated Shapleigh soil has a dark-brown fine sandy loam surface layer about 8 inches thick. The subsoil is dark yellowish-brown loamy sand that fades to brown with depth. This generally is underlain by granitic bedrock at a depth of about 16 inches.

Outcrops of bedrock occur 10 to 100 feet apart, and stones and boulders are also scattered over the surface. The depth to bedrock generally is about 20 inches but ranges from bare outcrop to about 24 inches. The texture of the surface layer and upper subsoil ranges from fine sandy loam to loamy sand. Rock fragments less than 10 inches in diameter comprise from 5 to 40 percent of the subsoil material.

Shapleigh fine sandy loam, 3 to 8 percent slopes (ShB).—This slightly droughty, shallow soil is in gently sloping uplands in the eastern part of the county. Outcrops of rock are 100 to 300 feet apart, and the depth to bedrock is a little greater than is typical of the series. Most surface stones have been removed from this soil.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. The soil is shallow and therefore droughty during dry periods. A few areas are used for cultivated crops or improved hay, but most of this soil is in woodland or pasture. Tillage and reseeding should be on the contour, if possible, to prevent erosion. Upland oaks, northern hardwoods, red pine, and white pine produce fair yields of timber on this soil. (Capability unit IIe–7; woodland suitability group 10)

Shapleigh fine sandy loam, 8 to 15 percent slopes (ShC).—This slightly droughty, shallow soil is in moderately sloping uplands in the eastern part of the county. Outcrops of rock are 100 to 300 feet apart, and the depth to bedrock is a little greater than is typical of the series. Included with this soil in mapping are a few areas that have slopes greater than 15 percent.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. The soil is shallow and therefore droughty during dry periods. A few areas are used for cultivated crops or improved hay, but most of this soil is in pasture or woodland. Tillage and reseeding should be on contour strips, if possible, to prevent erosion. Because of shallowness and rock outcrops, however, some conservation practices may be impractical. Upland oaks, northern hardwoods, red pine, and white pine produce fair yields of timber on this soil. (Capability unit IIIe–7; woodland suitability group 10)

Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes (SkC).—This shallow, droughty soil has a thinner, darker surface layer in most places, than the typical soil described. It is in gently sloping and moderately sloping uplands in the eastern part of the county. Outcrops of rock are about 100 feet apart. Also, there are many stones and boulders on the surface in most places. Included with this soil in mapping are some areas that have slopes of less than 3 percent.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. The soil is droughty during dry periods because it is shallow. Rock outcrops interfere with tillage and limit the use of the soil for crops. Most of this soil is in woodland, but some of it is used for pasture. Upland oaks, northern hardwoods, red pine, and white pine produce fair yields of timber. Roads and skidways should be so located and maintained that they will not be washed out by runoff. (Capability unit VIs–7; woodland suitability group 10)

Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes (SkD).—This shallow, droughty soil has a thinner, darker surface layer than the soil described for the series. It is on moderately steep uplands in the eastern part of the county. Outcrops of rock are about 50 to 100 feet apart. Also, there are many stones and boulders on the surface.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. It is droughty during dry periods because of its shallowness. This soil is too steep and has too many rock outcrops to

be used for anything but unimproved pasture and woodland. Upland oaks, northern hardwoods, red pine, and white pine produce fair yields of timber. Roads and skidways should be carefully planned to prevent surface water from concentrating and causing gullies. (Capability unit VIs–7; woodland suitability group 10)

Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes (SmC).—This shallow, droughty soil has a thinner, darker surface layer than the soil described for the series. It is in gently sloping to moderately steep uplands in the eastern part of the county. Outcrops of bedrock are less than 50 feet apart, and many stones and boulders are on the surface.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. It is droughty because of its shallowness. The use of this soil is limited to woodland. Upland oaks, northern hardwoods, red pine, and white pine produce poor yields of timber on this soil. Roads and skidways should be so located that they do not concentrate surface water and cause washouts. (Capability unit VIIs–7; woodland suitability group 11)

Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes (SmF).—This shallow, droughty soil has a thinner, darker surface layer than the soil described for the series. It is in steep and very steep uplands in the eastern part of the county. Outcrops of bedrock are less than 50 feet apart, and many stones and boulders are on the surface. Most areas are shallower than is typical of the series. Included are some areas that have outcrops of bedrock on more than 50 percent of the surface.

This soil has moderately rapid to rapid permeability and low to moderate moisture-holding capacity. The soil is droughty because it is shallow. Use of this soil is limited to woodland. Upland oaks, northern hardwoods, red pine, and white pine produce poor yields of timber and, in many areas, careful planning and special equipment are necessary to harvest the crop. The risk of erosion is high if the vegetation is removed. (Capability unit VIIs–7; woodland suitability group 11)

Shelburne Series

The soils of the Shelburne series are well-drained loams that formed in compact glacial deposits derived mainly from dark-gray schistose material and impure limestone. These soils have a hard layer about 24 inches from the surface that is difficult to dig with a spade. They are in gently sloping to very steep foothills in the western highlands.

Shelburne soils are near the shallow Westminster, the well-drained Colrain, the moderately well drained Buckland, and the poorly drained and very poorly drained Cabot soils.

A typical Shelburne soil that has been tilled has a crumbly surface layer of very dark grayish-brown loam about 8 inches thick. The subsoil is olive-brown loam. It extends to a depth of about 24 inches and contains a few dark reddish-brown fragments of partly decomposed, impure limestone. The substratum is very firm olive-gray loam that contains many fragments of partly decomposed limestone.

Many of the Shelburne soils are extremely stony. Stones 10 to 24 inches in diameter are scattered throughout the soil. In some areas there are boulders 2 to 5 feet in diameter. The texture is a little coarser in some places. It ranges from loam to fine sandy loam. The depth to the hard layer ranges from 20 to 30 inches. Because of their loam texture, these soils retain moisture well.

Shelburne loam, 3 to 8 percent slopes (SnB).—This soil is well drained. It is in gently sloping foothills of the western highlands. Most of the surface stones have been removed. Included with this soil in mapping are some areas in which slopes are less than 3 percent.

This soil has moderate to slow permeability and moderate moisture-holding capacity. It is suited to silage corn, hay, pasture, and other crops grown in the area. Simple control measures are needed to protect the soil from runoff. Row crops should be grown on the contour. Bothersome wet spots may need to be drained. (Capability unit IIe–2; woodland suitability group 3)

Shelburne loam, 8 to 15 percent slopes (SnC).—This soil is well drained. It is in moderately sloping areas in the foothills of the western highlands. Most of the surface stones have been removed.

This soil has moderate to slow permeability and moderate moisture-holding capacity. It is suited to silage corn, hay, pasture, and other crops. The risk of erosion is high in unprotected areas. Row crops should be in contour strips. On long slopes diversions and grass waterways are needed to control runoff and erosion. (Capabality unit IIIe–2; woodland suitability group 3)

Shelburne loam, 15 to 25 percent slopes (SnD).—This soil is well drained. It is in moderately steep foothills of the western highlands. Most of the surface stones have been removed.

This soil has moderate to slow permeability and moderate moisture-holding capacity. Row crops can be grown occasionally, but the soil is better suited for hay and pasture. The risk of erosion is high in unprotected areas. If the soil is cultivated, diversions, grass waterways and contour strips help to control runoff and erosion. (Capability unit IVe–2; woodland suitability group 3)

Shelburne very stony loam, 3 to 8 percent slopes (SoB).—In most places this well-drained soil has a thinner, darker surface layer than the soil described for the series. It is in gently sloping foothills of the western highlands. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity.

Surface stones limit the use of this soil to pasture or woodland. Northern hardwoods, red pine, and white pine produce good yields of timber. In some places it may be practical to remove the surface stones if more acreage is needed for row crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Shelburne loam, 3 to 8 percent slopes. (Capability unit VIs–2; woodland suitability group 3)

Shelburne very stony loam, 8 to 15 percent slopes (SoC).—In most places this well-drained soil has a thinner, darker surface layer than the typical soil. It is in moderately sloping foothills of the western highlands. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity. Surface stones limit the use of this soil to pasture or woodland. Northern hard-

woods, red pine, and white pine produce good yields of timber. In some places removing the surface stones may be practical if more acreage is needed for row crops. If stones are removed, this soil is suited to the same crops and the same kind of management as Shelburne loam, 8 to 15 percent slopes. (Capability unit VIs–2; woodland suitability group 3)

Shelburne very stony loam, 15 to 25 percent slopes (SoD).—This well-drained soil has a thinner, darker surface layer than the typical soil described. It is in moderately steep foothills of the western highlands. Stones 10 to 24 inches in diameter are 20 to 100 feet apart on the surface.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity. Surface stones limit the use of this soil to hay, pasture, or woodland. Northern hardwoods, red pine, and white pine produce good yields of timber. In some places removing the surface stones may be practical if more acreage is needed for row crops, hay, or improved pasture. If stones are removed, this soil is suited to the same crops and kind of management as Shelburne loam, 15 to 25 percent slopes. (Capability unit VIs–2; woodland suitability group 3)

Shelburne extremely stony loam, 3 to 8 percent slopes (SpB).—This well-drained soil has a thinner, darker surface layer than the typical soil described. It is in gently sloping foothills of the western highlands. Stones 10 to 24 inches in diameter are 5 to 20 feet apart on the surface.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity. Generally, removing the surface stones from this soil is not practical. Its use is limited to unimproved pasture and woodland. Northern hardwoods, red pine, and white pine produce good yields of timber on this soil. Access roads and skidways should be so located and maintained that they do not concentrate surface water and cause gullying. (Capability unit VIIs–2; woodland suitability group 4)

Shelburne extremely stony loam, 8 to 25 percent slopes (SpD).—This well-drained soil has a thinner, darker surface layer than the soil described as typical. It is in moderately sloping and moderately steep foothills of the western highlands. Stones 10 to 24 inches in diameter are about 5 to 20 feet apart on the surface.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity. Removing the surface stones from this soil generally is not practical. Its use is limited to unimproved pasture and woodland. Northern hardwoods, red pine, and white pine produce good yields of timber. Access roads and skidways should be so located and maintained that they do not concentrate surface water and cause gullying. (Capability unit VIIs–2; woodland suitability group 4)

Shelburne extremely stony loam, 25 to 50 percent slopes (SpF).—This well-drained soil has a thinner, darker surface layer than the typical soil described. It is in steep and very steep foothills of the western highlands. Stones 10 to 24 inches in diameter are about 5 to 20 feet apart on the surface. Included with this soil in mapping are some areas that have fewer surface stones.

This soil is moderately to slowly permeable and has a moderate moisture-holding capacity. The surface stones and degree of slope limit the use of this soil to woodland or wildlife habitats. Northern hardwoods, white pine, and red pine produce good yields of timber, but in many areas careful planning and special equipment are necessary to harvest the crop. Access roads and skidways must be carefully located to prevent surface water from concentrating and causing gullies. (Capability unit VIIs–2; woodland suitability group 4)

Stissing Series

The Stissing series consists of poorly drained silt loams that have formed in compact glacial till deposits derived mainly from dark-gray phyllite. At a depth of about 16 inches, these soils have a hard layer that is difficult to dig with a spade. They are in gently sloping upland depressions and seep areas at the base of slopes in the towns of Bernardston and Leyden.

The Stissing soils are near the shallow Nassau, the well-drained Dutchess and Bernardston, the moderately well drained Pittstown, and the very poorly drained Whitman soils.

These soils are dull or dark colored, a characteristic that is derived from the dark parent material. From 5 to 15 percent of the soil consists of phyllite chips less than one-half inch long. Many larger phyllite fragments are also in these soils.

A typical Stissing soil that has been cultivated has a crumbly, very dark grayish-brown silt loam surface layer about 8 inches thick. The subsoil is gray silt loam that has many dark reddish-brown mottles. It extends to a depth of about 16 inches. This is underlain by a very firm, gray silt loam substratum that has many dark-brown mottles.

These soils generally are stony on the surface unless they have been cleared for farming. The depth to the compact substratum ranges from 12 to 24 inches. Stissing soils are wet most of the year. They get surface water and seepage from surrounding slopes, and they are sometimes ponded. The hard layer in these soils restricts the downward movement of water. Natural outlets for surface drainage in many places are very poor or are lacking altogether.

Stissing silt loam, 0 to 8 percent slopes (SrB).—This soil is poorly drained. It is in level to gently sloping upland depressions and in areas at the base of slopes in the towns of Bernardston and Leyden. Most of the surface stones have been removed.

This soil is moderately to slowly permeable and has a high moisture-holding capacity. It is wet 7 to 9 months of the year. In many places natural outlets for surface drainage are very poor or are lacking altogether. If this soil is not drained, the use is limited to low-yielding hayfields or pasture and to woodland. Drained areas are suited to improved hay or pasture and to moisture-tolerant row crops. A row crop should be followed by a winter cover crop. On gentle slopes, row crops should be in graded rows. Lime and fertilizer are necessary for favorable yields. (Capability unit IIIw–2; woodland suitability group 7)

Stissing very stony silt loam, 3 to 8 percent slopes (SsB).—This poorly drained soil has a thinner, blacker surface layer than the soil described for the series. It is in gently sloping upland depressions or at the base of slopes in the towns of Bernardston and Leyden. Stones are scattered less than 50 feet apart on the surface. Included with this soil in mapping are some areas in which slopes are less than 3 percent.

This soil is moderately to slowly permeable and has a high moisture-holding capacity. It is wet 7 to 9 months of the year. Surface stones 10 to 24 inches in diameter interfere with tillage. This soil is well suited to and used mostly for woodland. (Capability unit VIIs–23; woodland suitability group 7)

Sudbury Series

The soils of the Sudbury series are moderately well drained fine sandy loams that formed in deep sandy and gravelly deposits. The sand and gravel were derived mainly from granite, gneiss, and quartzite in varying proportions. The Sudbury soils are on level to gently sloping glacial-outwash terraces and stream terraces.

These soils are near the excessively drained Hinckley, the somewhat excessively drained to well drained Merrimac, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

A typical profile of the Sudbury soils has a crumbly, very dark grayish-brown fine sandy loam surface layer about 9 inches thick. The upper subsoil is a dark yellowish-brown fine sandy loam. The lower subsoil is light olive-brown fine sandy loam that has brown to dark yellowish-brown mottles. This is underlain at a depth of about 24 inches by a rapidly permeable substratum, which consists of coarsely stratified sand and gravelly sand with occasional cobbles. The substratum is dark yellowish brown to light olive brown.

In some areas the surface layer and upper subsoil are a little coarser than is typical of the series. The texture ranges from fine sandy loam to sandy loam. The lower subsoil is loamy sand in some areas. The depth to mottling ranges from 16 to 28 inches. The depth to the stratified substratum ranges from 20 to 36 inches.

Water passes readily through the Sudbury soils, except when they are saturated. A high water table makes them wet in the spring. These soils are easy to work after they have dried out. Drained areas are used extensively for corn, tobacco, and other cultivated crops and for forage crops. Undrained areas are suitable for hay and pasture. Drainage is needed for best yields of crops. In some years irrigation may be needed during long dry periods. Hay and pasture crops can be grown without drainage. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth.

Sudbury fine sandy loam, 0 to 3 percent slopes (StA).—This soil is moderately well drained. It is on nearly level terraces near fast-flowing rivers or streams. Included with it are small areas that are wetter than is typical of the series.

A high water table keeps this soil wet in the spring, but the soil is easy to work after it has dried out. Drained areas are suited to corn, tobacco, and other cultivated crops and to forage crops. Drainage is needed for row crops, but hay and pasture can be grown without drainage. Crops may require irrigation during long dry periods. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Additions of organic matter help to maintain good tilth. (Capability unit IIw–5; woodland suitability group 6)

Sudbury fine sandy loam, 3 to 8 percent slopes (StB).—This soil is on gently sloping terraces near fast-flowing streams. Included with this soil in mapping are small areas in which slopes are steeper than 8 percent.

A high water table keeps this soil wet in the spring, but the soil is easy to work after it dries out. Drained areas are suited to corn, tobacco, and other cultivated crops as well as to forage crops. Drainage is needed for row crops, but hay and pasture can be grown without drainage. Irrigation may be necessary during long, dry periods. Liberal amounts of lime and fertilizer are needed to obtain favorable yields. Additions of organic matter help to maintain good tilth. (Capability unit IIw–5; woodland suitability group 6)

Suffield Series

The Suffield series consists of well-drained silt loams that formed in silt and clay deposits in old lakebeds. They are in gently sloping to steep areas in the Connecticut Valley.

The Suffield soils are near the moderately well drained Buxton, the poorly drained Scantic, and the very poorly drained Biddeford soils.

A typical Suffield soil that has not been cultivated has a crumbly surface layer of very dark grayish-brown silt loam about 2 or 3 inches thick. Below this is the subsoil, which extends to a depth of about 24 inches. It is crumbly, olive to olive-brown silt loam in the upper part. The lower part is olive in color, is firm, and contains more clay. The substratum is composed of thin layers of clay separated by somewhat thicker layers of silt. These layers are old lake sediments. They are olive or olive gray and in some places are mottled gray and very dark grayish brown. They are firm to very firm and hard to dig.

Water moves somewhat readily through the surface layer and upper subsoil but slowly through the substratum. When these soils become saturated, they stay wet for quite a long time, and they compact if they are worked when wet. Their fine-textured substratum impedes internal drainage and makes them slow to warm up in the spring. These soils retain moisture well, however, and crops grown on them are seldom affected by drought. They are suited to row crops, hay, and pasture.

Suffield silt loam, 3 to 8 percent slopes (SuB).—This soil is well drained. It is in gently sloping areas in the Connecticut Valley. It has a thicker surface layer than the soil described for the series, and it is slightly deeper to the substratum. Also, some small areas are wetter than typical.

Because of the fine texture and the slow infiltration of water, this soil is subject to severe erosion, even in gently sloping areas. Therefore, conservation practices are needed if the soil is tilled. Row crops should be grown on the contour, and stripcropping is needed on longer slopes. (Capability unit IIe–4; woodland suitability group 3)

Suffield silt loam, 8 to 15 percent slopes, eroded (SuC2).—This soil is well drained. It is in moderately sloping, old, dissected lakebeds in the Connecticut Valley. This soil is eroded and lacks the normal 7- or 8-inch surface layer and the upper subsoil that is typical of the series. It has a dark grayish-brown surface layer that is only 3 or 4 inches thick. This is underlain by a light olive-brown subsoil that corresponds to the lower part of the typical subsoil. The substratum is like that of the

typical profile, but is generally only about 18 or 20 inches from the surface.

Because of the fine texture and the slow infiltration of water, this soil is subject to severe erosion. Therefore, conservation practices are needed if the soil is tilled. Diversions, grass waterways, and contour strips are needed to protect this soil if it is used for row crops. (Capability unit IIIe–4; woodland suitability group 3)

Suffield silt loam, 15 to 35 percent slopes, eroded (SuE2).—This soil is well drained. It is like Suffield silt loam, 8 to 15 percent slopes, eroded, except that it is more steeply sloping and in some places the substratum is closer to the surface. This soil is in the steepest areas of old, dissected lakebeds in the Connecticut Valley. Many slopes are as steep as 35 percent, and some are steeper. Where slopes are steeper than 25 percent, the substratum generally is within 14 or 16 inches of the surface.

This soil has slow permeability in the substratum and a high moisture-holding capacity. Once it is saturated, it stays wet for a long time. Because of the steep slopes, the fine texture, and the slow infiltration, this soil is subject to severe erosion. It is not suited to cultivated crops. It needs to be protected from erosion by a sod crop or by trees or shrubs. This soil is suited to hay, pasture, or woods. It should be reseeded in strips and grass waterways left in sod to control erosion. (Capability unit VIe–4; woodland suitability group 3)

Suncook Series

The Suncook series consists of excessively drained loamy sands that formed in recently deposited materials. These soils occur along many of the rivers and streams in the county and, in some places, are flooded annually. Most Suncook soils are nearly level. They are steeper, however, in eroded areas where steep banks have formed along most of the rivers or streams.

The Suncook soils are near the well-drained Ondawa and Hadley soils, the moderately well drained Podunk and Winooski soils, the poorly drained Rumney and Limerick soils, and the very poorly drained Saco soils. Some areas are near the excessively drained Windsor and Hinckley and the well-drained Agawam and Merrimac soils.

A typical Suncook soil that has been cultivated has a surface layer of crumbly, very dark grayish-brown loamy sand about 10 inches thick. Below this is olive or olive-brown sand, loamy sand, or gravelly sand.

The Suncook soils are nonstony, but some areas are gravelly or cobbly in the surface layer or lower. The texture of the surface layer ranges from loamy fine sand to cobbly or gravelly loamy sand.

Suncook loamy sand (Sv).—This soil dries out early in the spring, except where it is flooded. The soil is easy to work. It is rapidly permeable and has a low moisture-holding capacity. This soil is suited to row crops if planting is delayed until after spring floods have receded. It is also suited to forage crops and pasture. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. Irrigation is necessary to obtain maximum yields of row crops. There is some risk of bank erosion along the rivers and streams. (Capability unit IIIs–6; woodland suitability group 8)

Sunderland Series

The Sunderland series consists of somewhat excessively drained, shallow fine sandy loams. These soils formed in glacial deposits derived mainly from red sedimentary rocks. Consequently, they have a red subsoil. They are in gently sloping to very steep areas in the central part of the county.

The Sunderland soils are near the shallow Holyoke and the deep, well-drained Cheshire soils.

A typical Sunderland soil that has not been tilled has a thin surface layer of crumbly, nearly black fine sandy loam about 2 inches thick. It generally is covered with 2 to 3 inches of forest litter consisting of leaves and twigs in various stages of decomposition. Below the surface layer the dark reddish-brown fine sandy loam subsoil extends to a depth of about 22 inches. This is underlain by bedrock of red sandstone, shale, or conglomerate.

Outcrops of rock occur 10 to 200 feet apart. The depth to bedrock ranges from the exposed outcrops to about 26 inches. The texture generally is fine sandy loam but ranges from sandy loam to loam. Gravel and cobbles of red sandstone and shale may comprise as much as 60 percent of these soils.

In Franklin County the Sunderland soils are mapped only with the Holyoke soils in undifferentiated mapping units and are described with those soils.

Sutton Series

The soils of the Sutton series are moderately well drained fine sandy loams that formed in glacial deposits derived mainly from schist. They are in level to moderately steep uplands.

The Sutton soils are near the shallow Lyman, Westminster, and Hollis soils, the well-drained Berkshire and Charlton soils, the poorly drained Ridgebury soils, and the very poorly drained Whitman soils.

A typical cultivated Sutton soil has a surface layer of crumbly, dark-brown fine sandy loam about 8 inches thick. The subsoil is fine sandy loam that extends to a depth of about 24 inches. It is dark yellowish brown in the upper part and fades to a yellowish brown or a light olive brown with depth. At a depth below 16 to 20 inches, the subsoil has dark yellowish-brown to dark-brown mottles. The substratum is olive or olive-brown fine sandy loam that has dark yellowish-brown mottles.

These soils generally are very stony or extremely stony except where they have been cleared for farming. The texture of the substratum is sandy loam in some places. The depth to mottling ranges from 16 to 26 inches. In some places there is a hard layer in the substratum at a depth below 30 inches. Such a layer has moderately slow to slow permeability.

The Sutton soils are always wet early in spring, often late in spring, and sometimes in fall.

Sutton fine sandy loam, 3 to 8 percent slopes (SwB).—This moderately well drained soil is in gently sloping upland areas mainly in uplands in the north-central part of the county. It has a slightly thicker surface layer than the soil described for the series. Most of the surface

stones have been removed for tillage. Included with this soil in mapping are a few areas in which slopes are less than 3 percent.

Water passes fairly rapidly through this soil, except when it is saturated. It has a moderately high moisture-holding capacity. Wetness is the major problem, but erosion also is a problem if this soil is not tilled properly. Working across the slope in graded strips wherever possible helps to control erosion. Long slopes may need diversions and grass waterways that intercept and carry away excess surface water. (Capability unit IIw–3; woodland suitability group 3)

Sutton fine sandy loam, 8 to 20 percent slopes (SwC).—This moderately well drained soil is in moderately sloping and moderately steep uplands in the north-central part of the county. Most of the surface stones have been removed for tillage. Included with this soil in mapping are a few areas in which slopes are steeper than 20 percent.

Water passes fairly rapidly through this soil, except when it is saturated. It has a moderately high moisture-holding capacity. This soil erodes if it is not tilled properly. Working across the slope in graded strips wherever possible helps to control erosion. On long slopes diversions and grass waterways are needed to control runoff and erosion. (Capability unit IIIe–22; woodland suitability group 3)

Sutton very stony fine sandy loam, 3 to 8 percent slopes (SxB).—In most places this moderately well drained soil has a thinner, darker surface layer than the soil described for the series. It is in gently sloping uplands mostly in the north-central part of the county. Stones 10 to 24 inches in diameter are 30 to 100 feet apart on the surface.

Except when this soil is saturated, water passes fairly rapidly through it. It has a fairly high moisture-holding capacity. The surface stones interfere with tillage and limit the use of this soil to woodland and pasture. Clearing the stones from the surface may be practical if more acreage is needed for cultivated crops. If stones are removed, this soil is suited to the same crops and kind of management as Sutton fine sandy loam, 3 to 8 percent slopes. (Capability unit VIs–22; woodland suitability group 3)

Sutton very stony fine sandy loam, 8 to 15 percent slopes (SxC).—In most places this moderately well drained soil has a thinner, darker surface layer than the soil described for the series. It is in sloping uplands, mostly in the north-central part of the county. Stones 10 to 24 inches in diameter are 30 to 100 feet apart on the surface. Included with this soil in mapping are some areas in which slopes are steeper than 15 percent.

Except when this soil is saturated, water passes moderately rapidly through it. It has a moderately high moisture-holding capacity. The surface stones interfere with tillage and limit the use of this soil to woodland and pasture. Clearing the stones from the surface may be practical if more acreage is needed for cultivated crops. When cleared of stones, this soil is suited to the same crops and management as Sutton fine sandy loam, 8 to 20 percent slopes. (Capability unit VIs–22; woodland suitability group 3)

Sutton extremely stony fine sandy loam, 0 to 8 percent slopes (SyB).—This moderately well drained soil is in nearly level to gently sloping uplands, mostly in the north-central part of the county. The surface layer is thinner and darker in color than is typical of the series. Surface stones 10 to 24 inches in diameter are less than 30 feet apart.

Water passes readily through this soil except when it is saturated. It has a fairly high moisture-holding capacity. The surface stones limit the use of this soil to unimproved pasture and woodland. It is best used for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Clearing the stones from the surface generally is not practical. (Capability unit VIIs–2; woodland suitability group 4)

Sutton extremely stony fine sandy loam, 8 to 25 percent slopes (SyC).—This moderately well drained soil is in moderately sloping to moderately steep uplands, mostly in the north-central part of the county. The surface layer is thinner and darker in color than is typical of the series. Surface stones 10 to 24 inches in diameter are less than 30 feet apart.

Except when this soil is saturated, water passes moderately rapidly through it. It has a moderately high moisture-holding capacity. Surface stones and wetness limit the use of this soil to unimproved pasture and woodland. The best use is for woodland. Northern hardwoods, upland oaks, white pine, and red pine produce good yields of timber on this soil. Access roads and skidways should be carefully located to prevent surface water from concentrating and causing gullies. (Capability unit VIIs–2; woodland suitability group 4)

Swanton Series

The Swanton series consists of poorly drained very fine sandy loams that formed in sandy deposits underlain by silt and clay. These soils are on nearly level to gently sloping terraces or in depressions in terraces that were once glacial lakebeds.

The Swanton soils generally are near the well-drained Agawam soils, silty substratum, or the moderately well drained Ninigret soils, silty substratum.

A typical Swanton soil that has been cultivated has a surface layer of crumbly, very dark grayish-brown very fine sandy loam about 8 inches thick. The sandy subsoil is grayish fine sandy loam that has dark bluish-gray to yellowish-brown mottles. It extends to a depth of about 15 inches. Below this to a depth of about 24 inches is gray, gritty silt loam that grades to olive silty clay loam with depth. The substratum is olive, dark brown, and grayish brown. It consists of thin layers of clay separated by thicker layers of silt. Very thin layers of very fine sand are present in some places.

The depth to the varved silt and clay substratum ranges from 15 to 36 inches. In places the layer just above the silt and clay contains as much as 30 percent gravel.

The Swanton soils are wet 7 to 9 months of the year. Water passes readily through their surface layer and subsoil, except when these layers are saturated. Water passes very slowly through the substratum, however. Consequently, these soils are slow to dry out in the spring and after heavy rains. The substratum also limits the amount of water these soils can absorb during any period of rainfall. Some areas can be drained by tile or open ditches.

Without drainage these soils are best suited to hay and pasture or to woodland, and the yields of hay and pasture are poor. Grazing should be delayed until the soil has

dried out. This practice will prevent puddling of the surface layer and cutting of the sod. Areas that are drained can be used for silage corn, potatoes, and most of the truck crops grown in the county and for all improved forage crops except alfalfa. Crops may fail, however, when the rainfall is excessive during the growing season. Lime and fertilizer are needed to obtain favorable yields.

Swanton very fine sandy loam, 0 to 3 percent slopes (SzA).—This poorly drained soil is in nearly level areas and depressions in former lakebeds.

Without drainage this soil produces a low quality of hay and pasture. Drainage may be practical if suitable outlets can be found. Drained areas can be used for silage corn, most truck crops, and improved forage, except alfalfa. (Capability unit IIIw–5; woodland suitability group 7)

Swanton very fine sandy loam, 3 to 8 percent slopes (SzB).—This soil is in gently sloping areas in former lakebeds.

Because the soil is gently sloping it generally is easy to drain, but it is susceptible to erosion. Without drainage, the soil produces a low quality of hay and pasture. Drained areas can be used for silage corn, potatoes, most truck crops, and improved forage crops, except alfafa. If the soil is cultivated, row crops should be in graded rows. (Capability unit IIIw–5; woodland suitability group 7)

Walpole Series

The Walpole series consists of poorly drained fine sandy loams that formed in deep sandy and gravelly deposits. The sand and gravel were derived mainly from granite, gneiss, and quartzite.

These soils are in depressions or gently sloping areas on glacial outwash terraces and stream terraces. The Walpole soils generally are near the excessively drained Hinckley soils, the somewhat excessively drained to well-drained Merrimac soils, the moderately well drained Sudbury soils, and the very poorly drained Scarboro soils. They are intermingled with the Wareham soils.

A typical Walpole soil that has been cultivated has a surface layer of crumbly, very dark gray fine sandy loam about 7 inches thick. The subsoil is dark-gray to very dark grayish-brown fine sandy loam that is mottled with dark reddish brown to brown. This layer is underlain at a depth of about 26 inches by the substratum, which is gray and brown stratified sand and gravel.

The depth to stratified sand and gravel ranges from 15 to more than 36 inches. The amount of gravel in the subsoil generally ranges from about 5 to 30 percent, but in some places it is as much as 75 percent. The texture in some places is a little coarser than is typical of the series; it ranges from sandy loam to loam and includes gravelly phases. The lower part of the subsoil is loamy sand in places.

The Walpole soils are wet 7 to 9 months of the year. Their use is limited by slow to very slow runoff, by lack of natural drainage outlets in many areas, and by a high water table. These soils are suited mainly to hay, pasture, or woodland. If the soils are not drained, yields of forage crops are low and poor in quality. The risk of row crop failure is high. If these soils are artificially drained, they can be improved enough to produce fair to good yields of forage crops and row crops. Applications of lime and fertilizer are needed to obtain favorable yields.

In Franklin County, the Walpole and Wareham soils are mapped together in undifferentiated units because they are intermingled, are both poorly drained, and their use and management are similar.

Walpole and Wareham fine sandy loams, 0 to 3 percent slopes (WaA).—These soils are poorly drained. Either one or both of these soils may occur within any area of this mapping unit. They are in nearly level depressions or low areas on terraces. Without drainage these soils can produce only a low quality of hay, pasture, or trees. If drained, they can be used for silage corn, truck crops, and improved forage crops, except alfalfa. (Capability unit IIIw–5; woodland suitability group 7)

Walpole and Wareham fine sandy loams, 3 to 8 percent slopes (WaB).—These soils are poorly drained. Either one or both soils may occur within any area of this mapping unit. They are in gently sloping depressions or low areas on terraces.

Without drainage, these soils can produce only a low quality of hay, pasture, or trees. Drained areas can be used for silage corn, truck crops, and improved forage crops, except alfalfa. Outlets for drainage are more readily available in these soils than in the less sloping soils. On long slopes contour tillage helps to prevent erosion. (Capability unit IIIw–5; woodland suitability group 7)

Wareham Series

The soils of the Wareham series are poorly drained fine sandy loams that formed in deep sandy and gravelly deposits. The sand and gravel were derived mainly from granite, gneiss, and quartzite. The Wareham soils are in depressions or gently sloping areas of glacial outwash terraces and stream terraces.

These soils generally are near the excessively drained Windsor, the moderately well drained Deerfield, and the very poorly drained Scarboro soils. The Wareham soils are intermingled with the poorly drained Walpole soils.

A typical Wareham soil that has been cultivated has a very dark gray fine sandy loam surface layer about 7 inches thick. It is crumbly and contains reddish-brown stains in root channels. The subsoil generally is a loamy sand and extends to a depth of about 16 inches, but the texture ranges to loamy coarse sand. It is crumbly and is light olive brown with yellowish-red mottles. Below this the substratum is olive gray with mottles of yellowish brown to light olive brown. The substratum is loamy coarse sand that grades with depth to stratified, fine, medium, and coarse sand. In many areas it contains gravel strata below a depth of about 30 inches.

Except for the coarser texture in the subsoil, these soils are like the Walpole soils. In Franklin County, the Wareham soils are mapped only with the Walpole soils in undifferentiated units and they are described with those soils.

Warwick Series

The soils of the Warwick series are well drained. These soils are gravelly fine sandy loams and gravelly loams that formed in stratified sand and gravel derived mainly from dark-colored phyllite, slate, and schist. They are on nearly level to very steep outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill.

The Warwick soils are near the shallow Nassau, the well-drained Dutchess and Bernardston, and the moderately well drained Pittstown soils. They are also near the moderately well drained Sudbury, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

A typical Warwick soil that has been cultivated has a surface layer of crumbly, dark-brown gravelly fine sandy loam about 8 inches thick. The subsoil is yellowish-brown gravelly fine sandy loam. With increasing depth the color changes to light olive brown. About 40 percent of the subsoil is dark-colored coarse fragments. The substratum is at a depth of about 20 inches. It is olive-brown, very gravelly sand that changes with depth to black and yellowish-brown stratified sand and gravel.

The texture of the surface layer and subsoil ranges from gravelly loam to gravelly sandy loam; that of the substratum ranges from fine sand to gravel. The depth to the substratum ranges from about 16 to 26 inches. The gravel content of this soil is as high as 50 percent in the surface layer and subsoil and ranges from 75 to 80 percent in the substratum. Cobbles are present in some places.

Warwick gravelly fine sandy loam, 0 to 3 percent slopes (WfA).—This soil is slightly droughty. It is on nearly level outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill.

Water passes readily through this soil, and the moisture-holding capacity is fair. This soil is suitable for corn and most other row crops. It is also suitable for alfalfa and for clover hay. Irrigation is usually necessary to obtain favorable yields of row crops, and frequent applications of fertilizer and lime are also needed. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. (Capability unit I–5; woodland suitability group 5)

Warwick gravelly fine sandy loam, 3 to 8 percent slopes (WfB).—This slightly droughty soil is on gently sloping outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill.

Water passes readily through this soil, and the moisture-holding capacity is poor to fair. The soil is suitable for corn and most other row crops, for alfalfa, and for clover hay, but irrigation is usually necessary to obtain favorable yields of crops, and frequent applications of lime and fertilizer are also needed. On some long slopes conservation is needed to control erosion. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. (Capability unit IIe–5; woodland suitability group 5)

Warwick gravelly fine sandy loam, 8 to 15 percent slopes (WfC).—This slightly droughty soil is on moderately sloping outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill.

Water passes readily through this soil, and the moisture-holding capacity is poor to fair. The soil is suitable for corn and most other row crops, for alfalfa, and for clover hay. Irrigation is usually necessary, however, for favorable yields of crops. Frequent applications of lime and fertilizer are also needed. Contour stripcropping helps control erosion. Diversions and grass waterways may be needed on long slopes. Organic matter in the form of manure or crop residue helps to maintain good tilth. (Capability unit IIIe–5; woodland suitability group 5)

Warwick gravelly fine sandy loam, 15 to 40 percent slopes (WfD).—This soil is slightly droughty. It is on moderately steep to very steep outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill. Included in mapping are some areas in which slopes are steeper than 40 percent.

Water passes readily through this soil, and the moisture-holding capacity is fair. Use is limited mainly to hay, pasture, or trees. The less sloping areas are suitable for limited cultivation. Row crops should be grown in contour strips alternating with grass or grass legumes. The reseeding of hayfields and pastures should be done in alternate contour strips, and grazing should be controlled to maintain the vegetation. Areas that have slopes steeper than 25 percent are better suited to trees. Woodland roads should be carefully located to control erosion. (Capability unit IVe–5; woodland suitability group 5)

Warwick gravelly loam, 0 to 3 percent slopes (WgA).—This well-drained soil is on nearly level outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill. It is underlain by deep deposits of sand and gravel. It is similar to the soil described for the series, but the surface layer and upper subsoil are gravelly loam, and the lower subsoil is gravelly loam or gravelly sandy loam. Included with this soil in mapping are areas that have very little gravel in the surface layer.

Water passes readily through this soil and through the substratum, but the soil has a moderate moisture-holding capacity because of its loam texture. Irrigation may be needed, however, to assure best yields. This soil is suitable for corn and most other row crops, for alfalfa, and for clover hay. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Adding organic matter helps to maintain good tilth. (Capability unit I–5; woodland suitability group 5)

Warwick gravelly loam, 3 to 8 percent slopes (WgB).—This well-drained soil is on gently sloping outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill. It is underlain by deep deposits of sand and gravel. It is similar to the soil described for the series, but the surface layer and upper subsoil are gravelly loam, and the lower subsoil is gravelly loam or gravelly sandy loam. Included are some areas that have very little gravel in the surface layer.

Water passes rapidly through this soil and through the substratum. Because of the loam texture of the surface layer and subsoil, the soil has a moderate moisture-holding capacity. Irrigation may be needed, however, to assure best yields. This soil is suitable for corn and most other row crops, for alfalfa, and for clover hay. On long slopes conservation practices may be needed to control erosion. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Organic matter in the form of manure or crop residue helps to maintain good tilth. (Capability unit IIe–5; woodland suitability group 5)

Warwick gravelly loam, 8 to 15 percent slopes (WgC).—This well-drained soil is on moderately sloping outwash plains and terraces in the towns of Bernardston, Greenfield, and Gill. It is underlain by deep deposits of sand and gravel. It is similar to the soil described for the series, but the surface layer and upper subsoil are gravelly loam, and the lower subsoil is gravelly loam or gravelly sandy loam. Included are some areas that have very little

gravel in the surface layer. Also included are some areas that have slopes steeper than 15 percent.

Water passes readily through this soil. The loam texture of the surface layer and subsoil provides a moderate moisture-holding capacity, but irrigation may be needed to assure best yields. This soil is suitable for corn and most other row crops, for alfalfa, and for clover hay. On slopes steeper than 12 percent, the operation of equipment for cultivating row crops may be dangerous. Row crops should be grown in contour strips. On long slopes diversions and grass waterways may be needed to control erosion. Lime and fertilizer are needed in liberal amounts to obtain favorable yields. Adding organic matter helps to maintain good tilth. (Capability unit IIIe-5; woodland suitability group 5)

Westminster Series

The Westminster series consists of well-drained, slightly droughty, shallow loams with a dull-colored subsoil. They formed in a layer of glacial material derived mainly from gray mica schist that contains some impure limestone in places. They are in gently sloping to very steep foothills of the western highlands.

The Westminster soils are near the well drained Marlow, dark subsoil, the well drained Colrain and Shelburne soils, the moderately well drained Peru and Buckland soils, the poorly drained Ridgebury soils, and the poorly and very poorly drained Cabot soils.

A typical Westminster soil that is forested has a thin, crumbly, black loam surface layer about 4 inches thick. This is covered by 3 or 4 inches of forest litter in various stages of decomposition. The subsoil is dark yellowish-brown loam. It is underlain at a depth of about 18 inches by dark-gray schist bedrock.

Outcrops of bedrock occur 10 to 150 feet apart, and stones and boulders are also scattered on the surface. The depth to bedrock is generally about 18 inches but ranges from the bare outcrop to 2 feet or more. The texture of the surface layer and subsoil ranges from loam to fine sandy loam.

Westminster loam, 3 to 8 percent slopes (WmB).—This soil is slightly droughty and shallow. It is in gently sloping foothills of the western highlands. This soil has a thicker, lighter colored surface layer than is typical of the series, and the depth to bedrock is generally slightly greater. Bedrock outcrops are 100 feet or more apart. Included in mapping are small areas in which slopes are less than 3 percent.

Most of this soil is forested or in pasture. Northern hardwoods, upland oaks, white pine, and red pine produce fair yields of timber on this soil. A few areas are used for cultivated crops and hay. Because this soil is shallow, it is droughty during dry periods. Tillage should be on the contour, if possible, to control erosion. (Capability unit IIe-7; woodland suitability group 10)

Westminster loam, 8 to 15 percent slopes (WmC).—This shallow soil is in sloping foothills of the western highlands. In most places it has a thicker, lighter colored surface layer than is typical of the series. Bedrock outcrops are 100 feet or more apart.

Most of this soil is forested, and adapted kinds of trees produce fair yields of timber. A few areas are used for cultivated crops and improved pasture and hay, but the soil is shallow and therefore droughty during periods of low rainfall. It is likely to erode if the vegetation is removed. Stripcropping is needed to control runoff and erosion, and on long slopes diversions and grass waterways may be needed. Some practices may be impractical to apply because the soil is shallow, and there are occasional rock outcrops. (Capability unit IIIe-7; woodland suitability group 10)

Westminster loam 15 to 25 percent slopes (WmD).—This soil is similar to the soil described as typical, but in places has a thicker, lighter colored surface layer. It is droughty and shallow. It is in moderately steep foothills of the western highlands. Bedrock outcrops are 100 feet or more apart.

Most of this soil is forested but some areas are used for row crops, hay, and pasture. Northern hardwoods, upland oaks, white pine, and red pine produce fair yields of timber on this soil. Access roads and skidtrails should be carefully planned and maintained to prevent washouts by runoff.

If the soil is cultivated, tillage and seeding should be in strips. Diversions and grass waterways are needed to control runoff and erosion. In places, these practices may be impractical to apply because of shallowness and occasional rock outcrops. (Capability unit IVe-7; woodland suitability group 10)

Westminster very rocky loam, 3 to 15 percent slopes (WnC).—This slightly droughty, shallow soil is in gently sloping and moderately sloping foothills of the western highlands. Rock outcrops are 50 to 100 feet apart. In many places there are stones and boulders on the surface.

The rock outcrops interfere with tillage, but a few small areas of this soil are used for cultivated crops and hay. Because the soil is shallow, however, most areas are used and are well suited for hay, pasture, or woodland. Northern hardwoods, upland oaks, white pine, and red pine produce fair yields of timber. (Capability unit VIs-7; woodland suitability group 10)

Westminster very rocky loam, 15 to 25 percent slopes (WnD).—This droughty, shallow soil is in moderately steep foothills of the western highlands. Rock outcrops are 50 to 100 feet apart.

This soil is too rocky and steep for cultivated crops. It is used for unimproved pasture and for woodland. Northern hardwoods, upland oaks, red pine, and white pine produce fair yields of timber on this soil. Access roads and skidroads should be so located that water does not concentrate and cause gullying. (Capability unit VIs-7; woodland suitability group 10)

Westminster extremely rocky loam, 3 to 25 percent slopes (WrD).—This droughty, shallow soil is in gently sloping to moderately steep foothills of the western highlands. Rock outcrops are less than 50 feet apart.

These outcrops of bedrock limit the use of this soil to unimproved pasture and woodland. Northern hardwoods, upland oaks, white pine, and red pine produce poor yields of timber on this soil. It is subject to severe erosion, however, if the vegetation is removed. Therefore, access roads and skidroads should be so located that they do not concentrate surface water on unprotected soil. (Capability unit VIIs-7; woodland suitability group 11)

Westminster extremely rocky loam, 25 to 75 percent slopes (WrF).—This droughty, shallow soil is in steep and very steep foothills of the western highlands. Rock out-

crops are less than 50 feet apart, and the depth to bedrock is less than is typical of the series.

Rockiness and steep slopes limit the use of this soil to woodland or wildlife habitats. Northern hardwoods, upland oaks, red pine, and white pine produce poor yields of timber on this soil. Careful planning and sometimes special equipment are required to harvest the crop. Access roads and skidways must be carefully planned and maintained to prevent the concentration of water on unprotected soil. Water bars are necessary on most roads, and skidways are needed to prevent washouts. (Capability unit VIIs–7; woodland suitability group 11)

Whitman Series

The Whitman series consists of very poorly drained fine sandy loams that have formed in glacial deposits derived mainly from granite, gneiss, or schist. These soils have a hard layer at a depth of about 14 inches. They are nearly level and are in depressions in the uplands west of the Connecticut River.

The Whitman soils are near the shallow Lyman, Hollis, and Nassau soils, the well-drained Berkshire, Marlow, Charlton, Dutchess, and Bernardston soils, the moderately well drained Peru, Sutton, and Pittstown soils, and the poorly drained Ridgebury and Stissing soils.

A typical Whitman soil has a crumbly, black, fine sandy loam surface layer about 6 inches thick. Below the surface layer is gray gravelly very fine sandy loam underlain at 15 to 19 inches by dark-gray gravelly fine sandy loam that has olive-brown and yellowish-red mottles. Below this there is a firm substratum that is olive gravelly sandy loam with gray and dark yellowish-brown mottles. In most places the firm layer is at a depth of about 14 inches, but the depth ranges from 14 to 24 inches or more.

The surface layer contains much organic matter and, in places, it consists of as much as 12 inches of muck. The texture of the surface layer that does not have any organic accumulation, ranges from silt loam to fine sandy loam. Below the surface layer, and to a depth of about 20 inches the texture ranges from very fine sandy loam to sandy loam. Most of the Whitman soils are very stony or extremely stony.

These soils have a water table that is at or near the surface most of the year. Also they are often ponded by surface water and seepage from surrounding slopes. The hard layer restricts the downward movement of water. In most places natural outlets for surface drainage are lacking, and generally it is not feasible to drain these soils.

Whitman fine sandy loam, 0 to 3 percent slopes (WsA).—This soil is level or nearly level and very poorly drained. It is in the bottoms of depressions in uplands west of the Connecticut River. Few stones are on the surface. Included in mapping are a few areas in which slopes are steeper than 3 percent.

A water table is at or near the surface of this soil most of the year. The soil is often ponded by surface water and seepage from surrounding slopes. It is not productive, and drainage is generally impractical. Most of this soil is used for woodland or for native pasture, but the forage quality is poor and the growth of the trees is slow. If the soil could be drained, the quality of the forage would be improved. (Capability unit Vw–2; woodland suitability group 13)

794–264—66——11

Whitman extremely stony fine sandy loam, 0 to 3 percent slopes (WtA).—This soil is level or nearly level and very poorly drained. It is in the bottoms of depressions in uplands west of the Connecticut River. Stones cover more than 2 percent of the surface. Included in mapping are some areas in which slopes are greater than 3 percent.

A water table is at or near the surface of this soil most of the year. It is often ponded by surface water and seepage from the surrounding slopes. Surface stones and wetness limit the use of this soil to woodland and to wildlife habitats, but the growth of trees is slow. (Capability unit VIIs–24; woodland suitability group 13)

Windsor Series

The soils of the Windsor series are droughty loamy sands that formed in deep deposits of wind or water-sorted sand. These soils are on nearly level to steep terraces bordering the major streams. There are short, steep escarpments between terrace levels.

The Windsor soils are near the droughty Hinckley soils, the well-drained Agawam soils, the moderately well drained Deerfield and Ninigret soils, the poorly drained Walpole, Wareham, and Saugatuck soils, and the poorly drained Scarboro soils.

A Windsor soil that has been cultivated and is now in woods has a surface layer about 5 inches thick. It is very dark brown loamy fine sand that crumbles in the hand. The subsoil is yellowish-brown loamy fine sand. Immediately beneath the plow layer in many areas is a 3- to 4-inch layer of the subsoil that is firm and dense as a result of repeated plowing. Below this plowpan the subsoil is crumbly. The lower subsoil is light in color, often a light yellowish brown or very pale brown. The subsoil extends to a depth of about 20 inches. Below this depth is a very pale brown to pale-yellow sand substratum.

In some places the Windsor soils contain fine gravel that is less than 20 percent of the soil volume, and in some areas there are thin layers of fine gravel at a depth of 4 to 5 feet. In some areas the surface layer and subsoil are a little finer or coarser than described here. The range is from loamy very fine sand to loamy sand in the surface layer and loamy fine sand to sand in the subsoil.

The Windsor soils warm early in the spring and are easily worked. Water passes readily through the surface layer and subsoil because of their sandy texture. Liberal amounts of lime and fertilizer are needed for favorable yields. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. Irrigation is required to obtain best yields of cultivated crops.

Windsor loamy fine sand, 0 to 3 percent slopes (WuA).—This droughty soil has a thicker surface layer, in most places, than the typical soil described. It is on nearly level terraces bordering the major streams. Included in mapping are some areas of loamy very fine sand or loamy sand.

Water moves rapidly downward through this soil, which has a low moisture-holding capacity. The soil occurs in large areas and is suitable for intensive farming. It is suitable for tobacco, corn, alfalfa, and most truck crops grown in the county. When the soil is cultivated, a winter cover crop should follow a row crop. (Capability unit IIIs–9; woodland suitability group 8)

Windsor loamy fine sand, 3 to 8 percent slopes (WuB).—This droughty soil is on gently sloping terraces bordering the major streams. It is similar to the soil described as typical, but in many places, has a thicker surface layer. Included in mapping are some areas of loamy very fine sand or loamy sand.

Water moves rapidly downward through this soil, and the moisture-holding capacity is low. The soil is suitable for tobacco, corn, alfalfa, and most truck crops grown in the county. Row crops should be grown on the contour and should be followed by a winter cover crop. (Capability unit IIIs-9; woodland suitability group 8)

Windsor loamy fine sand, 8 to 15 percent slopes (WuC).—This droughty soil is on moderately sloping terraces bordering the major streams. Included in mapping are areas of loamy very fine sand or loamy sand. Water moves rapidly downward through this soil, and the moisture-holding capacity is low. If the soil is irrigated and well fertilized and limed, it is suitable for tobacco, corn, alfalfa, and most truck crops grown in the county. The risk of erosion is severe, however, and conservation practices are needed if this soil is used for row crops. Row crops should be grown in contour strips alternating with grass or grass-legume. Winter cover crops protect the soil from erosion. Diversions and grass waterways may be needed on long slopes. (Capability unit IVs-9; woodland suitability group 8)

Windsor loamy fine sand, 15 to 35 percent slopes (WuE).—This droughty soil is on moderately steep and steep terrace escarpments or the sides of old erosion channels. The surface layer is thinner than is typical of the series. Included in mapping are areas of loamy very fine sand or loamy sand. Also included are some areas in which slopes are steeper than 35 percent.

This soil has a low moisture-holding capacity. It is too steep and droughty for cultivated crops and needs to be protected by a sod crop or by trees or shrubs. It is well suited for woodland and for wildlife habitats. Drop inlets are needed in some areas to prevent surface water from concentrating and causing gullies in the escarpments. (Capability unit VIIs-9; woodland suitability group 8)

Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes (WvB).—The erosive action of wind has altered the surface layer of this soil. Areas without vegetation have been eroded by wind, and areas protected by vegetation have caught and held some of this windblown material. In many places a thin layer of sand has been recently deposited on top of the normal surface layer, and in places the surface layer and some of the subsoil have been blown away. These areas are undulating or rolling and have a hummocky appearance.

Water moves rapidly downward through this soil. Consequently, the soil is very droughty and very susceptible to erosion by wind or water. It should be kept in trees or in other drought-resistant vegetation. (Capability unit VIIs-9; woodland suitability group 8)

Winooski Series

The soils of the Winooski series are moderately well drained very fine sandy loams that formed in deep deposits of recent alluvial sediments. These soils occur on bottom lands along the larger, slower flowing rivers and streams. Most areas are seldom damaged by flooding, but some of the lower areas are flooded at least once a year. These soils are level or nearly level.

The Winooski soils are near the well-drained Hadley, the poorly drained Limerick, and the very poorly drained Saco soils.

A typical Winooski soil that has been cultivated has a crumbly, very dark brown very fine sandy loam surface layer about 11 inches thick. Underlying this is brown to dark-brown or olive very fine sandy loam extending to a depth of about 30 inches. Below a depth of about 20 inches, this soil has many dark reddish-brown mottles. Pale-brown very fine sand interbedded with olive-gray silt is at a depth below 30 inches.

The texture of the surface layer ranges from very fine sandy loam to silt loam. At a depth of 24 inches and more, the texture may range from silt loam to gravelly sand. In some areas there are gravelly layers below a depth of about 3 feet.

Winooski very fine sandy loam (Ww).—This soil is on bottom lands along the larger streams. Except when the soil is saturated, water passes readily through it. Because of a high water table, the soil is wet in the spring and following long rainy periods. It is sometimes wet in the fall. The soil is easy to work after it has dried out, and row crops can be grown if early planting is not required. Otherwise, this soil is best suited to hay and pasture. Artificial drainage is needed for row crops. Liberal applications of lime and fertilizer are needed to obtain favorable yields. Organic matter, added in the form of manure or crop residue, helps to maintain good tilth. There is some risk of bank erosion along the rivers and streams. (Capability unit IIw-6; woodland suitability group 1)

Formation, Classification, and Morphology of Soils

In this section the soil-forming factors and major processes of soil formation are discussed, the soil series are classified in orders and great soil groups, and the morphology of the soil series is discussed. Following this discussion is a laboratory analysis of the physical and chemical properties of selected soil profiles.

Factors of Soil Formation

Soil is formed by the interaction of climate, living organisms, parent material, relief, and time. The nature of the soil anywhere on the earth depends upon the combination of these five factors. The relative importance of each factor differs from place to place. In extreme cases, one of these factors may dominate in the formation of a soil and fix most of its properties (*18*).

The differences among soils in Franklin County can be attributed mainly to parent material, relief, and climate. The other factors—living organisms and time—are fairly uniform throughout the county and do not account for important differences among the soils. The kinds of rocks that contributed to glacial drift and the waterborne and windborne material deposited during the glacial recession and in the postglacial period have provided a variety of parent materials from which soils have formed. Differences among soils that can be attributed to relief are mainly related to the degree of natural soil drainage.

The differences between the Podzols of the western uplands and the Brown Podzolic soils of the Connecticut Valley and the eastern uplands are primarily manifestations of differences in the climates of these two areas.

Parent material

Parent material is the horizon of weathered rocks or partly weathered soil material from which the soil has formed. Normally, the parent material is horizon C in the profile.

The bedrock formations in Franklin County and surrounding areas to the north are the source of parent material for the soils. As the county is in the glaciated New England Uplands and the Connecticut Valley physiographic areas, the physiography, the drainage, the glacial history, and the action of the postglacial wind determined how these parent materials were formed and deposited over the county. The depth, texture, color, porosity, permeability, reaction, and other characteristics of the soils are partly the result of characteristics of the parent material.

The broad topographic features of the county are the result of intense scrubbing by several massive continental glaciers. Little soil or weathered rock remained anywhere except in isolated pockets that were protected from moving ice. Glacial advances removed, mixed, and resorted the drift left from the preceding ice sheets. The present features and parent soil material are largely the remains of the last ice advance and retreat during the Late Wisconsin stage of glaciation (*6*).

As the ice receded, a heterogeneous mantle of rock fragments, sand, silt, and some clay was deposited over the surface of the eastern and western highlands. This material is known as glacial till, and it ranges in thickness from a few inches, where bedrock is at or very near the surface, to more than 10 feet. The melting ice produced large amounts of water, which carried sand, gravel, silt, and clay away from the glacier edge and deposited them as stratified material. These stratified deposits are the terraces of assorted gravel, sand, silt, and clay that occur over much of the valley floors and on some of the valley sides. This material is known as stratified drift or glaciofluvium. Wind activity that occurred at the same time as the glacial recession or in postglacial times has modified the glacial surfaces in some areas.

When ice melted in the Connecticut River valley, the low areas became temporary glacial lakes created by dams of glacial drift and stagnant ice (*5*, *6*). While the lakes were in existence, material was deposited as sandy and gravelly terraces and as varved deposits of glaciolacustrine silt and clay.

In this manner the mineral soils of Franklin County have developed from glacial till, water stratified deposits, or windblown deposits.

In most of the upland sections of the county, ice carried the debris only short distances; thus, the mantle of glacial till is closely related to the underlying bedrock. In the western highlands the till is olive colored and in places contains occasional fragments of partly decomposed limestone. These characteristics are inherited from the bedrock, which is mainly fine-grained gneiss, gray schist with interbedded siliceous limestone, and some granite. In the Bernardston area the till is a dark-gray silt loam that contains many small chips of very dark gray or black phyllite that underlies the area. The till in the Greenfield-Montague area is yellowish brown to red—a characteristic inherited from the underlying Triassic sedimentary and intrusive bedrock. The till in the eastern highlands is coarse sandy and stony material that reflects the nature of the coarse crystalline gneiss, schist, and granite bedrock.

Climate

The present climate of Franklin County is cool and temperate. The average annual precipitation ranges from 50 inches at Heath to 43 inches at Turners Falls. About two-thirds of the precipitation falls during the growing season. Additional climatic data are given in the section "Additional Facts About the County."

Living organisms

Forest was the native vegetation in the county. Sugar maple, white birch, white pine, and hemlock were the dominant species in most of the county. Smaller areas of spruce were in the extreme western part and red oak and black oak were in the eastern uplands. The variations in tree species have not produced significant differences in the well-drained soils in the county.

Time

Time, as a soil-forming factor, refers to the length of time parent materials have lain in place and have been exposed to climate and living organisms. The processes of soil formation take place very slowly, and it has taken a long time to form the distinctive characteristics of most of the soils in Franklin County. Most of the soils have formed on parent material that was deposited directly by the glacier as glacial till, or on sorted deposits of glacial outwash or lacustrine sediments laid down by the water that flowed from the glacier as it melted. Consequently, the various parent materials in the county have been exposed to the soil-forming processes for about the same length of time, and the differences apparent in the soils cannot be attributed to time alone. The exceptions to this are the Alluvial soils. They are on recent sedimentary deposits left by the major rivers when they overflowed and flooded the adjacent bottom lands. Soil-forming processes have not been working on these parent materials long enough to form more than very weakly developed horizons.

Relief

The shape of the land surface, the slope, and the position with reference to the water table have had great influence on the soils of the county. In any of the climatic provinces in the county, the climate and vegetation are fairly uniform and the soil materials have been exposed to soil-forming processes for about the same length of time, so that local differences in soils are primarily the result of differences in parent material and relief. Relief ranges from nearly level to very steep in Franklin County. Where slopes are steep, a large amount of water runs off the surface. Erosion is rapid and keeps almost even pace with the weathering of rocks and with the formation of soils. On moderately sloping or gently sloping areas, less water runs off and more of it percolates through the soil. As a result deeper profiles develop in the soils. In this county, most of the soils have slopes that favor development of distinct horizons in the soils.

Many nearly level soils are in depressions or on bottom lands where surface runoff and internal drainage are slow and the water table is high. The soils in these areas have a wet, mottled, poorly aerated subsoil. The profiles in these poorly drained soils are normally not so well developed as the profiles in the better drained soils.

Major Processes of Soil Formation

In Franklin County the major processes that have affected the soils are evident in the distinctness of the soil horizons. Some of the soils have prominent horizons within the solum and a few have little or no horizon development.

The differentiation of horizons in soils of the county is the result of one or more of the following processes: Accumulation of organic matter, leaching of carbonates, translocation of silicate clay minerals, and reduction and transfer of iron and aluminum (*13*, *14*). In most soil profiles two or more of these processes have operated in the development of horizons.

Some organic matter has accumulated in the uppermost layer of most soils to form an A1 horizon. Organic matter, mostly in the form of humus, is present in quantities that range from very small in some soils to fairly large in others. Consequently, the accumulation of organic matter probably has been most important among processes of horizon differentiation.

Leaching of carbonates has occurred in all soils of the county, although it has been of limited importance to horizon differentiation. Carbonates have been carried completely out of the profiles of most of the well-drained soils. Even in the wettest soils, some leaching is indicated, with few exceptions, by the absence of carbonates and by acid reactions.

Translocation of silicate clay minerals has contributed to the development of horizons in relatively few soils in the county. The actual amount of clay movement has been small, but it has contributed to horizon differentiation.

The reduction and transfer of iron has occurred in all of the poorly and very poorly drained soils. It has also occurred to some extent in deeper horizons of moderately well drained soils. In some of the well-drained soils of the county, the iron has been oxidized after translocation to form prominent horizons of iron accumulation that are frequently accompanied by the accumulation of translocated organic matter. In the areas of wet soils in Franklin County, the reduction and transfer of iron, a process often called gleying, has been an important process in horizon differentiation.

The gray colors of the deeper horizons of the wet soils indicate the reducton of iron oxides. This reduction is commonly accompanied by some transfer of the iron, which may be local or general in character. After the iron has been reduced, it may be removed completely from some horizons and may even go out of the soil profile. More commonly, it has moved a short distance and stopped either in the horizon of its origin or in a nearby horizon. Iron has been segregated within deeper horizons of many of the soils to form yellowish-red, strong-brown, or yellowish-brown mottles. It has also been segregated into concretions in deeper horizons of some soils.

The differentiation of the A1 horizon from the deeper horizons in poorly drained soils of Franklin County is caused in part by the reducton and transfer of iron in the lower horizons and in part by the accumulation of organic matter in the surface layer.

Classification of Soils

Soils are placed into narrow classes for the organization and application of knowledge about their behavior within farms or counties. They are placed in broad classes for study and comparisons of large areas such as continents. In the system followed in the United States, the soils are placed in six categories, one above the other. Beginning at the top, the six categories are the order, suborder, great soil group, family, series, and type (*16*, *18*).

In the highest category the soils of the entire country are grouped into three orders, whereas thousands of soil types are recognized in the lowest category. Attention has been centered largely on the classificaton of soils into soil types and series within counties or comparable areas and to the subsequent grouping of series into great soil groups and orders.

Classes in the highest category of the classification scheme are the zonal, intrazonal, and azonal orders. The zonal order consists of soils with evident, genetically related horizons that reflect the predominant influence of climate and living organisms, chiefly vegetation, in their formation. The intrazonal order consists of soils with evident, genetically related horizons that reflect the dominant influence of topography, parent material, or some other local factor over the effects of climate and living organisms. In the azonal order are soils that lack distinct, genetically related horizons commonly because of youth, resistant parent material, or relief.

The soil series in Franklin County are classified into eight great soil groups in table 10. In addition there are soil series that have some characteristics common to two great soil groups. These soils are commonly called intergrades. The nomenclature of intergrades includes the names of both great soil groups. The Colrain, Shelburne, and Buckland soils, for example, are classified as Sols Bruns Acides intergrading to the Brown Forest group.

In the following discussion of the classification of soil series by great soil groups, only the representative series are mentioned. For the classification of the soil series not mentioned, see table 10.

Zonal soils

In Franklin County, the zonal order is represented by three great soil groups, namely the Podzols, the Brown Podzolic soils, and the Sols Bruns Acides.

TABLE 10.—*Soil series classified according to great soil groups and natural drainage*

[Great soil group designations are (A), Alluvial soils; (B), Bog; (BF), Brown Forest; (BP), Brown Podzolic; (GWP), Ground-Water Podzols; (HG), Humic Gley; (LHG), Low-Humic Gley; (L), Lithosol; (P), Podzols; (SBA), Sols Bruns Acides; (R), Regosols; intergrades are designated by letters of two great soil groups; dashed lines indicate there is no series of this drainage class in the county]

Great soil group [1] and parent material	Excessively drained or shallow to bedrock	Well drained and somewhat excessively drained	Moderately well drained	Poorly drained	Very poorly drained
Podzols and their gley associates:					
Glacial till derived principally from dark schist and gneiss. (Soils have a fragipan.)	----------	Marlow (P)	Peru (P)	Ridgebury (LHG).	Whitman (HG).
		Marlow, dark subsoil (P).	----------	----------	
Glacial till derived principally from dark schist and gneiss.	Lyman (P)	Berkshire (P)	----------	----------	
		Berkshire, dark subsoil (P).	----------	----------	
Brown Podzolic soils and their gley associates:					
Glacial till derived principally from schist and gneiss.	Hollis (BP)	Charlton (BP)	Sutton (BP)	----------	
Glacial till derived principally from granitic rocks.	Shapleigh (BP)	Gloucester (BP)	----------	----------	
Glacial till derived principally from coarse-textured Triassic sedimentary rocks.	Sunderland (BP).	Cheshire (BP)	----------	----------	
Glacial till derived principally from granitic rocks. (Soils have a fragipan.)	----------	Essex (BP)	Scituate (BP)	----------	
Glacial till derived principally from slate and phyllite. (Soils have a fragipan.)	----------	Bernardston (BP).	Pittstown (BP)	Stissing (LHG)	
Glacial till derived principally from slate and phyllite. (Soils have no fragipan within a depth of 30 inches.)	----------	Dutchess (BP)	----------	----------	
Moderately coarse textured and coarse textured, water-laid sediment containing little or no gravel.	----------	Agawam (BP)	Ninigret (BP)	Walpole (LHG)	
Water-laid and windblown sand containing fine gravel in places.	Windsor (BP)	----------	Deerfield (BP)	Wareham (LHG).	Scarboro, brownish subsoil (variant) (HG).
Stratified glacial drift derived principally from acid crystalline rocks.	Hinckley (BP)	Merrimac (BP)	Sudbury (BP)	Walpole (LHG)	Scarboro, brownish subsoil (variant) (HG).
Stratified glacial drift derived from slate or phyllite and acid crystalline rocks.	----------	Warwick (BP)	----------	----------	
Moderately coarse-textured, water-laid sediments over glaciolacustrine silt and very fine sand.	----------	Agawam, silty substratum (BP).	Ninigret, silty substratum (BP).	----------	
Medium-textured, water-laid sediments over glaciolacustrine silt and clay.	----------	----------	----------	Swanton (LHG)	
Glaciolacustrine, varved silt and clay	----------	Suffield (BP)	Buxton (BP)	Scantic (LHG)	Biddeford (HG).
Glaciolacustrine deposits of silt and very fine sand.	----------	Hartland (BP)	Belgrade (BP)	Raynham (LHG).	
Silty mantle over unconforming, compact glacial till.	----------	Broadbrook (BP).	----------	----------	
Thin mantle of glacial till and residuum from underlying schist and, in places, siliceous limestone.	Westminster (BP).	----------	----------	----------	
Brown Podzolic soils intergrading to Regosols—					
Coarse-textured, water-laid sand	Carver (BP–R)	----------	----------	----------	

See footnote at end of table.

TABLE 10.—*Soil series classified according to great soil groups and natural drainage*—Continued

Great soil group [1] and parent material	Excessively drained or shallow to bedrock	Well drained and somewhat excessively drained	Moderately well drained	Poorly drained	Very poorly drained
Sols Bruns Acides:					
Thin eolian mantle and residuum from underlying basalt or traprock.	----------	Holyoke (SBA)	----------	----------	
Sols Bruns Acides intergrading to Brown Forest soils and their gley associates—					
Glacial till derived mainly from schist, gneiss, siliceous limestone, and quartz. (Soils have a fragipan.)	----------	Shelburne (SBA–BF).	Buckland (SBA–BF).	Cabot (LHG)	Cabot, black surface (HG).
Glacial till derived mainly from schist, gneiss, siliceous limestone, and quartz. (Soil has no fragipan within 20 inches of the surface.)	----------	Colrain (SBA–BF).	----------	----------	
Bog soils:					
Acid plant remains	----------	----------	----------	----------	Muck (B).
Acid plant remains	----------	----------	----------	----------	Peat (B).
Ground-water Podzols:					
Coarse textured, water-laid sand	----------	----------	----------	Saugatuck (GWP).	
Lithosols:					
Lithosols intergrading to Sols Bruns Acides—					
Thin glacial till and residuum from underlying slate and phyllite.	Nassau (L–SBA).	----------	----------	----------	
Alluvial soils:					
Medium-textured, acid alluvium from crystalline rocks.	----------	Hadley (A)	Winooski (A)	Limerick (LHG).	Saco(HG).
Moderately coarse textured, acid alluvium from crystalline rocks.	Suncook (A)	Ondawa (A)	Podunk (A)	Rumney (LHG).	

[1] The Low-Humic Gley and Humic Gley great soil groups are not listed separately, but the soils in these groups are shown as associates of those in other groups. Riverwash is a miscellaneous land type and is not included in this table.

PODZOLS

The Podzols are the least extensive of the two great soil groups in the zonal order in the county. They are in the extreme western highlands.

Soils of the *Lyman*, *Berkshire*, *Marlow*, and *Peru* series are typical of the Podzols that occur in the highest parts of the western highlands. In undisturbed, forested areas these soils have a 2- to 6-inch layer of forest litter that is underlain by a black A1 horizon ranging in thickness from 1 to 2 inches. This is underlain by an A2 horizon or bleicherde, that is generally 2 or 3 inches thick. This horizon is discontinuous in many places and ranges in thickness from 0 to 10 inches. It is a leached layer and is a light gray that in many places is tinged with pink. This light-colored horizon is thickest in the coarse-textured soils.

Much of the moisture from precipitation percolates through the organic mat on the surface. Complex, soluble sesquioxide-humate compounds are formed when humic acids, leached from the organic mat, combine chemically with the aluminum and iron of the mineral particles of the A horizon. These compounds move downward through the soil until they are precipitated or jelled by chemical or microbial action as coatings on mineral particles (*14*). Typically, the compounds accumlate in the upper part of the B horizon, as manifested by the most intense color in the area of greatest accumulation. The upper B horizon is generally dark reddish brown, in places almost black. This dark coloration is caused by precipitated organic matter and iron, and the upper B horizon is weakly cemented in places. Generally, this horizon is only about an inch thick, and there is a gradual transition to the next horizon, which is yellowish red to reddish brown, primarily because of iron concentration. This zone of iron accumulation is generally 3 to 5 inches thick, and the color changes with depth to weaker shades of olive or yellowish brown.

The *Berkshire*, *dark subsoil*, and *Marlow*, *dark subsoil*, are representative of the Podzols at lower elevations in the western highlands. In undisturbed, forested areas, these soils have a thin, black A1 horizon, generally less than an inch thick, underlain by a thin, dark-gray A2 horizon about 2 inches thick. These are obliterated in plowed areas, and the resultant Ap horizon is very dark grayish brown. The B2 horizon is dark brown to dark grayish brown in the upper part, and 2 to 6 percent of it is organic matter. The color of the lower B2 horizon grades to olive brown or olive gray.

BROWN PODZOLIC SOILS

The Brown Podzolic soils are the most extensive zonal soils in the county. They have the same sequence of horizons as the Podzols, but the horizons are not so well developed in the Brown Podzolic soils (*15*). In effect, they

are weakly developed Podzols. In the Brown Podzolic soils the layer of forest litter is underlain by a dark grayish-brown A1 horizon, ranging in thickness from one-half inch to about 2 inches. In some places the A1 horizon is underlain by a thin A2 horizon that is barely visible, or it may be as much as one-half inch thick. The B horizon is not so prominent as in the Podzols. It ranges in color from dark brown to olive brown and is paler with depth.

The Brown Podzolic soils have developed from a variety of materials that consist of acid glacial till, a sandy and silty mantle over an unconforming C horizon, an acid glaciolacustrine deposit, or a moderately coarse to medium-textured, water-laid deposit over an unconforming coarse sand and gravel C horizon.

The *Gloucester*, *Essex*, *Charlton*, and associated shallow and moderately well drained soils are the principal Brown Podzolic soils developed on glacial till in the eastern highlands.

Brown Podzolic soils that are underlain by an unconforming C horizon are the *Broadbrook*, *Agawam*, *silty substratum*, and associated moderately well drained soils.

The *Hartland*, *Suffield*, *Belgrade*, and *Buxton* soils are Brown Podzolic soils that have developed in acid glaciolacustrine deposits.

The *Merrimac*, *Hinckley*, and associated moderately well drained soils developed in stratified sand and gravel on terraces.

Agawam, *Windsor*, *Ninigret*, and *Deerfield* soils are Brown Podzolic soils that formed on deep sandy terraces.

The silty *Dutchess* soils are another example of the local influence of parent material in this great soil group. These soils formed in acid glacial till derived from dark slate and phyllite.

Brown Podzolic soils intergrading to Regosols.—Regosols consist of deposits of relatively unweathered but soft rock or mineral material. They show little evidence of soil development except for a weakly developed A1 horizon. The parent material is either too young or too resistant to weathering to show any appreciable soil development, regardless of time. The *Carver* soils have some characteristics that show their resistance to weathering.

SOLS BRUNS ACIDES

Sols Bruns Acides are differentiated from the Brown Podzolic soils by a weakly expressed A2 horizon, uniform color in contrast to color that fades with depth, and weak to moderate subangular blocky structure in the B horizon in contrast to very weak or no structure (*2*, *15*).

The *Holyoke* soils, which represent this great soil group, have no A2 horizon, but they have the other characteristics of Sols Bruns Acides.

Sols Bruns Acides intergrading to Brown Forest soils.—The *Buckland*, *Colrain*, and *Shelburne* soils have some of the characteristics of the Brown Forest group. The Brown Forest soils developed on highly calcareous drift. Their profile development is weak. The profile consists principally of an A1 horizon of accumulated humus, underlain by a brown or reddish-brown B horizon that derived its color from the humus and from iron oxides, which were released as the parent material weathered.

The major characteristics of the Buckland, Colrain, and Shelburne soils, however, are those of the Sols Bruns Acides. They formed from glacial drift that contained appreciable amounts of limestone, but most of the bases have leached out in the weathering process. The nature of the parent material was, locally, more important than the other soil-forming factors.

Intrazonal soils

The intrazonal order of soils in Franklin County is represented by four soil groups. These groups consist of soils that have poor internal or surface drainage, or both. They are soils in which relief alone, or in conjunction with parent material, is the dominant factor of soil formation.

The four great soil groups in the intrazonal order are Low-Humic Gley soils, Humic Gley soils, Bog soils, and and Ground-Water Podzols.

LOW-HUMIC GLEY SOILS

The Low-Humic Gley great soil group consists of poorly drained soils that have a very dark grayish-brown to very dark brown surface layer and a mottled subsurface layer (*16*, *18*). The water table is at or near the surface 7 to 9 months of the year. Consequently, the soils are deficient in oxygen. Water-soluble products of plant decomposition move down through the profile and cause solution, reduction, and removal of ferric (iron) compounds. The change in ferric compounds results in gray or strongly mottled horizons under the dark surface horizon. Low-Humic Gley soils developed from many kinds of parent material, and they vary in texture.

The *Ridgebury*, *Rumney*, *Scantic*, *Cabot*, *Walpole*, and *Wareham* soils are representative of this great soil group.

HUMIC GLEY SOILS

The Humic Gley great soil group consists of very poorly drained soils (*16*, *18*). They are acid, and they vary in texture. Their dominant characteristics are associated with gleying, which is described under the Low-Humic Gley group. The Humic Gley soils have water at or on the surface most of the time. Organic matter decomposes slowly under this condition, and it accumulates on the surface. The very dark surface layer contains much more organic matter than the surface layer of a Low-Humic Gley soil. In addition, the iron compounds in the subsoil are reduced to a greater degree.

The *Biddeford*, *Saco*, *Scarboro*, and *Whitman* soils are representative of this group.

BOG SOILS

The Bog great soil group consists of *Peat* and *Muck* (*18*). These soils have developed in organic deposits in depressions. Water-tolerant vegetation grows in these wet areas, and the remains of plants sink to the bottom where they decay slowly. In this manner the organic plant material accumulates. The organic deposits are known as peat if they are only partially decomposed. If the organic deposits are so decomposed that the original plant remains cannot be recognized, they are called muck.

GROUND-WATER PODZOLS

The Ground-Water Podzols are poorly drained soils that have formed in acid, coarse-textured sediments. These soils are characterized by a dark grayish-brown to black surface layer, a thick, ashy gray A2 horizon, and an ortstein or B horizon that is hard in place or becomes hard

when exposed to air and contains a large amount of iron oxides, organic matter, or both (*18*, *22*). The *Saugatuck* soils are the sole representatives of this great soil group in Franklin County.

Azonal soils

In Franklin County the azonal order is represented by Lithosols intergrading to Sols Bruns Acides and by the Alluvial soils.

LITHOSOLS

Typically, Lithosols are shallow over bedrock and lack a strongly developed soil profile. These soils are generally steep and are strongly influenced by parent material or relief. They generally consist of a plow layer underlain by shattered or relatively solid bedrock. In Franklin County none of the soil series are representative Lithosols.

Lithosols intergrading to Sols Bruns Acides.—The *Nassau* soils have characteristics of the Lithosols, but they also have characteristics grading to Sols Bruns Acides.

ALLUVIAL SOILS

The Alluvial soils consist of flood-plain deposits that have been in place for a relatively short time (*18*). The soils in this group have poorly defined genetic horizons or none at all, because horizons have not had time to develop. The *Suncook*, *Ondawa*, *Hadley*, and associated moderately well drained soils are representative of this great soil group.

Morphology of Soils

In this subsection the morphology of the soils of each soil series is described. Each description contains (1) a statement about the drainage, texture, parent material, and geological location, (2) a description of the profile, and (3) the range of characteristics. The Munsell color notations in the profile descriptions are for moist soils.

AGAWAM SERIES

The Agawam series consists of deep, well-drained, moderately coarse textured Brown Podzolic soils that developed in loose, stratified sand on stream terraces. They are nearly level to gently sloping except on the moderately steep escarpment where a higher terrace merges with a lower terrace or a flood plain.

The Agawam soils are members of the catena that includes the moderately well drained Ninigret and the poorly drained Walpole soils.

The Agawam soils are similar to the Merrimac, except that the Agawam soils are not underlain by stratified sand and gravel at a depth of 20 to 36 inches. Gravel is present in some places, however, below a depth of 42 inches. The Agawam soils are similar to the alluvial Ondawa and Hadley soils but have a stronger horizon development. They are coarser textured than the Hadley soils.

Profile of Agawam fine sandy loam in an idle field 1¼ miles northwest of the village of South Deerfield—

Ap—0 to 11 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine and medium, crumb structure; very friable; many fibrous roots; medium acid; abrupt, smooth boundary. 10 to 11 inches thick.

B21—11 to 14 inches, yellowish-brown (10YR 5/4) fine sandy loam; massive; breaks to single grain; slightly firm; fibrous roots are common; slightly acid; clear, smooth boundary. 3 to 4 inches thick.

B22—14 to 25 inches, light olive-brown (2.5Y 5/4) fine sandy loam; single grain; very friable; fibrous roots are common in upper half but few in lower half; slightly acid; abrupt, smooth boundary. 10 to 12 inches thick.

B3—25 to 36 inches, light olive-brown (2.5Y 5/4) loamy fine sand; single grain; very friable to loose; very few fibrous roots in upper 5 inches, none below; medium acid; abrupt, smooth boundary. 8 to 10 inches thick.

C—36 to 46 inches +, olive-gray (5Y 5/2) to grayish-brown (2.5Y 5/2) loamy fine sand; single grain; loose; slightly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the A horizon and upper B horizon ranges from sandy loam to very fine sandy loam. The texture of the lower B horizon is generally loamy fine sand, and the C horizon is generally sand.

The Ap horizon is typically dark yellowish brown (10YR 3/4 to 4/4). The B horizon is commonly yellowish brown (10YR 5/4) in the upper part and light olive brown (2.5Y 5/4) in the lower part. The C horizon is generally olive gray (5Y 5/2) but in some places is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2).

Loamy fine sand normally is at a depth of 24 to 30 inches but may be at 36 inches. The depth to sand generally ranges from 30 to 36 inches. In typical Agawam soils the proportion of coarse fragments is less than 5 percent to a depth of 42 inches. In some places, however, the strata of sand and gravel are below 42 inches. Where these soils have been farmed intensively, a plowpan has formed directly under the Ap horizon.

AGAWAM SERIES, SILTY SUBSTRATUM

Some soils of the Agawam series have a silty substratum. These soils are well-drained Brown Podzolic soils that developed in sandy glaciofluvial deposits overlying glaciolacustrine silt and very fine sand. They are gently sloping to moderately steep. These soils are like other Agawam soils, except that they have an unconforming substratum of varved silt and very fine sand at a depth of 2 to 5 feet.

Profile of Agawam fine sandy loam, silty substratum, in a hayfield 1¾ miles west of the village of South Deerfield—

Ap—0 to 8 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; weak, fine, crumb structure; very friable; many fine roots; medium acid; abrupt, smooth boundary. 7 to 9 inches thick.

B21—8 to 15 inches, yellowish-brown (10YR 5/4) fine sandy loam; very weak, fine, crumb structure; very friable; many fine roots; strongly acid; clear, smooth boundary. 7 to 8 inches thick.

B22—15 to 23 inches, yellowish-brown (10YR 5/4) sandy loam; single grain; loose; common fine roots; strongly acid; clear, smooth boundary. 7 to 9 inches thick.

B23—23 to 28 inches, light olive-brown (2.5Y 5/4) sandy loam; single grain; loose; few fine roots; strongly acid; abrupt, smooth boundary. 4 to 6 inches thick.

IIC—28 to 60 inches +, variegated dark grayish-brown (2.5Y 4/2) and yellowish-brown (10YR 5/4) laminated or varved silt and very fine sand; massive; firm; strongly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the surface layer is sandy loam in some places. The texture of the subsoil is generally fine sandy loam in the upper part and sandy loam or loamy sand in the lower part. The substratum is varved silt and very fine sand, but in a few places thin

clay lamellae are included. The depth to silt and very fine sand generally ranges from 24 to 30 inches but is as much as 60 inches in places.

The A horizon is generally dark yellowish brown (10YR 3/4) but is dark brown (10YR 3/3) in some places. The B horizon is generally yellowish brown (10YR 5/4) in the upper part and fades with depth to brown (10YR 5/3), pale brown (10YR 6/3), or light olive brown (2.5Y 5/4). The color of the IIC horizon ranges from dark grayish brown (2.5Y 4/2) to olive gray (5Y 5/2).

BELGRADE SERIES

The Belgrade series consists of moderately well drained Brown Podzolic soils that formed in medium-textured lacustrine or glaciolacustrine deposits on terraces.

These soils are members of the catena that includes the well-drained Hartland and the poorly drained Raynham soils. The Belgrade soils are similar to the Buxton soils but are coarser textured, especially in the substratum and lower subsoil.

Profile of Belgrade silt loam, eroded, in an abandoned field about 3 miles south of Deerfield—

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary. 7 to 9 inches thick.

B21—8 to 18 inches, olive-brown (2.5Y 4/4) silt loam; massive; slightly firm to friable; few fine roots; medium acid; clear, wavy boundary. 8 to 12 inches thick.

B22—18 to 24 inches, olive-brown (2.5Y 4/4) silt loam with common, medium, distinct olive-gray (5Y 5/2) and brown to dark-brown (7.5YR 4/4) mottles; massive; firm; medium acid; clear, wavy boundary. 5 to 9 inches thick.

C—24 to 60 inches +, light olive-brown (2.5Y 5/4) varved silt and very fine sand that includes, in a few places, lenses of olive (5Y 4/3) clay; many, fine and medium, prominent mottles of olive gray (5Y 5/2), brown to dark brown (7.5YR 4/4), and dark reddish brown (5YR 3/4); massive; firm; medium acid.

Range of characteristics.—The texture of the solum is very fine sandy loam or silt loam. The substratum is varved very fine sand and silt that includes lenses of clay in a few places.

Colors are dull throughout the profile. The surface horizon is dark yellowish brown (10YR 4/4) to olive brown (2.5Y 4/4), depending on how severely the soil has been eroded. The B horizon is olive brown (2.5Y 4/4) to olive (5Y 5/4) but is dark yellowish brown (10YR 4/4) in a few places. The lower part of the B horizon is mottled with brown to dark brown (7.5YR 4/4) and olive gray (5Y 5/2) in the lower part. The C horizon has the same matrix colors as the B horizon, but the mottling is more prominent and includes dark reddish brown (5YR 3/4) in addition to the mottle colors in the lower B horizon. The depth to mottling is generally 18 or 20 inches but ranges from 12 to 30 inches.

In the solum and substratum there are no particles, or very few, larger than 2 millimeters, and usually none larger than very fine sand. The depth to varved very fine sand and silt is generally about 24 inches but ranges from 16 to more than 42 inches.

Truncation of cultivated soils by sheet erosion makes the depth to mottling and parent material extremely variable. The reaction is slightly acid to medium acid.

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BERKSHIRE SERIES

The Berkshire series consists of deep, well-drained Podzols that developed in firm to loose glacial till derived chiefly from micaceous schist. These soils are at high elevations in the Berkshire Hills and are gently sloping to very steep.

The Berkshire soils are near the shallow Lyman, the moderately well drained Peru, the poorly to somewhat poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Berkshire soils are similar to the Marlow soils but do not have a fragipan within 30 inches of the surface. In Franklin County the Berkshire series is similar to the Berkshire series, dark subsoil, but the B horizon is reddish brown and not so dark. The Berkshire soils are the Podzol amalogs of the Brown Podzolic soils of the Charlton series.

Profile of Berkshire very stony fine sandy loam in a wooded area, formerly cultivated, in the town of Rowe one-half mile east-southeast of Monrone Bridge.

O1—3 inches to 1 inch, litter of loose leaves and twigs of beech, white birch, yellow birch, and hemlock.

O2—1 inch to 0, partly decomposed litter.

Ap1—0 to 3 inches, dark reddish-brown (5YR 2/2) fine sandy loam; weak, fine and medium, granular structure; very friable; many fine, medium, and coarse tree roots; 5 to 10 percent coarse skeleton consisting of schist and quartzite fragments 2 to 25 millimeters in diameter and a few cobbles; extremely acid; clear, wavy boundary. (Stones occupy about 10 percent of the surface of this horizon.) 3 to 4 inches thick.

Ap2—3 to 6 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine and medium, granular structure; very friable; many fine, medium, and coarse roots; 5 to 10 percent coarse skeleton consisting of schist and quartzite fragments 2 to 25 millimeters in diameter and a few cobbles; extremely acid; abrupt, wavy boundary. 2 to 3 inches thick.

A2—6 to 8 inches, light-gray to gray (5YR 6/1) fine sandy loam; single-grained to weak, fine, granular structure; very friable; many fine, medium, and coarse tree roots; coarse fragments as in horizon above; extremely acid; abrupt, broken boundary. 0 to 2 inches thick.

B21h—8 to 9 inches, dark reddish-brown (2.5YR 2/4) loam; very weak, fine, subangular blocky structure or massive; friable; many fine and medium tree roots; coarse fragments the same as in Ap2 horizon; extremely acid; abrupt, broken boundary. 0 to 2 inches thick.

B22ir—9 to 13 inches, yellowish-red (5YR 4/6) loam; very weak, fine and medium, subangular blocky structure; friable; many fine and medium tree roots; coarse fragments as in Ap2 horizon; extremely acid; clear, wavy boundary. 3 to 5 inches thick.

B23—13 to 22 inches, yellowish-brown (10YR 5/4) fine sandy loam; very weak, fine and medium, subangular blocky structure; friable to very friable; many fine and a few medium roots; 5 to 10 percent coarse skeleton consisting of schist and quartzite fragments 2 to 25 millimeters in diameter, plus a few cobbles and stones; extremely acid; abrupt, smooth boundary. 9 to 12 inches thick.

C—22 to 36 inches +, light olive-brown (2.5Y 5/4) fine sandy loam; massive or weak granular structure; very friable; few fine tree roots in upper 6 inches, none below; 5 to 10 percent coarse skeleton consisting of schist and quartzite fragments 2 to 25 millimeters in diameter; common to many cobbles and stones; very strongly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the A and B horizons is loam in some places. The C horizon is generally fine sandy loam, but the texture ranges from loamy fine sand to loam.

The Ap horizon is typically dark yellowish brown (10YR 4/4) to dark brown (7.5YR 3/2). A black (10YR 2/1) A1 horizon is present where the soil has not been plowed. The A2 horizon, or bleicherde, is discontinuous. It is typically about 3 inches thick but ranges from 0 to 12 inches in thickness. This horizon is generally gray (5YR 6/1), in contrast to adjoining horizons, but in some places it is tinged with a pink or brown ranging from 5YR to 10YR in hue, from 5 to 6 in value, and from 1 to 2 in chroma. The B21h horizon is also discontinuous. Its thickness is generally about 1 inch but ranges from 0 to 3 inches. This horizon is very dusky red (2.5YR 2/2) to dark reddish brown (2.5YR 2/4). Below this, the B horizon is reddish brown (5YR 4/4) or yellowish red (5YR 4/6). The lower B horizon commonly is yellowish brown (10YR 5/4). The C horizon generally is light olive brown (2.5Y 5/4) but is olive (5Y 5/3) in some places.

The coarse skeleton is extremely variable in all horizons. It is commonly 5 to 10 percent in the A horizon but ranges from 0 to 20 percent. In the B horizon the coarse skeleton ranges from 5 to 40 percent, and in the C horizon, from 5 to 20 percent. In addition, stones makes up 10 to 50 percent of the volume.

The thickness of the solum is generally 20 to 26 inches but ranges from 18 to 30 inches. The soils do not have a firm layer within a depth of 30 inches, but in some places the substratum is firm or very firm below this depth.

The slopes are generally 15 to 45 percent, but the range is from 3 to 65 percent.

BERKSHIRE SERIES, DARK SUBSOIL

The Berkshire series, dark subsoil, consists of well-drained Podzols that formed in firm glacial till derived from gneiss, phyllite, and schist. In places they have a thin bleicherde and orterde that plowing completely obliterates; otherwise, their colors are uniformly dull throughout the solum. These soils are at lower elevations in the Berkshire Hills than the other Berkshire soils and are gently sloping to very steep.

The Berkshire soils, dark subsoil, are near the shallow Westminster, the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

These Berkshire soils developed in the same lithological materials as the Marlow soils, dark subsoil, but the latter soils have a prominent fragipan. The Berkshire soils, dark subsoil, are similar to the Charlton soils but contain more organic matter in the horizon beneath the plow layer.

Profile of Berkshire fine sandy loam, dark subsoil, in woods about 2 miles northeast of North Heath in the town of Heath—

O1—3 inches to 1 inch, litter of loose leaves and twigs, mostly beech and birch.

O2—1 inch to 0, partly decomposed litter.

A1—0 to ½ inch, black (10YR 2/1) fine sandy loam; weak, medium, granular structure; very friable; many tree roots; extremely acid; abrupt, broken boundary. 0 to 1 inch thick. Surface stones 10 to 14 inches in diameter are about 50 feet apart.

A2—½ inch to 3 inches, dark-gray (10YR 4/1) fine sandy loam; weak, fine and medium, granular structure; very friable; many tree roots; 10 to 15 percent coarse skeleton of 1-inch granite, gneiss, quartzite, and schist gravel; very strongly acid; abrupt, wavy boundary. 1 to 3 inches thick.

B21h—3 to 7 inches, dark-brown (7.5YR 3/2) fine sandy loam; massive; clods crush to weak, fine granules; very friable; many tree roots; 10 to 15 percent coarse skeleton of gravel less than 1 inch in diameter; strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B22—7 to 13 inches, dark-brown (10YR 3/3) fine sandy loam; massive; clods crush to weak, fine granules; very friable; many tree roots; 10 to 15 percent coarse skeleton of gravel 1 inch in diameter; very strongly acid; clear, smooth boundary. 4 to 7 inches thick.

B23—13 to 31 inches, olive-brown (2.5Y 4/4) to dark grayish-brown (2.5Y 4/2) fine sandy loam; massive; clods crush to weak, fine granules; friable; roots are common in upper half, few below; 10 to 15 percent coarse skeleton of gravel 1 inch in diameter; strongly acid; abrupt, smooth boundary. 16 to 20 inches thick.

C—31 to 38 inches +, olive (5Y 4/3) fine sandy loam; massive; clods crush to weak fine granules and single grains; friable; about 20 percent coarse skeleton of gravel 1 inch in diameter; strongly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the surface layer ranges from fine sandy loam to loam. The texture of the B horizon also is generally fine sandy loam but may be loam in places. The texture of the substratum is commonly fine sandy loam but ranges from loamy fine sand to loam.

The surface horizon ranges from black (10YR 2/1) or very dark brown (10YR 2/2), where the soil has not been cultivated, to dark yellowish brown (10YR 3/4) where cultivated. The bleicherde, if present, is dark gray (10YR 4/1). The orterde is dark brown (7.5YR 3/2 to 4/4). The B horizon under the plow layer is commonly dark yellowish brown (10YR 4/4) to dark brown (10YR 3/3). The lower B horizon is dull, generally olive brown (2.5Y 4/4) or olive gray (5Y 4/2). The C horizon ranges from olive gray (5Y 4/2) to olive (5Y 4/3).

In the B horizon under the Ap horizon, or under its equivalent depth, the content of organic matter is 2 to 6 percent. In many places the content is more than 1 percent at a depth of 18 to 24 inches. The coarse skeleton ranges from 10 to 30 percent in the solum and substratum, but generally is about 10 to 15 percent. The thickness of the solum is commonly about 30 inches, but the range is from 26 to 36 inches. These soils do not have a distinct firm layer within 30 inches of the surface, but in most places the substratum is firm or very firm below this depth.

Except in cultivated fields, where stones have been removed, these soils are very stony or extremely stony.

BERNARDSTON SERIES

The Bernardston series consists of deep, well-drained Brown Podzolic soils that developed in compact glacial till derived principally from dark-gray phyllite. These soils are gently sloping to very steep.

These soils are members of the catena that includes the moderately well drained Pittstown and the poorly drained Stissing soils.

The Bernardston soils are like the Dutchess soils but have a prominent fragipan within 30 inches of the surface. They are finer textured than the Essex soils, which are Brown Podzolic soils, and the Marlow soils, which are Podzols.

Profile of Bernardston very stony silt loam in an abandoned pasture one-half mile northwest of the village of Bernardston—

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) very channery silt loam; weak, fine, granular structure; very friable; many fine and medium roots; about 60

percent coarse skeleton consisting of 10 percent phyllite fragments less than ½ inch long and 50 percent phyllite fragments as much as 6 inches long and 1 to 2 inches thick; very strongly acid; abrupt, smooth boundary. 1 to 3 inches thick. Surface stones are about 20 feet apart.

B21—2 to 7 inches, dark-brown (10YR 3/3) very channery silt loam; weak, fine, granular structure; friable; many fine and medium roots; very strongly acid; coarse fragments as in horizons above; clear, smooth boundary. 5 to 7 inches thick.

B22—7 to 18 inches, very dark grayish-brown (2.5Y 3/2) very channery silt loam; massive; clods crush to weak, fine granules; firm in place, friable when removed; few fine and medium roots; coarse fragments the same as in A1 horizon; very strongly acid; clear, smooth boundary. 6 to 11 inches thick.

Cx—18 to 26 inches +, olive-gray, (5Y 4/2) very channery silt loam; moderate, medium, platy structure; very firm in place, but if removed, firm when moist and plastic when wet; very few fine roots in upper 4 inches; very strongly acid; coarse fragments the same as in A1 horizon.

Range of characteristics.—Channery silt loam and silt loam are the only types. Very stony phases of these soils are most common, but they range to nonstony where the land has been cleared for cultivation.

The colors of these soils are noticeably dull, and the hue is 10YR in the A horizon, 2.5Y in the B horizon, and 5Y in the C horizon. In the B and C horizons, the value is 3 or 4 and the chroma ranges from 2 to 4.

The coarse skeleton is uniform. Generally, it is 40 to 60 percent of the soil by volume, and 10 to 15 percent of this consists of small channers of phyllite less than one-half inch long; the rest consists of larger fragments of phyllite up to 6 inches long and 2 inches thick. The depth to the fragipan is commonly 20 to 24 inches but ranges from 18 to 30 inches.

Slopes range from 3 to 55 percent but commonly are 8 to 25 percent.

BIDDEFORD SERIES

The Biddeford series consists of very poorly drained Humic Gley soils that developed in glaciolacustrine deposits of silt and clay. These soils are nearly level or depressional.

The Biddeford soils are members of the catena that includes the well-drained Suffield, the moderately well drained Buxton, and the poorly drained Scantic soils.

The Biddeford soils are similar to the Saco soils, but the latter soils are coarser textured and have developed in alluvium.

Profile of Biddeford silt loam in woods 1 mile northwest of the village of South Deerfield—

O2—1 inch to 0, partly decomposed litter of leaves and twigs, mostly red maple and hemlock.

A1—0 to 4 inches, black (10YR 2/1) silt loam; strong, fine, granular structure; very friable; many fine, medium, and coarse tree roots; very strongly acid; abrupt, wavy boundary. 3 to 5 inches thick.

B21g—4 to 12 inches, gray (5Y 5/1) silt loam coarsely mottled with dark brown; massive; clods crush to very weak, subangular blocks; friable; strongly acid; no roots; clear, smooth boundary. 7 to 10 inches thick. Water table at depth of 10 inches.

B22g—12 to 15 inches, gray (5Y 5/1) silty clay loam coarsely mottled with brown (color appears bluer than the 5Y 5/1 color chip); massive; plastic; medium acid; clear, smooth boundary. 3 to 5 inches thick.

Cg—15 to 23 inches +, gray to light-gray (5Y 6/1) varved clay coarsely mottled with weak red (color appears bluer than the 5Y 6/1 color chip); massive; plastic; slightly acid.

Range of characteristics.—Silt loam is the common type, but the texture of the A horizon is silty clay loam in places.

The A horizon is black (10YR 2/1 to N 2/0). The B horizon commonly is gray (5Y 5/1), but in some places is greenish gray (5BG 5/1). The C horizon commonly is gray (5Y 6/1) but in some places is greenish gray (5G 5/1 to 5BG 5/1). The B and C horizons usually have many, coarse, distinct mottles, but the mottling ranges from few to many, from medium to coarse, and from distinct to prominent. Mottles range from 7.5YR to 2.5YR in hue, from 4 to 5 in value, and from 2 to 4 in chroma.

The depth to varved clay is commonly about 16 inches but ranges from 12 to 20 inches.

BROADBROOK SERIES

The Broadbrook series consists of well-drained Brown Podzolic soils that developed in a mantle of very fine sandy loam that contains little coarse skeleton and is underlain by firm glacial till. The part of the profile that developed in the firm till is a fragipan.

The Broadbrook soils are near the moderately well drained Scituate and Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Broadbrook soils have a finer textured solum than Essex and Gloucester soils and a firmer substratum than the Gloucester soils.

Profile of Broadbrook very fine sandy loam in an orchard about 1½ miles east of the village of Ashfield in the town of Ashfield—

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

B21—10 to 16 inches, yellowish-brown (10YR 5/6) very fine sandy loam; weak, fine, granular structure; friable; many fine and medium roots; medium acid; clear, smooth boundary. 5 to 8 inches thick.

B22—16 to 23 inches, yellowish-brown (10YR 5/4) very fine sandy loam; massive; clods break to weak, fine granules; friable; fine and medium roots are common; medium acid; clear, smooth boundary. 7 to 10 inches thick.

B23—23 to 27 inches, brown (10YR 5/3) very fine sandy loam; massive; clods break to weak fine granules; friable; few fine and medium roots; medium acid; clear, smooth boundary. 3 to 6 inches thick.

IICx—27 to 40 inches +, olive-gray (5Y 4/2) gravelly fine sandy loam; massive; clods break explosively to single grains; firm in place; few roots in upper 4 or 5 inches, none below; about 25 percent coarse skeleton consisting of granitic gravel and a few cobbles; medium acid.

Range of characteristics.—The texture of the A and B horizons is very fine sandy loam, silt loam, or loam marginal to silt loam. The compact layer is firm to very firm. It is generally gravelly fine sandy loam or gravelly sandy loam, but in some places it is firm, platy gravelly loamy sand.

The A horizon is commonly dark brown (10YR 3/3) but ranges to very dark brown (10YR 3/2). The color of the upper B horizon is commonly yellowish brown (10YR 5/6) but ranges from brown or dark brown (10YR 4/3) to yellowish brown (10YR 5/8). The color of the lower

B horizon is usually paler and ranges from brown (10YR 5/3) to grayish brown (2.5Y 5/2). The color of the compact layer ranges from light brownish gray (10YR 6/2) to olive (5Y 4/3).

These soils are generally stony where they have not been cleared for cultivation. The coarse skeleton is less than 5 percent in the A and B horizons and is generally 20 to 50 percent in the underlying till. The depth to the fragipan is usually about 27 inches but ranges from 20 to 40 inches.

BUCKLAND SERIES

The Buckland series consists of moderately well drained Sols Bruns Acides intergrading to Brown Forest soils. They developed in compact glacial till derived principally from dark-gray mica schist and siliceous limestone. Carbonates have been leached from the upper horizons of these soils but remain in the centers of the larger fragments of partly disintegrated siliceous limestone. The leached, porous fragments are conspicuous components of the coarse skeleton in these soils.

The Buckland soils are members of the catena that includes the well-drained Shelburne and the poorly drained and very poorly drained Cabot soils.

The Buckland soils are similar to the Scituate soils, which are Brown Podzolic, and the Peru soils, which are Podzols, but the Buckland soils contain "ghosts" of siliceous limestone in the B and C horizons and have a higher reaction in the substratum. Also, the Buckland are finer textured than the Scituate soils.

Profile of Buckland fine sandy loam in a cultivated field 2 miles northeast of the village of Shelburne Falls in the town of Shelburne—

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; moderate, fine and medium, granular structure; friable; many, fine and medium, fibrous roots; 10 to 15 percent coarse skeleton consisting of gravel, channers, and cobbles; medium acid; abrupt, wavy boundary. 6 to 9 inches thick.

B21—7 to 13 inches, olive-brown (2.5Y 4/4) fine sandy loam with occasional reddish-brown stains that are the color remnants of siliceous limestone "ghosts"; weak, fine and medium, granular structure; friable; fine and medium fibrous roots are common; 10 to 20 percent coarse skeleton consisting of gravel, channers, and cobbles and including in the lower part a few fine and medium siliceous limestone "ghosts"; strongly acid; abrupt, smooth boundary. 5 to 8 inches thick.

B22—13 to 21 inches, olive-gray (5Y 4/2) fine sandy loam with common, medium, distinct, dark yellowish-brown (10YR 3/4) mottles; weak, thick, platy structure; firm in place, friable when removed; very few, fine fibrous roots; coarse skeleton is the same as in the horizon above; medium acid; clear, smooth boundary. 7 to 10 inches thick.

Cxg—21 to 36 inches +, dark-gray (5Y 4/1) loam with many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, thick, platy structure; very firm in place, firm when removed; no roots; 10 to 20 percent coarse skeleton consisting of gravel, channers, and cobbles; siliceous limestone "ghosts" are more abundant than in the horizon above; slightly acid.

Range of characteristics.—Fine sandy loam is the common type, but the textural range includes loam. The texture of the B horizon is commonly fine sandy loam but may range from sandy loam to loam. The C horizon is generally fine sandy loam but may range to loam.

The A horizon is generally very dark grayish brown (10YR 3/2). The upper B horizon is generally olive brown (2.5Y 4/4), but is dark yellowish brown (10YR 3/4 to 4/4) in some places. The lower B horizon is similar to the upper B horizon but is olive gray (5Y 4/2) or dark grayish brown (2.5Y 4/2) in places. The C horizon is generally dark gray (5Y 4/1). Mottles in the lower B horizon are generally common, fine, and distinct. Their hue is generally 7.5YR, but the range is to 10YR; the value is 4, and the chroma is 3 or 4. The upper B horizon may have reddish-brown (5YR 4/3) stains that resemble mottles but are the color remnants of otherwise completely disintegrated fragments of siliceous limestone. The C horizon generally has a hue of 5Y, a value of 3 or 4, and a chroma of 1 or 2.

The coarse skeleton commonly ranges from 10 to 20 percent but may be as much as 40 percent. It is evenly distributed throughout the soil and consists of dark-gray schist, some quartzite, and fragments of siliceous limestone. The limestone fragments are more abundant in the deeper parts of the C horizon.

The reaction is generally strongly acid to medium acid in the solum and slightly acid in the substratum but ranges from slightly acid in the lower B to neutral in the C horizon.

BUXTON SERIES

The Buxton series consists of moderately well drained Brown Podzolic soils that developed in glaciolacustrine deposits of silt and clay. Their topography is nearly level to sloping.

The Buxton soils are members of the catena that includes the well-drained Suffield, the poorly drained Scantic, and the very poorly drained Biddeford soils.

The Buxton soils are finer textured in the lower B horizon and substratum than the Belgrade soils, which formed in glaciolacustrine deposits of very fine sand and silt.

Profile of Buxton silt loam in a hayfield 2 miles north of the village of Whately in the town of Whately—

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; moderate, fine and medium, granular structure; friable; many, fine and medium, fibrous roots; medium acid; abrupt, smooth boundary. 7 to 10 inches thick.

B21—8 to 12 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, granular structure; friable; many, fine and medium, fibrous roots; medium acid; clear, wavy boundary. 3 to 6 inches thick.

B22—12 to 15 inches, light, olive-brown (2.5Y 5/6) silt loam with few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few, fine, fibrous roots; medium acid; clear, wavy boundary. 3 to 5 inches thick.

IIB23—15 to 25 inches, olive-gray (5Y 5/2) silty clay with many, medium, distinct, gray (N 5/0) and dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; clay skins on most ped faces and in root channels and earthworm burrows; firm in place, friable when removed; very few, fine, fibrous roots in the upper 5 inches, none below; slightly acid; clear, smooth boundary. 8 to 11 inches thick.

IIC—25 to 33 inches +, olive-gray (5Y 4/2) varved silt and clay with many, medium, distinct, gray (N 5/0) and very dark grayish-brown (10YR 3/2) mottles; massive; firm in place; few clay films in channels; slightly firm to friable when removed; no roots; slightly acid.

Range of Characteristics.—Silt loam is the common type, but the texture of the A horizon is light silty clay loam in places.

The Ap horizon commonly is very dark grayish brown (10YR 3/2) but ranges from dark brown (7.5YR 3/2) to

very dark grayish brown (2.5Y 3/2). Where these soils have not been cultivated, the A1 horizon is generally black (10YR 2/1). The upper B horizon is generally yellowish brown (10YR 5/6) and the color grades to light olive brown (2.5Y 5/6) or olive gray (5Y 5/2) in the lower B horizon. The C horizon generally is olive gray (5Y 4/2), though in some places it is dark grayish brown (2.5Y 4/2). In the lower B and C horizons there are commonly many, medium, distinct mottles, but they range from few to many, from fine to medium, and from distinct to prominent. Mottles range from 7.5YR to 10YR in hue from 3 to 5 in value, and from to 2 to 4 in chroma.

The depth to varved silt and clay is commonly about 24 inches but varies from 20 to 28 inches. These soils rarely contain coarse fragments, but in places the amount may be 5 to 10 percent. The coarse fragments generally occur as an unconforming horizon and are not uniformly distributed throughout the profile.

CABOT SERIES

The Cabot series consists of poorly drained Low-Humic Gley soils that developed in compact glacial till. The till was derived principally from gray, graphitic mica schist and siliceous limestone.

The Cabot soils are the poorly drained members of the catena that includes the well-drained Shelburne and the moderately well drained Buckland soils.

The Cabot soils are similar to the Ridgebury and Stissing soils. The Ridgebury soils are more acid throughout the profile than the Cabot and have a brighter matrix color and mottles in the B horizon. The Stissing soils developed in phyllite or slate and are finer textured than the Cabot.

Profile of Cabot fine sandy loam in an abandoned pasture 1¼ miles northwest of the village of Colrain in the town of Colrain—

Ap—0 to 9 inches, very dark gray (10YR 3/1) fine sandy loam; moderate, fine and medium, granular structure; friable; many, fine, fibrous roots; 5 to 10 percent coarse skeleton consisting mostly of medium and coarse quartzose and schistose gravel; medium acid; abrupt, smooth boundary. 7 to 9 inches thick.

A2—9 to 11 inches, dark olive-gray (5Y 3/2) loamy sand with few, fine, distinct, yellowish-brown (10YR 5/6) mottles; very weak, fine, granular structure to single grain; friable to loose; fine fibrous roots are few to common; about 5 percent coarse skeleton consisting mainly of coarse gravel and channers; slightly acid; abrupt, broken boundary. 0 to 2 inches thick.

B21—11 to 17 inches, very dark grayish-brown (2.5Y 3/2) fine sandy loam with common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, thick, platy structure; friable; very few, fine, fibrous roots; about 5 percent coarse skeleton consisting of coarse gravel and channers; slightly acid; clear, smooth boundary. 4 to 7 inches thick.

B22—17 to 21 inches, olive-gray (5Y 4/2) loamy fine sand with few, fine, distinct mottles of yellowish brown (10YR 5/6); single grained; loose; no roots; about 10 to 15 percent coarse skeleton consisting of fine gravel and medium and coarse channers; neutral reaction; abrupt, smooth boundary. 4 to 6 inches thick.

C1x—21 to 28 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam with many, fine, prominent, olive-gray (5Y 5/2) and strong-brown (7.5YR 5/6) mottles; moderate, thick, platy structure; very firm in place, firm when removed; about 10 percent coarse skeleton consisting of fine and medium gravel; neutral reaction; clear, smooth boundary. 6 to 8 inches thick.

C2—28 to 36 inches +, dark grayish-brown (2.5Y 4/2) fine sandy loam with common, fine, prominent, olive-gray (5Y 5/2) and dark-brown (7.5YR 3/2) mottles; massive; very firm in place, firm when removed; about 10 to 15 percent coarse skeleton consisting of fine and medium gravel; neutral reaction.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the surface layer and the B horizon ranges from fine sandy loam to loam. Gravelly phases of loam and fine sandy loam are within the range of the series.

Dull colors are typical of the profiles of Cabot soils. The A horizon commonly is very dark gray (10YR 3/1), but in some places is very dark grayish brown (10YR 3/2). The B horizon is generally very dark grayish brown (2.5Y 3/2) to olive gray (5Y 4/2). The C horizon is generally dark grayish brown (2.5Y 4/2). Mottling in the B and C horizons is distinct to prominent. If prominent, the mottles have a hue no redder than 7.5YR and a chroma of 6 or less.

The coarse skeleton is extremely variable and may be as much as 50 to 60 percent. It consists of quartzite, schist, and partly decomposed siliceous limestone. The amount of limestone "ghosts" in the profile increases with depth. The depth to the fragipan is generally about 20 inches but ranges from 16 to 30 inches.

These soils are generally very stony or extremely stony, but some areas have been cleared of surface stones.

CABOT SERIES, BLACK SURFACE

The Cabot series, black surface, consists of very poorly drained Humic Gley soils that developed in glacial till. The till was derived mainly from gray schist but contains appreciable amounts of siliceous limestone. These soils are in depressions and low areas in the foothills west of the Connecticut River valley.

These soils are like the other Cabot soils but have a nonconforming surface horizon that is thicker and blacker and contains much more organic matter. In places the surface horizon may be much less than 12 inches thick.

Profile of Cabot very stony loam, black surface, in woods about 2½ miles northwest of the village of Colrain in the town of Colrain—

A1—0 to 8 inches, black (10YR 2/1) loam containing much organic matter; moderate, fine and medium, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary. 6 to 9 inches thick. Surface stones, 12 to 18 inches in diameter, are about 50 feet apart.

B2—8 to 14 inches, dark olive-gray (5Y 3/2) loam with few, medium, prominent, brown to dark-brown (7.5YR 4/4) mottles; weak and moderate, fine, granular structure; friable; few roots; slightly acid; clear, smooth boundary. 5 to 7 inches thick.

C1x—14 to 18 inches, olive-gray (5Y 4/2) loam with many coarse, prominent, strong-brown (7.5YR 5/8) mottles; massive; breaks to weak, thick, platy clods that crush explosively to single grains; firm in place, slightly firm in hand; slightly acid; clear, smooth boundary. 4 to 6 inches thick.

C2x—18 to 31 inches, olive-gray (5Y 4/2) fine sandy loam with common, coarse, prominent, brown to dark-brown (7.5YR 4/4) mottles; massive; breaks to moderate, thick, platy clods that crush explosively to single grains; firm in place, slightly firm in hand; neutral reaction; clear, smooth boundary. 10 to 16 inches thick.

C3x—31 to 40 inches +, olive-gray (5Y 4/2) fine sandy loam with few, coarse, prominent, brown to dark-brown (7.5YR 4/4) mottles; massive; slightly firm in place, friable when removed; neutral reaction.

Range of characteristics.—The texture of the surface horizon ranges from loam to fine sandy loam. This horizon has a high content of organic matter that is muck in some places and contains small amounts of mineral material.

The B and C horizons typically have an olive-gray matrix and few to many coarse, prominent, brown to dark-brown (7.5YR 4/4) or strong-brown (7.5YR 5/8) mottles.

The coarse skeleton is extremely variable; it ranges from less than 5 to more than 40 percent. The depth to the fragipan is generally about 12 inches but ranges from 10 to 20 inches.

The surface is generally very stony. Stones 12 to 20 inches in diameter are 5 to 50 feet apart.

CARVER SERIES

The Carver series consists of excessively drained, coarse-textured Brown Podzolic soils that intergrade to Regosols. These soils developed in deep sandy deposits on outwash and glaciofluvial plains. Their texture is loamy coarse sand or coarse sand in the upper part of the solum and coarse sand in the lower part and in the substratum.

The Carver soils are coarser textured than the Windsor soils, which have loamy very fine sand to loamy sand in the solum and sand in the substratum. The Carver soils are not underlain by stratified sand, gravel, and cobbles as the Hinckley soils are.

Profile of Carver loamy coarse sand in woods about 2½ miles southeast of Turners Falls—

O1—2 inches to 1 inch, loose litter of oak leaves, pitch pine needles, and other debris.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) loamy coarse sand; single grain; loose; less than 5 percent coarse skeleton of fine gravel 2 to 5 millimeters in diameter; many fine roots; very strongly acid; abrupt, wavy boundary. 2 to 4 inches thick.

B2—4 to 18 inches, dark yellowish-brown (10YR 4/4) loamy coarse sand; single grain; loose; about 10 percent coarse skeleton of fine gravel 2 to 5 millimeters in diameter; fine roots common in upper half, few in lower half; very strongly acid; clear, wavy boundary. 14 to 16 inches thick.

B3—18 to 29 inches, yellowish-brown (10YR 5/4) coarse sand; single grain, loose; about 5 percent coarse skeleton of fine gravel 2 to 5 millimeters in diameter; few fine roots; very strongly acid; gradual, wavy boundary. 9 to 14 inches thick.

C—29 to 48 inches +, pale-brown (10YR 6/3) and brown (10YR 5/3) coarse sand; single grain; loose; about 15 percent coarse skeleton of fine gravel 2 to 5 millimeters in diameter; few fine roots; very strongly acid.

Range of characteristics.—The texture of the surface layer and upper B horizon is loamy coarse sand to coarse sand. The texture of the lower B horizon and the C horizon generally is coarse sand but in some places is sand.

The A horizon is very dark grayish brown (10YR 3/2) and, in some places, very dark brown (10YR 2/2). The B horizon has a hue of 10YR, a value of 4 to 5, and a chroma of 4 or 3. The C horizon has a hue of 10YR or 2.5Y, a value of 5 to 7, and a chroma of 3 to 4.

Throughout the solum these soils generally have less than 10 percent coarse skeleton of fine gravel 2 to 5 millimeters in diameter. The sand fraction is dominantly coarse and very coarse sand, and the combined total of these two particle sizes ranges from 25 to 85 percent. The thickness of the solum is generally about 30 inches. In some places fine gravel strata occur at a depth below 4 feet.

The reaction is strongly to very strongly acid.

CHARLTON SERIES

The Charlton series consists of well-drained Brown Podzolic soils that developed in loose to firm glacial till derived principally from gray or olive mica schist, gneiss, or phyllite. Their topography is gently sloping to very steep.

The Charlton soils are near the shallow Hollis, the moderately well drained Sutton, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Charlton soils have a finer textured solum than the Gloucester soils and do not have the compact layer of the Marlow, dark subsoil, and the Essex soils. The Charlton and Colrain soils are similar, but the Colrain soils are Sols Brums Acides intergrading to Brown Forest soils, are less acid, and contain limestone "ghosts" in the subsoil and substratum. The Charlton soils are coarser textured than the Dutchess soils, which developed in phyllite or slate. The Charlton and Berkshire, dark subsoil, are similar, but the latter soils contain more than 2 percent organic matter in the upper B horizon.

Profile of Charlton very stony fine sandy loam in woods 1½ miles southwest of the village of Northfield—

O1—2 inches to 1 inch, litter of leaves and twigs, mostly sugar maple, white birch, red oak, and black oak.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 3 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, granular structure; very friable; many, fine and medium, fibrous and woody roots; about 10 to 15 percent coarse skeleton consisting of fine and medium gravel; very strongly acid; clear, smooth boundary. 3 to 4 inches thick. (The surface of this horizon is very stony; stones have an average diameter of 16 to 20 inches and are about 25 feet apart.)

B21—3 to 8 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; many, fine and medium, fibrous and woody roots; about 10 to 15 percent coarse skeleton consisting of fine and medium gravel; strongly acid; clear, smooth boundary. 5 to 8 inches thick.

B22—8 to 18 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine, granular structure; very friable; few, medium, woody roots; about 10 to 15 percent coarse skeleton consisting of fine and medium gravel; medium acid; abrupt, smooth boundary. 10 to 14 inches thick.

C—18 to 32 inches +, olive (5Y 5/3) fine sandy loam; very weak, medium, platy structure; friable; few, medium, woody roots; about 10 to 15 percent coarse skeleton consisting of fine and medium gravel; medium acid.

Range of characteristics.—The texture of the surface layer is commonly fine sandy loam but ranges to loam. The texture in the solum and substratum is commonly fine sandy loam but is sandy loam in places.

A dark-brown (10YR 3/3 or 7.5YR 3/2) color is common in the A horizon. The B horizon is typically dark yellowish brown (10YR 4/4), but in some places it is strong brown (7.5YR 5/6). The C horizon is olive brown (2.5Y 4/4) to olive (5Y 5/4).

The amount of coarse skeleton commonly ranges from 10 to 20 percent, but may be as much as 75 percent. This

coarse skeleton consists of schist, phyllite, or gneiss, and in some places, granite.

The Charlton soils are generally extremely stony but the range includes nonstony and very stony soils. Slopes are generally 10 to 15 percent but range from 5 to 45 percent. In some places there is a firm horizon at a depth of 3 to 5 feet.

CHESHIRE SERIES

The Cheshire series consists of well-drained Brown Podzolic soils. These soils developed in loose to firm glacial till derived principally from reddish-brown Triassic sandstone, shale, and conglomerate. The topography is gently sloping to very steep.

The Cheshire soils are near the shallow Sunderland and Holyoke soils.

The Cheshire soils are redder in the solum and substratum than the Gloucester, Charlton, and Dutchess soils and the Berkshire soils, dark subsoil. The Cheshire soils are somewhat similar to the Berkshire soils, which are Podzols. In the Cheshire soils, however, the reddish color in the B horizon is inherited from the red parent material, whereas in the Berkshire soils the reddish color is a genetic manifestation.

Profile of Cheshire fine sandy loam in a wooded area 1 mile north of Greenfield—

O1—3 inches to 1 inch, loose litter of leaves and twigs, mostly red oak and black oak.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 1 inch, very dark gray (10YR 3/1) fine sandy loam; weak, fine, granular structure; very friable; many, fine and medium, and few, coarse, woody roots; about 10 to 15 percent coarse skeleton consisting mainly of angular fragments of red sandstone 3 to 5 inches long and about 2 inches thick; very strongly acid; abrupt, smooth boundary. 1 to 2 inches thick.

B21—1 to 2 inches, reddish-brown (5YR 5/3) fine sandy loam; very weak, fine, granular structure; very friable; many, fine and medium roots and a few, coarse, woody roots; 10 to 15 percent coarse skeleton consisting of angular fragments of red sandstone; very strongly acid; clear, smooth boundary. 1 to 2 inches thick.

B22—2 to 6 inches, reddish-brown (5YR 5/4) fine sandy loam; weak, fine, granular structure; very friable; many medium, and few coarse, woody roots; about 10 to 15 percent coarse skeleton consisting of angular fragments of red sandstone; very strongly acid; clear, smooth boundary. 4 to 6 inches thick.

B23—6 to 14 inches, reddish-brown (2.5YR 5/4)) gravelly fine sandy loam; massive; very friable; many medium and a few coarse, woody roots; about 20 percent coarse skeleton consisting of angular fragments of red sandstone; very strongly acid; clear, smooth boundary. 8 to 10 inches thick.

B24—14 to 29 inches, reddish-brown (2.5YR 5/4) gravelly sandy loam; massive; very friable; common medium and a few coarse, woody roots in upper 6 to 8 inches, the number diminishing with depth to few fine and medium and occasional coarse, woody roots; 20 to 25 percent coarse skeleton consisting of angular fragments of red sandstone 3 to 5 inches long and about 2 inches thick; strongly acid; clear, smooth boundary. 14 to 18 inches thick.

C—29 to 36 inches +, weak, red (10R 5/4) gravelly sandy loam; massive; very friable; few, fine and medium, woody roots in upper 4 to 6 inches, none below; about 25 percent coarse skeleton consisting of fragments of red sandstone 3 to 8 inches long and about 2 inches thick; very strongly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the A horizon ranges from sandy loam to loam. The texture of the B horizon is generally fine sandy loam in the upper part and sandy loam in the lower part, but in some areas the texture is fine sandy loam throughout. The C horizon generally has a texture of sandy loam.

The A1 horizon is typically black (10YR 2/1), ranging to dark reddish brown (5YR 3/2). Where these soils have been tilled, the Ap horizon is generally dark brown (10YR 3/3). The B horizon is commonly reddish brown (5YR 5/4) to yellowish red (5YR 5/6). The C horizon ranges from reddish brown (5YR 4/3) to weak red (10R 5/4).

The amount of coarse skeleton is generally 15 to 25 percent but ranges from 10 to 60 percent. The coarse skeleton consists mainly of angular to slightly rounded fragments of red Triassic sandstone and some red shale conglomerate.

These soils are naturally stony, but many areas, some of them now wooded, have been cleared of surface stones so that they could be farmed. Their slopes are generally 8 to 25 percent but range from 3 to 45 percent.

COLRAIN SERIES

The Colrain series consists of Sols Bruns Acides intergrading to Brown Forest soils. They developed in glacial till derived principally from dark-gray mica schist and siliceous limestone. These soils are gently sloping to very steep.

The Colrain soils are near the shallow Westminster, the moderately well drained Buckland, and the poorly and very poorly drained Cabot soils.

The Colrain soils are not so strongly acid as the Charlton, Gloucester, and Dutchess soils, which are Brown Podzolic. In addition, the subsoil and substratum of the Colrain soils contain "ghosts" of disintegrated siliceous limestone. The Colrain soils have developed in the same lithological materials as the Shelburne soils but have no distinct fragipan within 30 inches of the surface.

Profile of Colrain fine sandy loam in an abandoned field one-half mile east of the village of Stewartville in the town of Leyden—

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine and medium, granular structure; very friable; many, fine, fibrous roots; about 10 to 15 percent coarse skeleton consisting mainly of fine channers; very strongly acid; abrupt, smooth boundary. 7 to 9 inches thick.

B21—9 to 15 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine and medium, granular structure; very friable; common to many, fine, fibrous roots; 5 to 10 percent coarse skeleton of fine gravel; medium acid; clear, broken boundary. 0 to 6 inches thick.

B22—15 to 23 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; weak, fine and medium, granular structure; very friable; fine fibrous roots are common; about 10 percent coarse skeleton of fine gravel, including few limestone "ghosts"; medium acid; abrupt, wavy boundary. 4 to 8 inches thick.

C—23 to 44 inches +, very dark grayish-brown (2.5Y 3/2) gravelly sandy loam; very weak, fine and medium, granular structure; very friable to loose; few, fine fibrous roots in upper 8 inches; 30 to 40 percent coarse skeleton consisting of fine gravel and channers, including many limestone "ghosts"; slightly acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the surface soil ranges from fine sandy loam to loam.

The A horizon is generally very dark grayish brown (10YR 3/2). The B horizon commonly is dark yellowish brown (10YR 4/4), but the color ranges to olive brown

(2.5Y 4/4). The C horizon is generally very dark grayish brown (2.5Y 3/2), but in some places is olive gray (5Y 4/2). The limestone "ghosts" typically are dark reddish brown (5YR 2/2), but some are nearly black.

The amount of coarse skeleton generally ranges from 10 to 20 percent, but may be as much as 50 percent. The coarse skeleton consists of fine and medium gravel, channers, and numerous fragments of partly decomposed siliceous limestone.

Where they have not been cleared for farming, the Colrain soils are very stony or extremely stony. Stones 1 to 2 feet in diameter are common and in places are only 5 to 6 feet apart. Also, there are some boulders 2 to 5 feet in diameter.

DEERFIELD SERIES

The Deerfield series consists of moderately well drained Brown Podzolic soils that developed in deep sand deposits of mixed mineralogy.

The Deerfield soils are near the excessively drained Windsor, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

The Deerfield soils are associated with the Ninigret and Sudbury soils; however, the Ninigret soils are finer textured in the B horizon than the Deerfield, and the Sudbury soils are underlain by stratified sand, gravel, and cobbles in addition to having a finer textured B horizon than the Deerfield soils.

Profile of Deerfield loamy fine sand in a pasture about one-half mile north of the village of South Deerfield in the town of Deerfield—

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; weak, fine, crumb structure; very friable; many fine roots; strongly acid; abrupt, smooth boundary. 9 to 11 inches thick.

B21—10 to 12 inches, yellowish-brown (10YR 5/6) loamy fine sand; weak, fine, crumb structure; very friable; fine roots are common; strongly acid; abrupt, smooth boundary. 2 to 3 inches thick.

B22—12 to 16 inches, light olive-brown (2.5Y 5/6) loamy fine sand; very weak, fine, crumb structure or single grained; loose; few fine roots; medium acid; abrupt, wavy boundary. 3 to 7 inches thick.

B3—16 to 28 inches, light olive-brown (2.5Y 5/4) fine sand with few, fine, prominent mottles of reddish brown (5YR 4/4) and dark reddish brown (2.5YR 3/4) in the upper part and common, medium, prominent, red (2.5YR 4/6) mottles in the lower part; single grain; loose; few fine roots; medium acid; gradual, smooth boundary. 11 to 13 inches thick.

C—28 to 60 inches +, olive (5Y 4/3) fine sand with few, fine, distinct mottles of light olive brown (2.5Y 5/6) and strong brown (7.5YR 5/6) in the upper 10 inches and none below; single grain; loose; no roots; medium acid.

Range of characteristics.—Loamy fine sand is the common type, but the texture ranges from loamy sand to fine sandy loam. The lower B horizon is loamy sand or sand, and the C horizon is generally sand. The depth to sand is normally 18 to 24 inches but ranges from 12 to about 30 inches.

The Ap horizon is typically very dark grayish brown (10YR 3/2). The colors in the B horizon are paler with depth. The B horizon commonly has a hue of 10YR, in places 2.5Y, in the upper part, and a hue of 2.5Y in the lower part. The value is 4 or 5, and the chroma is 2 to 6. The dominant hue in the C horizon is 5Y, but it ranges to 10YR; the value and chroma are like those in the B horizon but may be a little lower, especially the chroma.

The consistence in all horizons is very friable or loose. The reaction ranges from very strongly acid to medium acid but may be slightly acid in the C and lower B horizons.

DUTCHESS SERIES

The Dutchess series consists of well-drained Brown Podzolic soils. These soils developed in acid glacial till derived principally from dark-gray to black slate and phyllite. Their topography is gently sloping to very steep.

The Dutchess soils are near the shallow Nassau, the moderately well-drained Pittstown, the poorly drained Stissing, and the very poorly drained Whitman soils.

Dutchess soils are similar to the Bernardston soils but developed in loose glacial till instead of compact till. They have a finer texture and more olive color than the Charlton soils, which are Brown Podzolic. The Dutchess and Marlow soils, dark subsoil, are similar, but the Dutchess soils have less organic matter in the B horizon and are finer textured throughout.

Profile of Dutchess silt loam in a wooded area 2 miles north of the village of Bernardston in the town of Bernardston—

O1—2 inches to 1 inch, litter of leaves and twigs, mostly sugar maple, white birch, and beech.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 2 inches, black (10YR 2/1) heavy loam; weak, fine, granular structure; very friable; many, fine and medium, woody roots; about 10 percent coarse skeleton of channers consisting mainly of flat chips of black slate or phyllite; very strongly acid; abrupt, smooth boundary. 2 to 3 inches thick.

A3—2 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; many, fine and medium, woody roots; about 10 percent coarse skeleton consisting of fine and medium gravel; very strongly acid; clear, smooth boundary. 1 to 2 inches thick.

B21—3 to 9 inches, brown to dark-brown (10YR 4/3) silt loam; very weak, fine, granular structure; very friable; fine and medium woody roots are common; 10 to 15 percent coarse skeleton consisting of fine and medium gravel plus a few slate or phyllite fragments; very strongly acid; clear, smooth boundary. 6 to 8 inches thick.

B22—9 to 20 inches, dark grayish-brown (2.5Y 4/2) silt loam; massive; very friable; medium woody roots are common in the upper 4 inches and a few, fine, woody roots below; 10 to 15 percent coarse skeleton consisting of fine and medium gravel with some slate or phyllite fragments; very strongly acid; clear, smooth boundary. 10 to 14 inches thick.

C1—20 to 30 inches, olive-gray (5Y 4/2) silt loam; weak, medium, platy structure; slightly firm in place, friable when removed; few, fine, woody roots; 15 to 20 percent coarse skeleton consisting of fine and medium gravel with many slate or phyllite fragments; very strongly acid; gradual, smooth boundary. 8 to 12 inches thick.

C2—30 to 40 inches +, olive-gray (5Y 4/2) silt loam; massive; slightly firm in place, friable when removed; no roots; 15 to 20 percent coarse skeleton consisting of fine and medium gravel with many slate or phyllite fragments; very strongly acid.

Range of characteristics.—Silt loam is the common type, but the texture of the surface layer is heavy loam or loam in places.

The A1 horizon generally is black (10YR 2/1 or blacker). Where the Ap horizon is present, it commonly is very dark grayish brown (10YR 3/2) but in some places is very dark grayish brown (2.5Y 3/2). The upper B horizon is typically dark yellowish brown (10YR 4/4) and the

lower B horizon is dark grayish brown (2.5Y 4/2). The C horizon is generally olive gray (5Y 4/2) or dark olive gray (5Y 3/2).

The amount of coarse skeleton generally ranges from 10 to 20 percent but may be as much as 40 percent, particularly in the C horizon. Flat chips of slate or phyllite are characteristic of the coarse fragments throughout the profile.

The Dutchess soils are naturally very stony or extremely stony. Stones 10 to 18 inches in diameter may be only 10 to 15 feet apart. In places bedrock is 36 to 48 inches from the surface. The slopes generally range from 15 to 25 percent but may range from 5 to 55 percent.

ESSEX SERIES

The Essex series consists of well-drained Brown Podzolic soils that developed in compact glacial till derived mainly from granite and gneiss. Their topography is gently sloping to steep.

The Essex soils are members of the catena that includes the moderately well drained Scituate soils.

The Essex soils are similar to the Gloucester soils but have a very distinct fragipan within 30 inches of the surface. The Essex soils are coarser textured than the Shelburne soils, which are Sols Bruns Acides intergrading to Brown Forest soils. They are coarser than Marlow soils, dark subsoil, which contain more than 2 percent organic matter in the upper B horizon. The Essex soils are similar to the Bernardston soils but are coarser textured and formed in till derived principally from granitic rocks rather than phyllite or slate.

Profile of Essex fine sandy loam in a red pine plantation, Wendell State Forest, east of Millers Falls on Bear Mountain Road, town of Wendell—

Ap—0 to 7 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine and medium, granular structure; very friable; many tree roots; 5 percent coarse skeleton of gravel, mainly granite and gneiss; very strongly acid; abrupt, smooth boundary. 6 to 8 inches thick.

B21—7 to 15 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium, granular structure; very friable; tree roots are common; 10 percent coarse skeleton of gravel and cobbles, mainly granite and gneiss; strongly acid; gradual, wavy boundary. 6 to 9 inches thick.

B22—15 to 25 inches, light yellowish-brown (10YR 6/4) loamy sand; very weak, fine, granular structure; very friable; few tree roots; 10 to 15 percent coarse skeleton of gravel and cobbles; strongly acid; abrupt, smooth boundary. 9 to 10 inches thick.

Cx—25 to 36 inches +, light olive-gray (5Y 6/2) gravelly loamy sand; weak, medium, platy structure; very firm in place, firm in the hand; very few tree roots in the upper part, none below; 25 percent coarse skeleton of gravel and some cobbles and stones; strongly acid.

Range of characteristics.—Fine sandy loam is the common type but the texture ranges from sandy loam to loam, including stony phases. The texture of the upper B horizon is generally fine sandy loam, and the lower B horizon is commonly coarse sandy loam or loamy sand. The C horizon is typically gravelly loamy sand.

Where the A1 horizon is present, it is generally very dark grayish brown (10YR 3/2) but ranges from very dark brown (10YR 2/2) to dark grayish brown (10YR 4/2). Where the Ap horizon is present, it is dark brown (10YR 3/3) and in some places, dark yellowish brown (10YR 3/4). The upper B horizon is commonly dark yellowish brown (10YR 4/4) but ranges from brown (7.5YR 4/4) to light olive brown (2.5Y 5/6). The lower B horizon is commonly yellowish brown (10YR 5/4) but ranges from brown (7.5YR 5/4) to light yellowish brown (2.5Y 6/4). The C horizon is commonly olive gray (5Y 4/2 or 5/2) but ranges from light brownish gray (10YR 6/2) to light olive gray (5Y 6/2).

The coarse skeleton varies in amount but ranges from 5 to 50 percent. It generally consists of angular to partly rounded gravel and cobbles that are mainly granite or quartzite and some gneiss. The depth to the distinct fragipan is generally about 24 inches but ranges from 20 to 30 inches.

The slopes are commonly 8 to 25 percent but range from 3 to 45 percent. These soils are naturally very stony or extremely stony. In areas that have not been cleared, stones 1 to 2 feet in diameter may be no more than 8 to 10 feet apart. Boulders 3 to 5 feet in diameter are common on the surface.

GLOUCESTER SERIES

The Gloucester series consists of somewhat excessively drained Brown Podzolic soils that developed in loose glacial till derived principally from granite, gneiss, and quartzite. They are nearly level to very steep.

The Gloucester soils are near the shallow Shapleigh, the moderately well drained Scituate, and the poorly drained Ridgebury soils.

The Gloucester and Essex soils developed in materials that are lithologically similar, but the Essex soils have a distinct fragipan within 30 inches of the surface. The Gloucester soils contain less silt than the Charlton soils, which developed in till derived mainly from mica schist and phyllite with an admixture of granite. The Gloucester soils are like the Colrain soils, which are Sols Bruns Acides intergrading to Brown Forest soils, but the Gloucester soils are more strongly acid and do not contain disintegrated siliceous limestone "ghosts" in the B and C horizons. They are coarser textured than the Dutchess soils, which developed primarily in phyllite.

Profile of Gloucester sandy loam in a wooded area in the town of Montague 100 feet from road and 100 feet from an open old field at junction of Chestnut Loop Road and Chestnut Road—

O1 and O2—½ inch to 0, leaf litter and partly decomposed humus.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, fine, granular structure; very friable; 5 percent coarse skeleton of gravel; extremely acid; abrupt, smooth boundary.

B21—4 to 15 inches, strong-brown (7.5YR 5/6) sandy loam; weak, fine and medium, granular structure; very friable; 15 to 25 percent coarse skeleton of gravel and cobbles; extremely acid; gradual, smooth boundary.

B22—15 to 23 inches, yellowish-brown (10YR 5/4) gravelly loamy coarse sand; single grain; loose; 25 to 30 percent coarse skeleton of gravel and cobbles; very strongly acid; gradual, smooth boundary.

B23—23 to 33 inches, grayish-brown (10YR 5/2) very gravelly loamy coarse sand; loose; single grain; 60 percent coarse skeleton of gravel and cobbles; very strongly acid; gradual, smooth boundary.

C1—33 to 45 inches, banded light-gray (10YR 6/1) and light brownish-gray (10YR 6/2) coarse sand; single grain; loose; 15 percent coarse skeleton of gravel and cobbles; very strongly acid; 2- to 3-inch gravel layer is boundary to horizon below.

C2—45 inches +, light-gray (10YR 7/1) gravelly sand; single grain; loose; 15 to 25 percent coarse skeleton of gravel and cobbles; some silt faces noticeable; strongly acid.

Range of characteristics.—Extremely stony sandy loam is the common type, but the texture ranges from loamy sand to fine sandy loam. The texture is loamy sand, sandy loam, or fine sandy loam in the A horizon and upper B horizon to a depth of about 14 inches. Below this depth, the texture in the B horizon is coarse sandy loam, loamy sand, or loamy coarse sand. The texture of the C horizon ranges from loamy sand to sand.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to brown to dark brown (10YR 4/3). The A1 horizon ranges from black (10YR 2/1) to brown, and then to dark brown (10YR 4/3). The color of the Ap or A1 horizon, however, is dominantly very dark grayish brown (10YR 3/2). The upper part of the B horizon is characteristically dark yellowish brown (10YR 4/4) but ranges to brownish yellow (10YR 6/6). The lower part is yellowish brown (10YR 5/4) but ranges from brown to dark brown (10YR 4/3) to light yellowish brown (10YR 6/4). The C horizon is usually light yellowish brown (2.5Y 6/4) but ranges from brown (10YR 5/3) to pale olive (5Y 6/3).

The content of coarse fragments of all sizes throughout the soil is generally greater than 20 percent and is as much as 70 percent. In places there is a firm or very firm layer at a depth of 3 to 5 feet, and a faint, leached horizon may be present directly above this layer.

The Gloucester soils are conspicuously stony and bouldery on the surface and throughout the profile. The surface is nearly stone free in cleared areas to extremely stony in uncleared areas.

The reaction ranges from extremely acid to medium acid.

HADLEY SERIES

The Hadley series consists of deep, well-drained Alluvial soils developing in medium-textured sediments derived mainly from schist, gneiss, granite, slate, and phyllite.

These soils are members of the catena that includes the moderately well drained Winooski, the poorly drained Limerick, and the very poorly drained Saco soils.

The Hadley soils have a texture of very fine sandy loam, loam, or silt loam in contrast to the Ondawa soils, which have a texture of fine sandy loam or sandy loam, and in contrast to the Suncook soils, which have a texture of loamy sand or sand. The Hadley soils are similar to the Hartland soils, but the latter are Brown Podzolic and have developed in silt and very fine sand on glaciolacustrine material.

Profile of Hadley very fine sandy loam in a cultivated field three-fourths of a mile west of the village of Deerfield in the town of Deerfield—

Ap—0 to 12 inches, very dark grayish-brown (2.5Y 3/2) very fine sandy loam; weak, fine granular structure; very friable; strongly acid; abrupt, smooth boundary. 10 to 12 inches thick.

C1—12 to 16 inches, dark grayish-brown (2.5Y 4/2) very fine sandy loam; massive, crushes to single grain; very friable; medium acid; clear, smooth boundary. 4 to 8 inches thick.

C2—16 to 26 inches, olive-brown (2.5Y 4/4) very fine sandy loam; massive; crushes to single grain; very friable; strongly acid; abrupt, smooth boundary. 8 to 12 inches thick.

C3—26 to 40 inches +, olive (5Y 4/3) silt loam; massive; slightly firm in place, friable when removed; very strongly acid.

Range of characteristics.—Very fine sandy loam is the common type, but the texture of the surface layer and throughout the profile ranges from very fine sandy loam to silt loam. The C horizon may have a fairly uniform texture or may be prominently stratified. Typical Hadley soils have an A–C horizon sequence, but occasionally the sequence includes one or more buried horizons where the interval between periods of deposition was sufficiently long for an A horizon to develop.

The Ap horizon is generally very dark grayish brown (2.5Y 3/2 or 10YR 3/2). The upper C horizon commonly ranges in color from dark grayish brown (2.5Y 4/2) to olive (5Y 5/4). The lower C horizon is very dark grayish brown (2.5Y 3/2) to olive (5Y 4/4).

Hadley soils are nonstony and contain no coarse skeleton. The reaction ranges from medium acid to very strongly acid.

HARTLAND SERIES

The Hartland series consists of well-drained Brown Podzolic soils that developed in medium-textured deposits on lacustrine or glaciolacustrine terraces. They are mostly gently sloping to steep, but some are nearly level.

The Hartland soils are near the moderately well drained Belgrade and the poorly drained Raynham soils. They are similar to the Suffield soils but have less clay, especially in the substratum.

Profile of Hartland silt loam in a cornfield about 3 miles south of the village of Deerfield in the town of Deerfield—

Ap—0 to 9 inches, olive-brown (2.5Y 4/4) silt loam; very weak, fine and medium, granular structure, friable; many fine roots; strongly acid; abrupt, smooth boundary. 8 to 11 inches thick.

B21—9 to 13 inches, olive (5Y 5/4) silt loam; massive, but thick, platy clods crush to single grains; firm in place, slightly firm when removed; common fine roots; strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B22—13 to 17 inches, olive (5Y 5/3) silt loam; massive, but clods crush to single grains; firm in place, friable when removed; common fine roots; strongly acid; abrupt, smooth boundary. 4 to 6 inches thick.

C—17 to 42 inches +, olive (5Y 4/3) and light olive-brown (2.5Y 5/4) varved very fine sand and silt with occasional thin lenses of clay; massive; firm, few fine roots to about 30 inches; strongly acid.

Range of characteristics.—The texture of the solum is generally silt loam but in places is very fine sandy loam. The substratum texture is varved silt and very fine sand with occasional lenses of clay. Cultivated soils usually have a plowpan, 3 to 5 inches thick, directly under the plow layer.

The colors are generally dull, and they range from very dark grayish brown (2.5Y 3/2) and (10YR 3/2) to olive brown (2.5Y 4/4) in the surface horizon and from olive (5Y 4/3 and 5/3) to brown or dark brown (10YR 4/3) in the B horizon. The substratum is generally olive (5Y 4/3), and the varves may be banded with strong brown (7.5YR 5/6) at a depth greater than 36 inches.

Most cultivated areas have been truncated by moderate to severe sheet erosion. The depth to varved silt and very fine sand ranges from about 16 inches to more than 42 inches, depending on how severely the soil has been eroded.

The reaction is medium to strongly acid.

HINCKLEY SERIES

The Hinckley series consists of deep, excessively drained Brown Podzolic soils that developed in stratified, coarse-textured glaciofluvial deposits of sand, gravel, and cobbles. The parent material consists mainly of granite, gneiss, and quartzite in varying proportions. The Hinckley soils are on kames, eskers, and glaciofluvial terraces.

These soils are near the well drained to somewhat excessively drained Merrimac, the moderately well drained Deerfield and Sudbury, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils. The Hinckley soils are coarser textured in the solum than the Merrimac and Warwick soils. They differ from Windsor soils in being underlain by stratified sand, gravel, and cobbles within 30 inches of the surface.

Profile of Hinckley sandy loam in woods formerly cultivated, about 3½ miles southwest of the village of Erving in the town of Wendell—

Ap—0 to 5 inches, dark-brown (10YR 3/3) sandy loam; very weak, fine, crumb structure; very friable; many fine and medium and a few coarse tree roots; about 10 percent coarse skeleton of medium and coarse gravel; very strongly acid; abrupt, smooth boundary. 4 to 6 inches thick.

B21—5 to 12 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; very weak, fine, crumb structure; very friable; many fine and medium tree roots; about 25 percent coarse skeleton of medium and coarse gravel; strongly acid; clear, smooth boundary. 7 to 10 inches thick.

IIB22—12 to 18 inches, yellowish-brown (10YR 5/6) gravelly coarse sand; single grain; loose; few fine and medium roots; about 25 percent coarse skeleton of medium and coarse gravel and a few cobbles; strongly acid; abrupt, smooth boundary. 4 to 6 inches thick.

IIC—18 to 32 inches +, light olive-brown (2.5Y 5/4) coarsely stratified sand, gravel, and cobbles; single grain; loose; very few fine roots in upper 6 inches; 75 percent coarse skeleton, 25 to 50 percent of which is gravel and the rest cobbles; medium acid.

Range of characteristics.—The texture of the surface layer is commonly sandy loam but ranges from loamy sand to gravelly very fine sandy loam. The B horizon generally is loamy sand in texture but in places the upper B horizon is sandy loam. The C horizon consists of stratified deposits of sand, gravel, or cobbles, or all three.

The surface horizon is generally very dark grayish brown (10YR 3/2) but ranges to brown and dark brown (10YR 4/3). The upper B horizon ranges from brown to dark brown (7.5YR 4/4) to yellowish brown (10YR 5/6); the lower B horizon is yellower, with hues of 10YR and 2.5Y. The C horizon ranges from dark grayish brown (2.5Y 4/2) to very pale brown (10YR 7/3), depending on the color of the coarse skeleton.

The coarse skeleton is extremely variable in amount and composition. The depth to the strongly contrasting horizon of sand, gravel, and cobbles is commonly about 16 inches but ranges from 12 to 24 inches.

Except for the Ap horizon, which may be slightly acid, the Hinckley soils are generally medium to very strongly acid throughout the profile.

HOLLIS SERIES

The Hollis series consists of somewhat excessively drained, shallow Brown Podzolic soils. They formed in a shallow layer of glacial till derived principally from granite, gneiss, and schist. These soils are on gently sloping to very steep, rocky ridges.

The Hollis soils are near the well-drained Charlton, the moderately well drained Sutton, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Hollis soils have a finer textured solum than the Shapleigh soils, which formed in shallow sandy till derived principally from granite and quartzite. They are not so red as the Sunderland soils, which developed in Triassic material. They are coarser textured than the Holyoke soils. They are similar to the Westminster soils but have less organic matter in the B horizon. The Lyman soils are the Podzol analogs of the Hollis soils.

Profile of Hollis fine sandy loam in woods about 5 miles east of the village of Sunderland in the town of Leverett—

O1—2 inches to 1 inch, loose litter of leaves and twigs, mostly red oak and black oak.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 1 inch, very dark brown (10YR 2/2) fine sandy loam; weak, fine, granular structure; very friable; many fine and medium roots; 10 percent coarse skeleton consisting of fragments of schist and gneiss less than 3 inches in diameter; extremely acid; abrupt, smooth boundary. ½ to 2 inches thick.

B2—1 to 17 inches, dark yellowish-brown (10YR 4/4) gravelly fine sandy loam that grades to yellowish brown (10YR 5/4) with depth; massive; clods break to very weak, fine granules and single grains; friable to loose; many fine and medium roots in upper part; number of roots decreases with depth except in the lower inch or so of the horizon, which is almost a solid mass of roots; 20 to 25 percent coarse skeleton consisting of fragments of schist and gneiss less than 3 inches in diameter; very strongly acid; abrupt, smooth boundary. 14 to 20 inches thick.

IIR—17 inches +, gray granitic gneiss bedrock.

Range of characteristics.—The texture of the surface layer is generally fine sandy loam but may be loam. The B horizon commonly is fine sandy loam but ranges to sandy loam.

The A horizon is typically very dark brown (10YR 2/2) to dark yellowish brown (10YR 3/4). The color of the B horizon is generally dark yellowish brown (10YR 4/4) but ranges to brown and dark brown (7.5YR 4/4), and it fades in hue, chroma, or both, with depth.

The coarse skeleton is commonly about 15 percent but ranges from 5 to 35 or 40 percent. It generally consists of angular to subangular fragments of granite, gneiss, and schist less than 10 inches in diameter.

Surface stones are fairly common. The depth to bedrock is generally about 16 inches but ranges from about 10 inches to 2 feet. Rock outcrops are 30 to 100 feet apart.

These soils are medium to extremely acid. The slopes, commonly about 15 percent, range from 5 to 60 percent.

HOLYOKE SERIES

The Holyoke series consists of somewhat excessively drained, shallow Sols Bruns Acides that formed in medium-textured eolian mantles overlying basalt or diabase. They are on trap ridges in the Connecticut River valley.

The Holyoke soils are near the Sunderland soils, but they are finer textured and are not so red as the Sunderland soils, which developed over Triassic sandstone. They are finer textured than the Shapleigh soils, which are Brown Podzolic and developed primarily on granite and gneiss. They are also finer textured than the Hollis soils, which developed mainly on schist.

Profile of Holyoke very fine sandy loam in an abandoned pasture about 1 mile northeast of the village of South Deerfield—

A1—0 to 3 inches, dark-brown (7.5YR 3/2) very fine sandy loam; weak, fine, crumb structure; very friable; many fine grass roots; less than 10 percent coarse skeleton ½ to 2 inches in diameter; extremely acid; abrupt, smooth boundary. 2 to 3 inches thick. Bedrock outcrops are about 50 feet apart.

B21—3 to 8 inches, brown to dark-brown (7.5YR 4/4) very fine sandy loam; weak, fine, crumb and weak, very fine, subangular blocky structure; very friable; many grass roots; less than 10 percent coarse skeleton ½ to 2 inches in diameter; very strongly acid; clear, smooth boundary. 4 to 5 inches thick.

B22—8 to 14 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; weak, fine, subangular blocky structure; very friable; less than 10 percent coarse skeleton ½ to 2 inches in diameter; coarse skeleton in bottom 2 to 3 inches of this horizon has "silt caps"; grass roots are common; very strongly acid; abrupt, smooth boundary. 5 to 6 inches thick.

IIR—14 inches +, basalt bedrock.

Range of characteristics.—The narrow texture range of very fine sandy loam to loam reflects the eolian origin of the mantle in which the Holyoke soils developed.

The A horizon has a color range from dark reddish brown 5YR 2/2) to very dark brown (10YR 2/2). The B horizon is generally dark brown (7.5YR 4/4), but the color fades with depth. The range is from dark brown (7.5YR 3/2) to yellowish brown (10YR 5/4).

The slopes are generally about 30 percent but range from 5 to about 90 percent. The depth to bedrock is commonly about 18 inches but ranges from a few inches to 24 inches. The distance between bedrock outcrops is commonly about 100 feet but ranges from about 50 to 200 feet. In many places the depth is less than 18 inches to bedrock, even though rock outcrops are rather infrequent.

LIMERICK SERIES

The Limerick series consists of Low-Humic Gley soils that formed in medium-textured alluvial sediments derived principally from schist, gneiss, granite, and slate or phyllite. These soils are in depressions on the flood plains.

The Limerick soils are members of the catena that includes the well-drained Hadley, the moderately well drained Winooski, and the very poorly drained Saco soils. Limerick soils have a texture of very fine sandy loam, loam, or silt loam, compared with the fine sandy loam or sandy loam of the Rumney soils.

Profile of Limerick silt loam in cropland about 2 miles southeast of the village of South Deerfield in the town of Whately—

Ap—0 to 12 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, medium, granular structure; very friable; many fibrous roots; medium acid; abrupt, smooth boundary. 10 to 12 inches thick.

C1—12 to 26 inches, olive (5Y 4/3) silt loam with many, medium, prominent, dark-reddish brown (5YR 3/4) mottles; weak, fine, granular structure in upper part but grades to massive; friable; fibrous roots are common; medium acid; abrupt, smooth boundary. 12 to 14 inches thick.

IIC2—26 to 38 inches +, olive-gray (5Y 4/2) very fine sand interbedded with silt loam that contains many, medium, prominent, dark-reddish brown (2.5YR 3/4) mottles; massive; friable; few roots in upper 6 inches, none below; slightly acid.

Range of characteristics.—The texture of the A and C horizons is typically silt loam but may be very fine sandy loam or loam. The texture of the IIC2 horizon is extremely variable; it ranges from very fine sand to gravelly sand. The interbedded nature of the IIC2 horizon is most always apparent, but its expression ranges from weak to very strong. The depth to this horizon is generally between 15 and 30 inches but may be as much as 36 inches.

The A horizon is dull, generally a very dark grayish brown (2.5Y 3/2), but it ranges to black (10YR 2/1). The C and IIC2 horizons are commonly olive (5Y 4/3) or olive gray (5Y 4/2) but range from neutral to gray (10YR 5/1) or olive (5Y 5/3). Generally, they have distinct to prominent mottles of red, brown, and gray.

LYMAN SERIES

The Lyman series consists of somewhat excessively drained, shallow Podzols that formed in a thin layer of glacial till derived mainly from schist. They are in the western part of the county at elevations above 1,200 feet.

The Lyman soils are near the well drained Berkshire and Marlow, the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Lyman soils are similar to the Westminster soils but have a redder B horizon. They are coarser textured than the Nassau soils, which are Lithosols intergrading to Sols Bruns Acides. The Hollis soils are the Brown Podzolic analogs of the Lyman soils.

Profile of Lyman rocky loam in woods about one-half mile west of the village of Monroe Bridge in the town of Monroe—

O1—3 inches to 1 inch, loose litter of leaves and twigs, mostly beech, birch, and maple.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 2 inches, black (N 2/0) loam; weak, fine, granular structure; very friable; many fine and medium roots; extremely acid; abrupt, wavy boundary. 1 to 2 inches thick. (Surface stones, 1 to 2 feet in diameter, are 5 to 10 feet apart. Rock outcrops are 50 to 100 feet apart.)

A2—2 to 4 inches, reddish-gray (5YR 5/2) fine sandy loam; single grain to weak, fine, granular structure; very friable; many fine and medium roots; 5 to 10 percent coarse skeleton consisting of quartzite fragments less than ½ inch in diameter; extremely acid; abrupt, broken boundary. 0 to 4 inches thick.

B21h—4 to 6 inches, very dusky red (2.5YR 2/2) loam; weak, fine, subangular blocky structure; friable; many fine and medium roots; less than 5 percent coarse skeleton consisting of quartzitic fine gravel; extremely acid; abrupt, broken boundary. 0 to 2 inches thick.

B22ir—6 to 10 inches, dark-red (2.5YR 3/6) loam; fine and medium, granular structure; friable; many fine and medium roots; 5 to 10 percent coarse skeleton consisting of fine gravel; extremely acid; clear, wavy boundary. 3 to 5 inches thick.

B23—10 to 19 inches, brown (7.5YR 4/4) loam; massive; clods break to fine granules; friable; many fine and medium roots; about 10 percent coarse skeleton consisting of fragments of schist and quartzite less than 1 inch in diameter; very strongly acid; abrupt, smooth boundary. 7 to 10 inches thick.

IIR—19 inches +, dark-gray mica schist bedrock.

Range of characteristics.—Extremely rocky loam is common, but the surface layer and subsoil range from loam to fine sandy loam and very rocky phases are included.

The A1 horizon is typically black (N 2/0) to (10YR 2/1). The A2 horizon is discontinuous, commonly 2 or 3

inches thick, but ranges in thickness from 0 to 10 inches. The color of the A2 horizon is commonly reddish gray (5YR 5/2) but ranges from light gray to gray (5YR 6/1) to light brownish gray (10YR 6/2). The B21h horizon is also discontinuous and generally about 1 inch thick, but it ranges from 0 to 3 inches in thickness. It commonly is dark reddish brown (2.5YR 2/4) but ranges from very dusky red (2.5YR 2/2) to dark reddish brown (5YR 3/3). Below this the B horizon is commonly dark red (2.5YR 3/6) to yellowish red (5YR 4/6) and fades with depth to brown to dark brown (7.5YR 4/4) or dark yellowish brown (10YR 4/4).

The coarse skeleton is generally about 10 percent and consists of fine gravel. Stoniness is extremely variable; stones from 1 to 2 feet in diameter are commonly less than 50 feet apart. Bedrock outcrops are generally less than 100 feet apart. The depth to bedrock is generally about 16 inches but ranges from a few inches to 24 inches. The bedrock is mainly mica schist and ranges from gray through greenish gray to nearly black. In some places the bedrock is phyllite.

MARLOW SERIES

The Marlow series consists of well-drained Podzols that developed in compact, platy glacial till derived principally from micaceous schist, gneiss, and granite. These soils are gently sloping to very steep.

The Marlow soils are near the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Marlow soils are like the Berkshire soils but have a prominent fragipan within 30 inches of the surface. They have a redder B horizon and are finer than the Essex soils, which are Brown Podzolic.

Profile of Marlow loam in an abandoned field about 2½ miles northeast of the village of Rowe in the town of Rowe.

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, granular structure; very friable; many fine roots; less than 5 percent coarse skeleton of gneiss gravel; very strongly acid; abrupt, smooth boundary. 6 to 8 inches thick.

A2—8 to 10 inches, weak-red (2.5YR 5/2) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; less than 5 percent coarse skeleton of gneiss gravel; very strongly acid; abrupt, broken boundary. 0 to 2 inches thick.

B21h—10 to 11 inches, dark reddish-brown (2.5YR 2/4) loam; weak, fine, subangular blocky structure; friable; fine roots are common; less than 5 percent coarse skeleton of gravel; very strongly acid; abrupt, broken boundary. 0 to 2 inches thick.

B22ir—11 to 14 inches, reddish-brown (5YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; fine roots are common; less than 5 percent coarse skeleton of gravel; very strongly acid; clear, wavy boundary. 3 to 5 inches thick.

B23—14 to 24 inches, olive-brown (2.5Y 4/4) loam; weak, thick, platy structure; slightly firm in place, friable when removed; few fine roots; 10 to 15 percent coarse skeleton of gravel; very strongly acid; abrupt, smooth boundary. 10 to 12 inches thick.

Cx—24 to 38 inches +, olive (5Y 4/4) loam; moderate, thick, platy structure; very firm in place, firm when removed; no roots; 10 to 15 percent coarse skeleton of gravel; very strongly acid.

Range of characteristics.—Loam is the common type, but the texture of the surface soil is fine sandy loam in places. The texture in the B and C horizons is generally loam but ranges to fine sandy loam.

The Ap horizon is typically dark brown (10YR 3/3 to 7.5YR 3/2). A black (10YR 2/1) A1 horizon is present where the soil has not been cultivated. The A2 horizon is usually about 2 inches thick but ranges in thickness from 0 to 10 inches. In many places it is discontinuous. It is gray in contrast to adjoining horizons and is commonly tinged with pink, sometimes brown. The B21h horizon is also discontinuous. It is usually about 1 inch thick but ranges from 0 to 3 inches. It commonly is dark reddish brown (5YR 2/2) to very dusky red (2.5YR 2/2). Below this the B horizon is typically reddish brown (5YR 4/4), but in some places the color is yellowish red (5YR 4/6) and grades with depth to olive brown (2.5Y 4/4). The C horizon is commonly olive (5Y 4/4). When crushed, the color of the C horizon ranges from olive brown (2.5Y 4/4) to dark yellowish brown (10YR 4/4).

The amount of coarse skeleton varies in all horizons but generally is less than 20 percent. It consists of gneiss gravel and occasional cobbles and stones. The thickness of the solum is generally about 24 inches but ranges from about 20 to 30 inches.

The reaction is strongly to very strongly acid.

MARLOW SERIES, DARK SUBSOIL

The Marlow series, dark subsoil, consists of well-drained, moderately coarse to medium-textured Podzols that have weak horizon development but have a fragipan. These soils developed in compact glacial till derived principally from gneiss and phyllite. They are gently sloping to very steep.

The Marlow soils, dark subsoil, are near the shallow Westminster soils, which are Brown Podzolic. They are also near the moderately well drained Peru, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Marlow soils, dark subsoil, are also associated with the other Marlow soils and with the Berkshire soils and their dark subsoil phases. The Marlow soils, dark subsoil, developed in the same lithological material as the Berkshire soils, dark subsoil, but the latter soils do not have a prominent fragipan layer within 30 inches of the surface. The Berkshire soils have a reddish-brown B horizon under the plow layer, and the firm layer, if present, is more than 3 feet from the surface. The Marlow soils, dark subsoil, are similar to the Essex soils but are finer textured and contain more than 2 percent organic matter in the B horizon under the plow layer or under its equivalent depth.

Profile of Marlow loam, dark subsoil, in a hayfield three-fourths of a mile northeast of the village of Heath in the town of Heath—

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) loam; weak, medium, granular structure; very friable; strongly acid; abrupt, smooth boundary. 7 to 10 inches thick.

B21—9 to 13 inches, dark grayish-brown (10YR 4/2) loam; very weak, medium, subangular blocky structure; very friable; strongly acid; gradual, smooth boundary. 4 to 8 inches thick.

B22—13 to 31 inches, dark grayish-brown (2.5Y 4/2) loam; very weak, thick, platy structure; very friable; strongly acid; gradual, smooth boundary. 6 to 8 inches thick.

B23—21 to 32 inches, olive-gray (5Y 4/2) fine sandy loam; weak, medium, platy structure; firm in place, very friable when removed; very strongly acid; gradual, smooth boundary. 6 to 10 inches thick.

Cx—32 to 38 inches +, olive-gray (5Y 4/2) fine sandy loam; very thick, platy structure; very firm in place, friable to firm when removed; very strongly acid.

Range of characteristics.—Loam is the common type, but the range includes fine sandy loam.

The colors of the Marlow soils, dark subsoil, are typically dull, and the hues are yellower with depth. The Ap horizon generally is very dark grayish brown (10YR 3/2). The B horizon is dark grayish brown (2.5Y 4/2 or 10YR 4/2) and in some places, olive gray (5Y 4/2) to dark yellowish brown (10YR 4/4). The C horizon is olive gray (5Y 4/2). The Marlow soils are within the lower range of the well-drained class and normally are not mottled. In places slight mottling of strong brown is present in the upper part of the C horizon.

In places where these soils have not been plowed, the following horizonation is common: A1 horizon, 0 to 4 inches of black (10YR 2/1) loam; A2 horizon, 3 to 4 inches of discontinuous dark-gray (10YR 4/1) loam; and B21 horizon, 4 to 6 inches of dark reddish-brown (5YR 3/4) loam. These horizons are so thin that they are completely obliterated by plowing.

Slopes are commonly about 8 percent but range from 3 or 4 percent to about 45 percent. The depth of the solum is usually about 24 inches but ranges from 18 to 30 inches, the shallower solum being in the steeper areas.

The coarse skeleton is extremely variable; the amount is generally 10 to 20 percent but may be as much as 60 percent. The coarse skeleton consists mainly of black phyllite and gneiss and an occasional "ghost" of disintegrated siliceous limestone.

MERRIMAC SERIES

The Merrimac series consists of well-drained to somewhat excessively drained Brown Podzolic soils that formed in stratified glaciofluvial deposits derived principally from granite, gneiss, and schist. They are on glaciofluvial terraces and plains.

The Merrimac soils are members of the catena that includes the moderately well drained Sudbury, and the poorly drained Walpole soils.

The Merrimac soils are like the Agawam soils but are underlain by coarse sand and gravel at a depth of about 2 feet.

Profile of Merrimac fine sandy loam in a cultivated field about 3 miles east of the village of Sunderland in the town of Sunderland—

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

B21—10 to 16 inches, brown to dark-brown (7.5YR 4/4) sandy loam; very weak, fine, granular structure; very friable; roots are common; about 15 percent coarse skeleton of fine gravel; strongly acid; clear, wavy boundary. 3 to 6 inches thick.

B22—16 to 23 inches, yellowish-brown (10YR 5/4) sandy loam; very weak, fine, granular structure; very friable to loose; few roots; 10 to 15 percent coarse skeleton of fine gravel; strongly acid; abrupt, wavy boundary. 6 to 9 inches thick.

IIC—23 to 35 inches +, yellowish-brown (10YR 5/4) stratified sand and gravel; single grain; loose; few roots in upper 8 or 10 inches and none below; 75 percent coarse skeleton consisting of 60 percent gravel and 15 percent cobbles; medium acid.

Range of characteristics.—The surface layer is commonly sandy loam and fine sandy loam. The same textures are typical of the upper B horizon but are coarser with depth. The texture in the lower B horizon is commonly sandy loam or loamy sand and is gravelly in places. The C horizon consists of loose stratified sand and gravel and, occasionally, cobbles.

The depth to the C horizon is generally about 24 inches but ranges from 20 to 36 inches. The B horizon generally has brown to dark-brown (7.5YR 4/4) to dark yellowish-brown (10YR 4/4) colors that fade with depth.

Less than 25 percent of the coarse skeleton consists of dark, fine-grained fragments.

The reaction is medium to very strongly acid. Where these soils have been limed, the reaction of the Ap horizon is slightly acid to neutral.

MUCK

Muck includes Bog soils that are relatively shallow, are strongly to very strongly acid, and are underlain by acid mineral substrata. It has accumulated under forest growth, and fragments of tree limbs and trunks are common in the organic material. Muck is more decomposed than Peat.

Profile of Muck in brush about 1 mile north of North Orange in the town of Orange—

1. 0 to 8 inches, black (10YR 2/1) muck; moderate, medium, granular structure; very strongly acid.
2. 8 to 20 inches, black (10YR 2/1) muck; massive; greasy; very strongly acid.
3. 20 to 34 inches, black (5YR 2/1) muck; massive; slightly compact; greasy; very strongly acid.
4. 34 to 38 inches +, dark-gray (5Y 4/1) coarse sand; single grain; loose; medium acid.

Range of characteristics.—The depth to mineral soil ranges from 1 to 4 feet or more. In some shallow areas, boulders that are a component of the underlying mineral soil protrude through the organic material.

NASSAU SERIES

The Nassau series consists of somewhat excessively drained, shallow Lithosols intergrading to Sols Bruns Acides. Those soils developed in thin deposits of glacial till derived chiefly from slate and phyllite. They are on steep, rocky ridges in the north-central part of the county.

The Nassau soils are near the well drained Dutchess and Bernardston, the moderately well drained Pittstown, the poorly drained Stissing, and the very poorly drained Whitman soils.

The Nassau soils are finer textured than the Brown Podzolic Hollis and Westminster soils and the Podzol Lyman soils.

Profile of Nassau silt loam in woods about 1 mile west of North Bernardston in the town of Bernardston—

O1—3 inches to ½ inch, litter of loose leaves and twigs, mostly sugar maple and beech.

O2—½ inch to 0, partly decomposed litter.

A1—0 to 2 inches, very dark brown (10YR 2/2) silt loam; weak, fine and medium, crumb structure; very friable; many, fine, medium, and large roots; about 15 to 25 percent coarse skeleton consisting of phyllite fragments, and a few flags of very dark gray or black phyllite; extremely acid; abrupt, wavy boundary. 2 to 3 inches thick. (On this soil bedrock outcrops of very dark gray to black phyllite containing thin veins of quartzite are 40 to 50 feet apart.)

B21—2 to 5 inches, dark yellowish-brown (10YR 3/4) very channery silt loam; weak, fine and medium, granular structure; peds are soft when moist but firm and distinct when dry; friable; many, fine, medium, and large roots; about 65 percent coarse skeleton consisting of 15 percent fine phyllite fragments, about 50 percent coarse phyllite fragments, and a few flags of very dark gray or black phyllite; extremely acid; clear, wavy boundary. 2 to 3 inches thick.

B22—5 to 15 inches, olive-brown (2.5Y 4/4) very channery silt loam; weak, very fine, subangular blocky structure; peds are soft when moist but firm and distinct when dry; friable; fine and medium roots are common; coarse skeleton is the same as in the B21 horizon but most of it has "silt caps"; extremely acid; abrupt smooth boundary. 10 to 14 inches thick.

IIR—15 inches +, bedrock; very dark gray to black phyllite with thin veins of white quartzite.

Range of characteristics.—The texture is silt loam and heavy loam. These soils are commonly channery or very channery. In most places they are extremely rocky, but in places they are very rocky.

The A horizon is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). The B horizon is characteristically dull, dark yellowish brown (10YR 3/4) that grades to olive brown (2.5Y 4/4) or olive (5Y 4/4) with depth.

The amount of coarse skeleton is generally about 50 percent but ranges from 25 to 75 percent. The coarse skeleton consists of phyllite fragments that range in size from small thin flakes about one-fourth of an inch long and one-sixteenth of an inch wide to flags about 6 to 8 inches square and as much as 2 inches thick.

The depth to bedrock is commonly about 15 inches but ranges from 10 to 24 inches. In some of the deeper pockets, a few inches of the lower B horizon just above the bedrock is a much redder color, often a dark reddish brown (5YR 3/4). Rock outcrops are commonly about 50 feet apart but range from less than 25 to 75 feet apart. The bedrock is a very dark gray to black phyllite, heavily veined with thin veins of white quartzite.

NINIGRET SERIES

The Ninigret series consists of moderately well drained Brown Podzolic soils that developed in deep sand deposits. They are on stream terraces in the valley of the Connecticut River and in the valleys of some of the larger tributaries of the Connecticut River.

The Ninigret soils are near the well-drained Agawam, the poorly drained Walpole, and the very poorly drained Scarboro soils.

The Ninigret soils are similar to the Deerfield soils but are finer textured in the solum. They are also similar to the Sudbury soils but lack the substratum of stratified sand, gravel, and cobbles within 3 feet of the surface. The Ninigret soils differ from the Podunk soils in having a developed, genetic B horizon.

Profile of Ninigret fine sandy loam in a hayfield about 2 miles south of the village of Northfield—

Ap—0 to 10 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, granular structure; very friable; many roots; strongly acid; abrupt, smooth boundary. 8 to 11 inches thick.

B21—10 to 23 inches, yellowish-brown (10YR 5/8) fine sandy loam; very weak, fine, granular structure; very friable to loose; roots are common; strongly acid; clear, smooth boundary. 11 to 14 inches thick.

B22—23 to 26 inches, yellowish-brown (10YR 5/4) fine sandy loam with common, medium, distinct, strong-brown (7.5YR 5/6) mottles; very weak, fine, granular structure; very friable; few roots; strongly acid; clear, smooth boundary. 3 to 7 inches thick.

B23—26 to 34 inches, yellowish-brown (10YR 5/4) loamy fine sand with many, coarse, prominent, yellowish-red (5YR 5/8) and gray (N 5/0) mottles; single grain; loose; no roots; strongly acid; clear, smooth boundary. 6 to 9 inches thick.

C—34 to 48 inches +, stratified, weak-red (2.5YR 5/2) fine sand and brown (10YR 5/3) sand with many, coarse, prominent, yellowish-red (5YR 5/8) and gray (N 5/0) mottles that decrease in number with depth; single grain; loose; no roots; strongly acid.

Range of characteristics.—The surface layer is generally fine sandy loam but ranges from sandy loam to very fine sandy loam. These same textures are typical of the upper B horizon. The texture of the lower B horizon is a little coarser, commonly loamy fine sand or loamy sand. The texture of the C horizon is generally sand to a depth of at least 42 inches; below this depth the texture ranges from stratified sand to stratified sand and gravel.

The color of the surface horizon is commonly dark brown (10 YR 3/3) or dark yellowish brown (10YR 3/4) but ranges from very dark grayish brown (10YR 3/2) to brown or dark brown (10YR 4/3). The B horizon commonly is yellowish brown (10YR 5/8) in the upper part but grades to brown (10YR 5/3) with depth. The color ranges from dark brown to brown (10YR 4/3) to yellowish brown (10YR 5/8) in the upper part, and from yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4) in the lower part. The color of the C horizon is extremely variable; it ranges from weak red (2.5YR 5/2) to gray (N 5/0). Mottles in the lower B horizon are generally numerous, coarse, and prominent and are commonly yellowish red (5YR 5/8). The depth to mottling is generally about 24 inches but ranges from 20 to 26 inches.

The coarse skeleton, if present at all, is less than 10 percent and consists of fine gravel.

The reaction ranges from very strongly acid to medium acid, but it may be slightly acid to neutral in places where the soil has been limed.

NINIGRET SERIES, SILTY SUBSTRATUM

The Ninigret series, silty substratum, consists of moderately well drained Brown Podzolic soils that developed in sandy glaciofluvial deposits overlying glaciolacustrine silt and very fine sand. They are nearly level to gently sloping.

These soils are near the well-drained Agawam soils, silty substratum, and the poorly drained Swanton soils. These soils are similar to the other Ninigret soils but have a nonconforming substratum of varved silt and very fine sand at a depth of 2 to 4 feet.

Profile of Ninigret fine sandy loam, silty substratum, in a hayfield 1¾ miles west of the village of South Deerfield—

Ap—0 to 8 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, crumb structure; friable; many, fine and medium, fibrous roots; slightly acid; abrupt, smooth boundary. 7 to 10 inches thick.

B21—8 to 16 inches, yellowish-brown (10YR 5/6) fine sandy loam; very weak, fine, crumb structure; very friable; many, fine, fibrous roots; medium acid; clear, smooth boundary. 6 to 8 inches thick.

B22—16 to 20 inches, light olive-brown (2.5Y 5/6) sandy loam with many, medium, distinct mottles of strong brown (7.5YR 5/6); single grain; loose; few, fine, fibrous roots; medium acid; clear, smooth boundary. 4 to 7 inches thick.

B23—20 to 26 inches, grayish-brown (2.5Y 5/2) sandy loam with many, medium, prominent mottles of dark reddish brown (5YR 3/4); single grain; loose; strongly acid; abrupt, smooth boundary. 5 to 7 inches thick.

IICg—26 to 60 inches +, gray (5Y 5/1) laminated or varved silt and very fine sand; upper 10 inches has many, medium, prominent, yellowish-brown (10YR 5/4) mottles with strong-brown (7.5YR 5/6) centers; massive; firm; strongly acid.

Range of characteristics.—Fine sandy loam is the common type, but the surface layer ranges from fine sandy loam to sandy loam. The texture of the subsoil is generally fine sandy loam in the upper part and sandy loam in the lower part. The substratum is varved silt and very fine sand that occasionally contains thin laminations of clay.

The A horizon is commonly dark brown (10YR 3/3) but is very dark grayish brown (2.5Y 3/2) in some places. The colors of the B horizon generally are brown to dark brown (10YR 4/3) and, in some places, olive brown (2.5Y 4/4) in the upper part and olive brown (2.5Y 4/4) in the lower part. The IIC horizon is generally olive gray (5Y 5/2) or gray (5Y 5/1) mottled with strong brown.

The depth to silt and very fine sand is commonly 24 to 30 inches but ranges from about 20 to 36 inches. The coarse skeleton in these soils is generally less than 5 percent but may be as much as 20 percent in the horizon just above the underlying silt and very fine sand substratum.

ONDAWA SERIES

The Ondawa series consists of well-drained Alluvial soils in moderately coarse textured material of mixed mineralogy. They are members of the catena that includes the moderately well drained Podunk and the poorly drained Rumney soils. The Ondawa soils are finer textured than the Suncook soils and coarser textured than the Hadley soils.

Profile of Ondawa fine sandy loam in a hayfield about 1¼ miles west of the village of Colrain in the town of Colrain—

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

C1—8 to 20 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; friable; grass roots are common; slightly acid; abrupt, smooth boundary. 10 to 13 inches thick.

C2—20 to 31 inches, olive-brown (2.5Y 4/4) loamy fine sand; single grain; loose; few grass roots; medium acid; abrupt, smooth boundary. 11 to 14 inches thick.

IIC3—31 to 42 inches +, grayish-brown (2.5Y 5/2) coarse sand and fine gravel; single grain; loose; strongly acid.

Range of characteristics.—The texture to a depth of about 20 inches is fine sandy loam or sandy loam. Below 20 inches the texture ranges from fine sandy loam to sand that is gravelly in many places. Gravel layers are common at a depth of about 36 inches.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to brown to dark brown (10YR 4/3). The C horizon ranges from dark yellowish brown (10YR 4/4) to light yellowish brown (2.5Y 6/4).

The reaction ranges from strongly acid to slightly acid.

PEAT

Peat is a Bog soil that consists almost entirely of undecomposed vegetation. Some of the common sources of organic material are sphagnum moss, sedges, rushes, and other herbaceous plants. Peat bogs occur in upland depressions where water is ponded most of the time. They often encircle small ponds in such depressions.

Profile of Peat about one-half mile east of the village of Warwick in the town of Warwick—

O1—2 inches to 0, recent accumulation of undecomposed leaves, sedges, and reeds.

1. 0 to 8 inches, black (10YR 2/1) muck; medium, moderate, granular structure; very strongly acid; 6 to 8 inches thick.
2. 8 to 36 inches +, dark reddish-brown (5YR 3/2 to 3/3), porous peat consisting mostly of partly decomposed rushes and sedges and containing some woody material of unidentified origin.

Range of characteristics.—The common characteristic of these organic deposits is an accumulation of 1 foot or more of partly decomposed plant residue that is readily identifiable as plant material, underlain by a mineral soil. The depth to mineral soil ranges from 1 to several feet.

PERU SERIES

The Peru series consists of moderately well drained Podzols that formed in compact, platy till derived principally from gray mica schist and some granite. Most areas of these soils are nearly level to gently sloping.

The Peru soils are near the shallow Lyman soils, the well-drained Marlow and Berkshire soils, the poorly drained Ridgebury, and the very poorly drained Whitman soils.

The Peru soils are finer textured than the Scituate soils. In comparison with the Sutton soils, the Peru soils have a distinct to prominent fragipan within 30 inches of the surface.

Profile of Peru loam in a hayfield about 1 mile north of the village of North Heath in the town of Heath—

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine to medium, granular structure; very friable; many grass roots; medium acid; abrupt, wavy boundary. 6 to 8 inches thick.

B21h—6 to 15 inches, brown to dark-brown (10YR 4/3) loam; massive, but clods crush to medium granules; friable; few grass roots; medium acid; clear, wavy boundary. 9 to 11 inches thick.

B22ir—15 to 21 inches, dark yellowish-brown (10YR 4/4) loam with few, medium, distinct, red (2.5YR 4/6) mottles; massive; clods crush to subangular blocks; friable; few roots; medium acid; clear, wavy boundary. 3 to 9 inches thick.

B3—21 to 24 inches, light olive-brown (2.5Y 5/4) fine sandy loam with common, medium, distinct strong-brown (7.5YR 5/6) mottles; massive; firm in place, friable when removed; no roots; strongly acid; abrupt, smooth boundary. 2 to 3 inches thick.

Cx—24 to 36 inches +, olive (5Y 5/4) fine sandy loam with common, fine, prominent, red (2.5YR 4/6) mottles; moderate, medium, platy structure; very firm in place, firm when removed; plates rupture explosively under pressure; medium acid.

Range of characteristics.—The texture of the solum is generally loam but includes fine sandy loam. The substratum texture is fine sandy loam, and in some places, loam. Where these soils have not been cultivated, they are very stony or extremely stony, and in many areas there are a few surface boulders.

The surface horizon is very dark gray (10YR 3/1) to black (10YR 2/1) where the soils have not been cultivated. In cultivated areas the color of the plow layer is very dark grayish brown (10YR 3/2 to 2.5Y 3/2). The color of the B horizon ranges from dark brown (10YR 3/3) to yellowish brown (10YR 5/4) in the upper part and grades, with depth, to olive brown (2.5Y 4/4) or light olive brown (2.5Y 5/4). The C horizon is generally olive gray (2.5Y 5/2) to olive (5Y 5/4).

The depth to mottling is commonly about 18 inches but ranges from about 12 to 24 inches. The depth to the fragipan is generally about 24 inches but ranges from about 18 to 30 inches.

The reaction is medium to very strongly acid.

PITTSTOWN SERIES

The Pittstown series consists of moderately well drained Brown Podzolic soils that developed in compact glacial till derived principally from dark gray phyllite. These soils are mostly gently sloping.

The Pittstown soils are near the shallow Nassau, the well-drained Dutchess and Bernardston, and the poorly drained Stissing soils.

The Pittstown soils are finer textured than the Peru soils, which are Podzols that developed in schist. They are also finer textured than the Scituate soils, which developed in granite and gneiss.

Profile of Pittstown silt loam in a hayfield about 1½ miles west of Hales Crossing in the town of Bernardston—

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; moderate, fine, granular structure; very friable; many grass roots; about 10 percent phyllite channers 2 to 15 millimeters long; slightly acid; abrupt, smooth boundary. 7 to 10 inches thick.

B21—8 to 16 inches, olive-brown (2.5Y 4/4) silt loam; medium subangular blocky clods crush to fine and medium granules; friable; grass roots are common; 10 to 15 percent phyllite channers 2 to 50 millimeters long; medium acid; clear, wavy boundary. 6 to 10 inches thick.

B22—16 to 21 inches, olive (5Y 4/3) silt loam with common, medium, distinct mottles of gray (5Y 5/1) and dark yellowish brown (10YR 4/4); medium, subangular blocky clods crush to fine and medium granules; friable; few grass roots; 10 to 15 percent phyllite channers 2 to 50 millimeters long; medium acid; abrupt, smooth boundary. 4 to 7 inches thick.

Cx—21 to 36 inches +, olive-gray (5Y 4/2) channery silt loam with many, medium and coarse, prominent mottles of gray (5Y 5/1), dark yellowish brown (10YR 4/4), and dark reddish brown (5YR 3/4); moderate, thick and very thick, platy structure; firm to very firm; very few grass roots in upper 2 or 3 inches; about 25 percent phyllite channers 2 to 75 millimeters long; medium acid.

Range of characteristics.—Silt loam is the common type, but the texture ranges from silt loam to heavy loam.

These soils have noticeably dull colors. The Ap is commonly very dark grayish brown or very dark brown. The B21 horizon is commonly olive brown (2.5Y 4/4) or dark yellowish brown (10YR 4/4), but the color ranges in hue from 2.5Y to 10YR, in value from 3 to 5, and in chroma from 3 to 4. The color of the B22 horizon is generally olive (5Y 4/3) but ranges in hue from 2.5Y to 5Y, in value from 4 to 5, and in chroma from 2 to 4. The Cx horizon is commonly olive gray (5Y 4/2), but the color ranges from 2.5Y to 5Y in hue, from 3 to 5 in value, and from 2 to 4 in chroma. The B22 and Cx horizons generally have common to many distinct or prominent mottles.

The depth to mottling ranges from about 14 to 24 inches but is generally about 16 inches. The depth to the Cx horizon is generally about 20 inches but ranges from 16 to 26 inches.

The coarse skeleton is composed of two major fractions. The first fraction is fairly constant in amount, generally 5 to 15 percent, and is composed of phyllite channers, generally less than 15 millimeters long but as much as 50 millimeters long. The second fraction varies extremely in amount; it is as much as 50 percent and is composed of phyllite flagstones.

PODUNK SERIES

The Podunk series consists of moderately well drained Alluvial soils in moderately coarse textured material of mixed mineralogy. They are level or nearly level and are along most of the major swift-flowing streams.

The Podunk soils are members of the catena that includes the well-drained Ondawa and the poorly drained Rumney soils.

The Podunk soils are coarser textured than the Winooski soils. They resemble the Brown Podzolic soils of the Ninigret series but do not have a developed, genetic B horizon.

Profile of Podunk fine sandy loam in a hayfield about three-fourths of a mile east of Montague Center in the town of Montague—

Ap—0 to 7 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; moderate, fine, granular structure; very friable; many grass roots; medium acid; abrupt, smooth boundary. 6 to 9 inches thick.

C1—7 to 16 inches, brown (10YR 5/3) fine sandy loam; massive; clods crush easily to single grains; very friable; grass roots are common; medium acid; clear, smooth boundary. 7 to 10 inches thick.

IIC2—16 to 23 inches, pale-brown (10YR 6/3) fine sand with few distinct mottles; massive; clods crush easily to single grains; very friable; few grass roots; medium acid; abrupt, smooth boundary. 6 to 8 inches thick.

IIIC3—23 to 36 inches +, pale-brown (10YR 6/3) stratified sand and fine sand with common, medium, prominent, yellowish-red (5YR 5/8) mottles; massive; clods crush easily to single grains; very friable to loose; medium acid.

Range of characteristics.—The texture in the A horizon and upper C horizon is commonly fine sandy loam but is sandy loam in places. Below this the texture is generally loamy sand. Gravel layers are common at a depth of 30 to 36 inches.

The color of the A horizon ranges from dark brown (10YR 3/3) to olive brown (2.5Y 4/4). The color of the C horizon ranges from brown (10YR 5/3) to light brownish gray (10YR 6/2 or 2.5Y 6/2).

The reaction ranges from strongly acid to slightly acid.

RAYNHAM SERIES

The Raynham series consists of poorly drained Low-Humic Gley soils that developed in stratified, medium-textured deposits on lacustrine or glaciolacustrine terraces. They are in depressions and are level or nearly level.

The Raynham soils are members of the catena that includes the well-drained Hartland and the moderately well drained Belgrade soils. The Raynham soils are like the Scantic soils but have a coarser texture, especially in the substratum.

Profile of Raynham silt loam in native grasses and sedges about 3 miles south of the village of Deerfield in the town of Deerfield—

A1—0 to 4 inches, dark grayish-brown (2.5Y 4/2) silt loam with strong-brown (7.5YR 5/6) stains in root channels; weak, fine and medium, granular structure; friable; many, fine and medium, fibrous roots; medium acid; clear, smooth boundary. 3 to 6 inches thick.

AB—4 to 7 inches, equal parts of dark grayish-brown (2.5Y 4/2) and olive (5Y 4/3) silt loam with strong-brown (7.5YR 5/6) stains in root channels; weak, fine and medium, granular structure; friable; fine fibrous roots are common; strongly acid; abrupt, smooth boundary. 2 to 4 inches thick.

B21—7 to 19 inches, olive-gray (5Y 4/2) to olive (5Y 4/3) silt loam with few, fine, distinct, gray (N 5/0) and brown to dark-brown (7.5YR 4/4) mottles; massive; firm; few, fine, fibrous roots; strongly acid; abrupt, wavy boundary. 5 to 14 inches thick.

B22—19 to 22 inches, dark grayish-brown (2.5Y 4/2) to olive-brown (2.5Y 4/4) silt loam with few, fine, distinct, gray (N 5/0) and brown to dark-brown (7.5YR 4/4) mottles; massive; firm; very few, fine, fibrous roots; strongly acid; abrupt, wavy boundary. 2 to 4 inches thick.

C—22 to 60 inches +, olive (5Y 4/3) varved silt and very fine sand that contains occasional lenses (1 to 2 millimeters thick) of silty clay and has common, medium, prominent mottles of weak red (2.5YR 4/2), brown to dark brown (7.5YR 4/4), and gray (N 5/0); massive; firm; very few, fine, fibrous roots to a depth of 48 inches; strongly acid.

Range of characteristics.—Silt loam is the common type but the texture of the surface layer includes very fine sandy loam. The texture of the B horizon is silt loam or very fine sandy loam. The C horizon is thinly stratified very fine sand and silt that contains very thin lenses of silty clay or clay in a few places.

The A horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (2.5Y 4/2). The B horizon ranges from olive brown (2.5Y 4/4) to olive (5Y 4/4) and is distinctly or prominently mottled with gray (N 5/0) and brown to dark brown (7.5YR 4/4). The C horizon is generally olive (5Y 5/3 to 4/4) with prominent mottles of gray (N 5/0), weak red (2.5YR 4/2), and brown to dark brown (7.5YR 4/4).

The reaction is medium to very strongly acid.

RIDGEBURY SERIES

The Ridgebury series consists of poorly drained Low-Humic Gley soils that formed in compact glacial till derived principally from granite, gneiss, and schist. They are in depressions and gently sloping areas in the uplands. A few areas are moderately sloping.

The Ridgebury soils are near the shallow Lyman, Hollis, and Shapleigh soils; the well-drained Berkshire, Marlow, Essex, Charlton, and Gloucester soils; the moderately well drained Peru, Sutton, and Scituate soils; and the very poorly drained Whitman soils.

The Ridgebury soils are similar to the Cabot soils, which developed on schist and siliceous limestone, but the Ridgebury soils have a more acid reaction and brighter mottles in the B horizon. These soils are coarser textured than the Stissing soils, which developed in phyllite.

Profile of Ridgebury extremely stony fine sandy loam in woods about 1 mile west of the village of Warwick in the town of Warwick—

O1—3 inches to 1 inch, loose litter of leaves, mostly elm, oak, and blueberry.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 7 inches, black (10YR 2/1) fine sandy loam that contains much organic matter; weak, coarse, granular structure; very friable; very many roots; coarse skeleton is less than 5 percent and consists of granitic and quartzitic fine gravel; very strongly acid; abrupt, wavy boundary. 6 to 8 inches thick. Surface stones, 12 to 20 inches in diameter, are about 20 feet apart.

B2—7 to 13 inches, olive-gray (5Y 5/2) sandy loam with many, medium and coarse, prominent, brown to dark-brown (7.5YR 4/4) mottles; massive; subangular blocky clods crush easily to single grains; friable; very few roots; less than 5 percent coarse skeleton; strongly acid; abrupt, smooth boundary. 6 to 9 inches thick.

Cx—13 to 20 inches +, light-gray (5Y 7/2) loamy sand with many coarse, prominent, strong-brown (10YR 5/8) mottles; massive; breaks to platy clods that crush explosively to single grains; very firm in place, firm in hand; less than 5 percent coarse skeleton; strongly acid.

Range of characteristics.—The texture of the solum is commonly fine sandy loam but ranges from sandy loam to loam. The substratum texture is generally loamy sand or sandy loam.

The A horizon is generally black (10 YR 2/1) but in some places is very dark gray (5Y 6/1). The B and C horizons are typically gray but range from grayish brown (10YR 5/2) to light gray to gray (5Y 6/1) and have prominent, strong-brown (7.5YR 5/8) to yellowish-brown (10YR 5/8) mottles.

The coarse skeleton is extremely variable; it ranges from less than 5 percent to more than 50 percent and consists of granitic and quartzitic gravel and cobbles.

These soils generally are very stony to extremely stony on the surface. Stones are from 5 to 50 feet apart.

RIVERWASH

Riverwash is a miscellaneous land type consisting of sorted deposits of sand, gravel, and cobbles along the larger streams. It is commonly stratified coarse gravel and cobbles, but in some places strata of fine gravel and very coarse sand are present. These materials are reworked at irregular intervals, usually several times a year and at least once a year. Because the materials are frequently rearranged by high water and are inherently sterile, they are generally devoid of vegetation.

Most Riverwash is in long, narrow strips or bars parallel to the stream. It may be on the banks of the stream or occur as islands or peninsulas in the stream. The overall relief is nearly level, and the microrelief is mostly gently sloping but in some places is strongly sloping.

RUMNEY SERIES

The Rumney series consists of poorly drained Low-Humic Gley soils in moderately coarse textured material of mixed mineralogy. They are in depressions along most of the major streams.

The Rumney soils are members of the catena that includes the well-drained Ondawa and the moderately well drained Podunk soils. The Rumney soils have a coarser texture than the Limerick soils, which are also Low-Humic Gley soils.

Profile of Rumney fine sandy loam in a meadow about 1 mile north of Griswoldville in the town of Colrain—

A1—0 to 3 inches, dark olive-gray (5Y 3/2) fine sandy loam with strong-brown (7.5YR 5/6) stains in root channels; weak, fine and medium, crumb structure; friable; many grass roots; slightly acid; abrupt, smooth boundary. 2 to 3 inches thick.

C1—3 to 16 inches, olive-gray (5Y 4/2) fine sandy loam with many, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; single grain; loose; few roots; slightly acid; abrupt, smooth boundary. 11 to 13 inches thick.

IIC2—16 to 36 inches +, stratified olive (5Y 5/4) coarse sand and dark grayish-brown (2.5Y 4/2) medium and fine sand; single grain; loose; slightly acid.

Range of characteristics.—The texture, to a depth of about 20 inches, ranges from sandy loam to fine sandy loam. Below 20 inches the texture is extremely variable; it ranges from sand or gravelly sand to stratified sand, gravel, or silt.

The A horizon ranges in color from black (10YR 2/1) to dark olive gray (5Y 3/2). The C horizon is grayish brown (10YR 5/2) to gray (5Y 5/1) that is distinctly or prominently mottled.

The reaction ranges from strongly acid to slightly acid.

SACO SERIES

The Saco series consists of very poorly drained Humic Gley soils in medium-textured material of mixed mineralogy. They are in depressions on the flood plains of the Connecticut River and its tributaries.

The Saco soils are members of the catena that includes the well-drained Hadley, the moderately well drained Winooski, and the poorly drained Limerick soils.

Profile of Saco silt loam in a swamp about 1½ miles southeast of the village of South Deerfield—

A11—0 to 2 inches, very dark brown (10YR 2/2) silt loam with a few dark reddish-brown (5YR 3/4) stains surrounding roots and embedded leaves; weak, fine, granular structure; friable; many roots; very strongly acid; clear, smooth boundary. 2 to 3 inches thick.

A12—2 to 8 inches, very dark gray (10YR 3/1) silt loam with many dark reddish-brown (5YR 3/4) stains surrounding roots and embedded leaf fragments; weak, fine and medium, granular structure; friable; many roots; very strongly acid; abrupt, smooth boundary. 6 to 7 inches thick.

C1g—8 to 10 inches, about equal parts of very dark gray (10YR 3/1) and dark-gray (10YR 4/1) silt loam; massive; firm; very few roots; very strongly acid; clear, smooth boundary. 2 to 3 inches thick.

C2g—10 to 20 inches, dark-gray (N 4/0) silt loam with few, fine, distinct, olive (5Y 5/6) mottles; massive; firm; very strongly acid; clear, smooth boundary. 9 to 12 inches thick.

C3g—20 to 36 inches +, greenish-gray (5GY 5/1) silt loam; massive; firm to very firm; very strongly acid.

Range of characteristics.—The texture of the A and C horizons is extremely variable; it ranges from silt or silt loam to sandy loam and, in some places, to gravelly sand.

The A horizon is dark gray to black except where it consists of recent deposits, which may be dark brown or very dark brown. The color of the C horizon ranges from dark gray (10YR 4/1) or gray (N 5/0) to greenish gray (5GY 5/1).

SAUGATUCK SERIES

The Saugatuck series consists of poorly drained Ground Water Podzols that developed in loose, acid sand. They are in depressions in terraces and glaciofluvial plains.

The Saugatuck soils are near the excessively drained Windsor, the moderately well drained Deerfield, the poorly drained Wareham, and the very poorly drained Scarboro soils.

Profile of Saugatuck loamy sand in woods about 1 mile northeast of the village of Whately in the town of Whately—

O2—1 inch to 0, black (5YR 2/1) to dark reddish-brown (5YR 2/2), partly decomposed leaf litter.

A1—0 to 3 inches, black (5YR 2/1) loamy sand; single grain and very weak, fine, crumb structure; very friable; many roots; extremely acid; abrupt, smooth boundary. 2 to 4 inches thick.

A2—3 to 10 inches, dark-gray (10YR 4/1) loamy sand; massive; friable; roots are many to common; extremely acid; abrupt, smooth boundary. 6 to 8 inches thick.

B21—10 to 11 inches, dark-red (2.5YR 3/6), intermixed with black (10YR 2/1), sand; massive; firm in place and in hand; many small (BB size) nodules of cemented sand grains; few roots; extremely acid; abrupt, smooth boundary. 1 to 2 inches thick.

B22—11 to 21 inches, dark reddish-brown (2.5YR 3/4) sand that fades with depth to strong brown (7.5YR 5/6), then to brownish yellow (10YR 6/6); massive; very firm in place, firm in hand; very strongly acid; abrupt, smooth boundary. 9 to 13 inches thick.

C—21 to 28 inches +, light olive-brown (2.5Y 5/6) sand; single grain; loose; very strongly acid.

Range of characteristics.—The texture of the surface layer is generally loamy sand but is sand in places. The B and C horizons are sand in most places, but the upper B horizon is loamy sand in places. Gravel strata may be present below a depth of about 36 inches.

The color of the A1 horizon is black (10YR 2/1) to dark reddish brown (5YR 2/2). The A2 horizon, commonly about 8 inches thick, ranges from 4 to 16 inches and is gray in contrast to adjoining horizons. Although dark gray (10YR 4/1) is a common color for the A2 horizon, in many places this horizon is reddish gray (5YR 5/2) or pinkish gray (5YR 6/2). The B21 horizon is thin, generally about 2 inches thick, but ranges from 1 to 3 inches in thickness. This horizon is generally dark reddish brown (2.5YR 2/4) but ranges to dark red (2.5YR 3/6). The B22 horizon is commonly red (2.5YR 4/6) or reddish brown (2.5YR 4/4) and fades with depth to brownish yellow (10YR 6/6) or pale olive (5Y 6/4). It is firm to very firm. The C horizon ranges from light olive brown (2.5Y 5/6) to light olive gray (5Y 6/2).

The reaction is extremely acid to strongly acid.

SCANTIC SERIES

The Scantic series consists of poorly drained Low-Humic Gley soils that developed in glaciolacustrine silt

and clay deposits. These soils are in depressions in old lakebeds. Some areas are gently sloping.

The Scantic soils are members of the catena that includes the well-drained Suffield, the moderately well drained Buxton, and the very poorly drained Biddeford soils.

The Scantic soils are similar to the Swanton soils, which developed in sandy deposits underlain by silt and clay. They are also similar to the Raynham soils, which developed in deep deposits of very fine sand and silt.

Profile of Scantic silt loam in an abandoned hayfield about 1¼ miles south of the village of Whately in the town of Whately—

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; many roots; strongly acid; abrupt, irregular boundary. 7 to 9 inches thick.

B21—9 to 15 inches, olive-gray (5Y 4/2) silt loam with common, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; moderate, medium, subangular blocky structure; friable; few roots; silt films on ped surfaces and in pores and wormholes; strongly acid; clear, smooth boundary. 4 to 5 inches thick.

IIA'2g—15 to 19 inches, gray (N 5/0) silty clay loam with many, medium, prominent, dark reddish-brown (5YR 3/4) and dark-gray (5YR 4/1) mottles; weak, medium, blocky structure with clay films on ped surfaces and in pores and cavities; few manganese stains on ped faces; friable; strongly acid; few roots; clear, smooth boundary. 6 to 8 inches thick.

IIB'2—19 to 25 inches, olive-gray (5Y 4/2) silty clay with common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, platy structure that breaks to weak, medium, blocky structure; firm; clay films in pores and cavities and on some ped faces; few manganese stains on ped faces; strongly acid; gradual, smooth boundary. 6 to 7 inches thick.

IICg—25 to 48 inches +, gray (N 5/0) and very dark gray (N 3/0) varved silt and clay with many, medium, prominent, brown to dark-brown (7.5YR 4/4) mottles in upper part, diminishing to few at 48 inches; massive in place; breaks to weak, thick, platy structure; firm; few thin clay films in root and worm channels; strongly acid.

Range of characteristics.—Silt loam is the most common type, but the texture ranges from loam to silty clay loam. The depth to silty clay loam or silty clay ranges from about 15 to 30 inches.

The color of the surface horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The B horizon is gray (5Y 5/1) to olive gray (5Y 4/2) with prominent, brown to dark-brown (7.5YR 4/4) to dark reddish-brown (5YR 3/4) mottles. The C horizon is gray (N 5/0) to olive gray (5Y 4/2) with prominent brown to dark-brown (7.5YR 4/4) mottles. Mottles in the C horizon decrease in abundance with increasing depth.

The reaction ranges from strongly acid to slightly acid.

SCARBORO SERIES, BROWNISH SUBSOIL VARIANT

The Scarboro series, brownish subsoil variant, consists of very poorly drained Humic Gley soils that formed in deep deposits of sand or stratified sand and gravel. These soils are in depressions in glaciofluvial plains and terraces.

The Scarboro soils are near the excessively drained Hinckley and Windsor soils, the well-drained to somewhat excessively drained Merrimac, Warwick, and Agawam soils, the moderately well drained Sudbury, Ninigret, and Dearfield soils, and the poorly drained Walpole and Wareham soils.

Profile of Scarboro fine sandy loam, brownish subsoil variant, in a hayfield about 1½ miles north of the village of Montague—

Ap—0 to 10 inches, black (10YR 2/1) fine sandy loam; weak, fine, granular structure; very friable; many grass roots; very strongly acid; abrupt, smooth boundary. 7 to 10 inches thick.

B2—10 to 25 inches, dark grayish-brown (10YR 4/2) fine sand with many, medium, distinct, dark reddish-brown (5YR 3/4) mottles; single grain; loose; few roots in upper 3 or 4 inches, none below; very strongly acid; clear, smooth boundary. 12 to 18 inches thick.

Cg—25 to 36 inches +, dark-gray (5Y 4/1) fine sand with few, medium, prominent, dark reddish-brown (5YR 3/4) mottles that decrease in abundance as the depth increases; single grain; loose; very strongly acid.

Range of characteristics.—The texture of the surface horizon is generally fine sandy loam but ranges from sandy loam to loam that contains much organic matter. The texture of the B horizon varies considerably. In the upper part of the B horizon, the texture ranges from gravelly loamy sand to fine sand and in places to fine sandy loam. The C horizon may have a texture ranging from sand to stratified sand or stratified sand and gravel.

The surface horizon is typically black; generally it appears blacker than the Munsell color chips indicate. The B horizon is generally dark grayish brown (10YR 4/2 to 2.5Y 4/2) or in some places olive gray (5Y 4/2). In addition this horizon is distinctly or prominently mottled with brown (7.5YR 4/4) to dark reddish brown (5YR 3/4). The C horizon is gray (10YR 5/1) to dark gray (5Y 4/1) and prominently mottled, in the upper part at least, with brown (10YR 5/3) to dark reddish brown (5YR 3/4).

The amount of coarse skeleton varies extremely below the surface horizon and ranges from less than 5 percent to 80 percent.

The reaction is strongly acid to medium acid.

SCITUATE SERIES

The Scituate series consists of moderately well drained Brown Podzolic soils that developed in compact glacial till derived mainly from granite and gneiss. They are in the uplands in the eastern part of the county.

The Scituate soils are near the well-drained Essex, the excessively drained and shallow Shapleigh, the somewhat excessively drained Gloucester, and the poorly drained Ridgebury soils.

The Scituate soils have a coarser texture than the Peru and Sutton soils. Compared with the Sutton soils, the Scituate soils have a distinct fragipan within 30 inches of the surface. They are more acid and lack the "ghosts" of disintegrated siliceous limestone that are in the Buckland soils.

Profile of Scituate fine sandy loam in a hayfield about 1½ miles southwest of Moores Corner in the town of Leverett—

Ap—0 to 8 inches, very dark brown (10YR 2/2) fine sandy loam; weak, fine and medium, granular structure; very friable; many, fine, fibrous roots; less than 5 percent coarse skeleton of fine gravel; slightly acid; abrupt, smooth boundary. 6 to 9 inches thick.

B21—8 to 15 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; clods break to fine and medium granules; friable; fine fibrous roots are common; 5 percent coarse skeleton of fine gravel; medium acid; clear, wavy boundary. 7 to 10 inches thick.

B22—15 to 25 inches, olive-brown (2.5Y 4/4) coarse sandy loam with common, medium, distinct, dark yellowish-brown (10YR 3/4) mottles; clods break to fine and medium granules; friable; few roots; 15 percent coarse skeleton of fine gravel; medium acid; clear, wavy boundary. 10 to 12 inches thick.

C1x—25 to 33 inches, olive-brown (2.5Y 4/4) gravelly sandy loam with common, medium and coarse, distinct, brown to dark-brown (7.5YR 4/4) mottles; weak, thick, platy structure; very firm in place, firm when removed; peds rupture under pressure; very few roots; 20 percent coarse skeleton of fine gravel; medium acid; clear, wavy boundary. 6 to 9 inches thick.

C2x—33 to 46 inches +, olive-gray (5Y 5/2) gravelly loamy sand with common, medium, distinct, dark yellowish-brown (10YR 3/4) and common, coarse, prominent, dark-brown (7.5YR 3/2) mottles; weak to moderate, thin, platy structure; firm in place, friable when removed; peds rupture under pressure; no roots; 20 percent coarse skeleton of fine gravel; medium acid.

Range of characteristics.—The texture of the A horizon is generally fine sandy loam but ranges from fine sandy loam to loamy sand. Typically the texture in the upper B horizon is sandy loam or fine sandy loam, and in the lower B horizon is coarse sandy loam or loamy sand. Sandy loam and loamy sand or gravelly sandy loam and gravelly loamy sand are typical of the substratum.

The surface horizon is generally very dark brown (10YR 2/2) to dark brown (10YR 3/3). The upper B horizon is generally dark yellowish brown (10YR 4/4) and fades with depth to a light olive brown (2.5Y 5/4) that has prominent brown to dark-brown (7.5YR 4/4) mottles. The C horizon is typically olive (5Y 4/3) to olive gray (5Y 4/2) and in some places, pale olive (5Y 6/3). This horizon is mottled with brown (10YR 3/4) to dark brown (7.5YR 3/2).

In unimproved areas surface stones are not more than 40 to 50 feet apart. The coarse skeleton in the solum is generally between 5 and 30 percent and in the substratum is as much as 35 to 40 percent. The stones and gravel are predominantly granitic and quartzitic.

The reaction ranges from strongly acid to medium acid.

SHAPLEIGH SERIES

The Shapleigh series consists of somewhat excessively to excessively drained, shallow Brown Podzolic soils. They formed in a shallow layer of sandy glacial till derived principally from granite and quartzite.

The Shapleigh soils are near the well-drained Gloucester and Essex, the moderately well drained Scituate, and the poorly drained Ridgebury soils.

The Shapleigh soils have a coarser texture than the Hollis, Westminster, and Holyoke soils. They are not so red as the Sunderland soils, which are Brown Podzolic, and the Lyman soils, which are Podzols. The Shapleigh soils are coarser textured than the Nassau soils, which are Lithosols intergrading to Sols Bruns Acides and developed in till derived from phyllite.

Profile of Shapleigh fine sandy loam in pasture about 1 mile southwest of the village of Montague—

Ap—0 to 8 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, granular structure; very friable; many fibrous roots; 10 percent coarse skeleton of gravel; medium acid; abrupt, smooth boundary. 7 to 9 inches thick.

B2—8 to 16 inches, dark yellowish-brown (10YR 4/4) loamy sand that fades to brown (10YR 5/3) with depth; massive; clods crush to single grain; friable to loose; fibrous roots are common; 15 percent coarse skeleton of gravel; medium acid; abrupt, smooth boundary. 4 to 16 inches thick.

IIR—16 inches +, gray granite bedrock.

Range of characteristics.—The texture is generally fine sandy loam in the A horizon but ranges from fine sandy loam to loamy sand. The B horizon has a texture of coarse sandy loam or loamy sand. The A horizon is generally dark brown (10YR 3/3) but ranges from very dark brown (10YR 2/2) to dark yellowish brown (10YR 3/4). The color of the B horizon is dark yellowish brown (10YR 4/4) to brown to dark brown (7.5 YR 4/4) and fades with depth to brown (10 YR 5/3).

The coarse skeleton is commonly about 15 percent but ranges from 5 to 40 percent. It generally consists of granite and quartzite.

Rock outcrops are 10 to 100 feet apart. The depth to bedrock is generally about 20 inches but ranges from a few inches to 2 feet.

The reaction is medium acid to strongly acid.

SHELBURNE SERIES

The Shelburne series consists of well-drained Sols Bruns Acides intergrading to Brown Forest soils. These soils have a fragipan. They developed in compact glacial till derived principally from dark-gray mica schist and siliceous limestone. The carbonates have been leached from the upper horizons of these soils but remain in the center of the larger fragments of partly decomposed siliceous limestone. These leached, porous limestone fragments are conspicuous components of the coarse skeleton in the Shelburne soils.

The Shelburne soils are members of the catena that includes the moderately well drained Buckland and the poorly drained and very poorly drained Cabot soils.

Compared with the Brown Podzolic soils of the Essex series and the Podzols of the Marlow series, the Shelburne soils are less acid and contain "ghosts" of disintegrated siliceous limestone in the B horizon. Also, the Shelburne soils do not have the reddish-brown upper B horizon that the Marlow soils have.

Profile of Shelburne loam in a pasture about 2½ miles northwest of the village of Colrain in the town of Colrain—

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; many grass roots; about 10 percent coarse skeleton of gravel and channers; medium acid; abrupt, smooth boundary. 6 to 8 inches thick.

B21—8 to 16 inches, olive-brown (2.5Y 4/4) loam with occasional reddish-brown stains that are the color remnants of siliceous limestone "ghosts"; weak, fine, granular structure; very friable; grass roots are common; 10 to 15 percent coarse skeleton consisting of gravel and channers, including a few, small, siliceous limestone "ghosts"; medium acid; clear, smooth boundary. 8 to 10 inches thick.

B22—16 to 25 inches, olive-brown (2.5Y 4/4) loam; weak, thick, platy structure; firm in place, friable when removed; few roots in upper 6 inches, none below; 15 percent coarse skeleton consisting of gravel and channers, including a few small and medium limestone "ghosts"; slightly acid; clear, smooth boundary. 7 to 10 inches thick.

Cx—25 to 36 inches +, olive-gray (5Y 4/2) loam; moderate, thick, platy structure; very firm in place, firm when removed; 15 percent coarse skeleton consisting of gravel and channers and a few cobbles; limestone "ghosts" are more abundant in this horizon than in the overlying horizons; slightly acid.

Range of characteristics.—Loam is the common texture of the solum, but the range includes fine sandy loam.

The A horizon is generally very dark grayish brown (10YR 3/2 or 2.5Y 3/3) but ranges from very dark to dark brown (10YR 3/3). The color of the B horizon is generally olive brown (2.5Y 4/4) but ranges from dark yellowish brown (10YR 4/4) to olive brown (2.5Y 4/4). In places the soils have a weakly developed Brown Podzolic horizon sequence. The C horizon is commonly olive gray (5Y 4/2) but may be dark olive gray (5Y 3/2). The B horizon has reddish-brown (5YR 4/3) stains that resemble mottles but are the color remnants of disintegrated fragments of siliceous limestone.

The coarse skeleton is generally 10 to 20 percent but is as much as 40 percent in some places. It is evenly distributed throughout the soil and consists of dark-gray schist channers, quartzite gravel, and a few fragments of siliceous limestone "ghosts." The "ghosts" of limestone fragments increase in abundance as the depth from the surface increases.

The reaction is generally medium acid near the surface and less acid with depth. The reaction of the C horizon is generally slightly acid and in many places neutral.

STISSING SERIES

The Stissing series consists of poorly drained Low-Humic Gley soils that have formed in compact glacial till derived principally from dark-gray phyllite. They are in upland depressions and seep areas at the base of slopes.

The Stissing soils are near the shallow Nassau, the well-drained Dutchess and Bernardston, the moderately well drained Pittstown, and the very poorly drained Whitman soils. They are similar to the Ridgebury and Cabot soils but are finer textured. They are more acid than the Cabot soils.

Profile of Stissing silt loam in a hayfield about 2 miles west of the village of Bernardston—

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam with fine streaks of very dusky red (2.5YR 2/2) in root channels; moderate, fine, granular structure; very friable; many grass roots; about 10 percent coarse skeleton consisting of small flaky chips of phyllite; medium acid; abrupt, smooth boundary. 6 to 8 inches thick.

Bg—8 to 16 inches, gray (5Y 5/1) silt loam with many, medium, prominent, dark reddish-brown (5YR 3/2) mottles; massive; firm in place, friable when removed; very few roots in upper 2 or 3 inches, none below; about 10 percent coarse skeleton consisting of small flaky chips of phyllite; strongly acid; clear, wavy boundary. 6 to 10 inches thick.

Cxg—16 to 26 inches +, gray (N 5/0) silt loam with many, coarse, prominent, dark-brown (7.5YR 3/2) mottles; moderate, thick, platy structure; very firm in place, firm when removed; about 10 percent coarse skeleton consisting of small flaky chips of phyllite; strongly acid.

Range of characteristics.—Silt loam is the common texture, but in places the texture is loam. These soils are generally stony, except where they have been cleared for farming.

The Stissing soils have noticeably dull colors that range from very dark grayish brown (10YR 3/2) in the A horizon, through gray (5Y 5/1) with an olive tinge in the B horizon, to gray (N 5/0) or dark gray (N 4/0) in the C horizon.

The fragipan is very firm in place and firm to very firm when removed. The depth to the fragipan is about 16 inches in most places but ranges from 12 to 24 inches.

The coarse skeleton is composed of two major fractions. The first fraction is fairly constant in amount, generally 5 to 15 percent, and consists of small flakes or chips of phyllite less than one-half inch long. The second fraction is extremely variable in amount; the range is from 0 to about 50 percent. This fraction consists of phyllite flagstones.

The solum and substratum are medium to very strongly acid; but where the soil has been limed, the surface soil is slightly acid.

SUDBURY SERIES

The Sudbury series consists of moderately well drained Brown Podzolic soils that developed in sandy glaciofluvial deposits underlain by stratified sand and gravel. They are on glaciofluvial plains.

The Sudbury soils are near the excessively drained Hinckley, the well-drained to somewhat excessively drained Merrimac, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

The Sudbury soils are like the Ninigret soils but are underlain by stratified sand and gravel at a depth of about 2 feet. Sudbury soils differ from the Alluvial soils of the Podunk series in having a genetic B horizon.

Profile of Sudbury fine sandy loam in an abandoned field about 2 miles northwest of the village of Montague—

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

B21—10 to 17 inches, dark yellowish-brown (10YR 4/6) fine sandy loam; subangular clods break to weak, fine crumbs; very friable; fine fibrous roots are common; 5 percent coarse skeleton of ¼ to 1 inch gravel; strongly acid; clear, smooth boundary. 5 to 7 inches thick.

B22—17 to 23 inches, light olive-brown (2.5Y 5/4) fine sandy loam with common, medium and coarse, faint, dark yellowish-brown (10YR 4/4) and brown to dark-brown (7.5YR 4/4) mottles; very weak, fine, crumb structure; very friable; fine fibrous roots are common; about the same amount of coarse skeleton as in the horizon above; medium acid; abrupt, smooth boundary. 5 to 8 inches thick.

IIC1—23 to 28 inches, dark yellowish-brown (10YR 4/4) to olive-brown (2.5Y 4/4) very gravelly sand; single grain; loose; few roots; 70 to 80 percent coarse skeleton of gravel, ½ to 1 inch in diameter; medium acid; abrupt, smooth boundary. 4 to 5 inches thick.

IIC2—28 to 34 inches, olive-brown (2.5Y 4/4) gravelly coarse and very coarse sand; single grain; loose; 30 to 40 percent coarse skeleton of fine gravel, less than ¼ inch in diameter; medium acid; abrupt, smooth boundary. 6 to 7 inches thick.

IIIC3—34 to 52 inches +, light olive-brown (2.5Y 5/4) medium and coarse sand; single grain; loose; medium acid.

Range of characteristics.—The texture of the surface horizon is commonly fine sandy loam, but the range includes sandy loam. The texture of the B horizon is generally fine sandy loam but ranges to gravelly sandy loam and may be loamy sand in the lower part of this horizon. The texture of the substratum varies extremely; it consists of stratified sand and gravel and, in places, cobbles.

The color of the A horizon is generally very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). The color of the upper B horizon ranges from brown to dark brown (7.5YR 4/4) to very dark grayish brown

(10YR 3/2). The lower B horizon has colors ranging from dark yellowish brown (10YR 5/4) to very dark grayish brown (2.5Y 3/2). In many places the color of the substratum is pale brown (10YR 6/3) to light yellowish brown (2.5Y 6/4), but it may be most any pale color, depending on the mineralogy of the soil. Mottling in the lower B horizon is extremely variable and ranges from a few, fine, faint mottles to common, coarse, prominent ones. The depth to mottling is generally about 24 inches but ranges from 16 to 28 inches. The colors of the mottles are brown to dark brown (7.5YR 4/4 to 10YR 3/4). In many places thin, dark reddish-brown (5YR 3/3) and black (5YR 2/1) lamellar bands are present in the C horizon. These bands appear to be zones of iron or iron and organic matter concentration and are friable to firm when moist.

The depth to the contrasting substratum ranges from 20 to 36 inches. The reaction is medium to very strongly acid, except where the soil has been limed. In the limed areas the reaction may be slightly acid to neutral in the A and upper B horizon.

SUFFIELD SERIES

The Suffield series consists of well-drained Brown Podzolic soils that developed in glaciolacustrine deposits of silt and clay. These soils are gently sloping to steep.

The Suffield soils are members of the catena that includes the moderately well drained Buxton, the poorly drained Scantic, and the very poorly drained Biddeford soils.

The Suffield soils have a finer texture in the lower B and C horizons than the Hartland soils, which formed in similar glaciolacustrine deposits of very fine sand and silt.

Profile of Suffield silt loam in an abandoned pasture 300 feet west of River Road and 1,800 feet north of the intersection of Hillside Road and River Road in South Deerfield—

A1—0 to 2 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, fine, granular structure; very friable; many fine grass roots; strongly acid; abrupt, smooth boundary. 2 to 3 inches thick.

B21—2 to 10 inches, olive-brown (2.5Y 4/4) silt loam; massive; breaks to weak, fine granules; very friable; many fine grass roots; strongly acid; clear, smooth boundary. 8 to 9 inches thick.

B22—10 to 16 inches, olive (5Y 4/3) silt loam, massive; breaks to medium, subangular blocky fragments; firm; few roots; strongly acid, clear, smooth boundary. 5 to 8 inches thick.

IIB23—16 to 24 inches, olive (5Y 4/3) silty clay; moderate, medium, subangular blocky structure; firm to very firm; few fine roots; clay skins coat most ped surfaces and line root channels and earthworm burrows; strongly acid; clear, smooth boundary. 6 to 9 inches thick.

IIC—24 to 36 inches +, olive-gray (5Y 4/2) and olive (5Y 5/3) varved silt and clay; massive; breaks to moderate, medium, platy fragments; firm; no roots; strongly acid.

Range of characteristics.—About 90 percent of the area designated as Suffield soil is Suffield silt loam. The slopes generally range from 18 to 28 percent. In the small flat areas on top of knolls, the slopes range from 2 to 5 percent. The uneroded Suffield silt loam is in these areas, and the severely eroded phase is in the more sloping areas. There are places where the sediments were deposited on the hips of bedrock ridges, and the bedrock is at a depth of 36 to 48 inches. In the northern part of the area where these soils occur, erosional deposits have added coarser material to the Ap horizon in a few places. In these places the texture of the surface layer ranges from silt loam to fine sandy loam and the content of coarse skeleton may range from 10 to 15 percent. The coarse skeleton consists of gravel less than 2 inches in diameter and even a few stones 16 to 18 inches in diameter.

SUNCOOK SERIES

The Suncook series consists of excessively drained Alluvial soils in coarse-textured material of mixed mineralogy. They are nearly level and are on the flood plains of the Connecticut River and some of its tributaries.

The Suncook soils are near the well-drained Hadley and Ondawa soils, which are also alluvial, but Suncook soils are coarser textured.

Profile of Suncook loamy sand in an idle field about 1½ miles southwest of the village of Northfield—

Ap—0 to 13 inches, very dark grayish-brown (10YR 3/2) loamy sand that contains a few light-gray to gray (10YR 6/1) streaks; very weak, fine, granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary. 10 to 13 inches thick.

C1—13 to 15 inches, olive-brown (2.5Y 4/4) sand; single grain; loose; few fine roots; strongly acid; abrupt, smooth boundary. 2 to 3 inches thick.

C2—15 to 24 inches, olive (5Y 4/3) sand; single grain; loose; few fine roots; strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

C3—24 to 27 inches, very dark grayish-brown (2.5Y 3/2) sand; single grain; loose; very few fine roots; strongly acid; abrupt, smooth boundary. 3 to 6 inches thick. (This may be a buried A horizon.)

C4—27 to 42 inches +, olive (5Y 5/3) sand; single grain; loose; no roots; strongly acid.

Range of characteristics.—The texture of the surface layer is commonly loamy sand but the range includes loamy sands and cobbly or gravelly loamy sands. Below the surface layer the texture may be sand, loamy sand, gravelly sand, or gravelly loamy sand.

The surface horizon is generally very dark grayish brown (10YR 3/2) to dark grayish brown (2.5Y 4/2). The layers below the surface layer commonly are olive brown (2.5Y 4/4) to olive (5Y 5/3). In many places darker layers that once were surface layers have been buried by recent deposits. These subsurface layers may have colors of dark brown (10YR 3/3) to very dark grayish brown (2.5Y 3/2).

The reaction ranges from very strongly to strongly acid.

SUNDERLAND SERIES

The Sunderland series consists of somewhat excessively drained shallow Brown Podzolic soils that formed in a thin mantle of red glacial till over Triassic sandstone, shale, or conglomerate.

The Sunderland soils are similar in color and texture to the Cheshire soils but have a thinner solum. They have a coarser texture and redder solum than the Holyoke soils. They are similar to the Lyman soils, which also have a reddish orterde but developed in schist and are Podzols.

Profile of Sunderland fine sandy loam in woods about 1½ miles northeast of the village of Deerfield in the town of Deerfield—

O1—3 inches to 1 inch, loose litter of leaves and twigs, mostly oak.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 2 inches, black (5YR 2/1) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; very strongly acid; abrupt, smooth boundary. 1 to 2 inches thick.

B21—2 to 12 inches, dark reddish-brown (5YR 3/4) fine sandy loam; massive; subangular clods crush to weak, fine granules; friable; fine and medium roots are common; about 10 percent coarse skeleton of angular gravel consisting of red sandstone and shale; strongly acid; clear, smooth boundary. 8 to 14 inches thick.

B22—12 to 22 inches, dark reddish-brown (2.5YR 3/4) fine sandy loam; massive; subangular clods crush to very weak, fine granules; friable; fine, medium, and coarse roots are common; about 15 percent coarse skeleton of angular gravel consisting of red sandstone and shale; strongly acid; abrupt, smooth boundary. 6 to 12 inches thick.

IIR—22 inches +, dark reddish-brown (2.5YR 2/4) arkose bedrock.

Range of characteristics.—The texture is mainly fine sandy loam but ranges from sandy loam to loam.

The color of the B horizon is generally dark reddish brown (2.5YR 2/4 to 5YR 3/4).

The coarse skeleton ranges in amount from less than 5 percent to about 60 percent and is composed of red angular gravel and cobbles of sandstone and shale. The depth to bedrock is generally about 20 inches but ranges from 10 inches to 26 inches. Because bedrock is exposed in many places, very rocky and extremely rocky phases of these soils are common.

The reaction is strongly to extremely acid.

SUTTON SERIES

The Sutton series consists of moderately well drained Brown Podzolic soils that developed in glacial till derived principally from gray or olive mica schist, gneiss, or phyllite. They are mainly in gently to moderately sloping uplands.

The Sutton soils are near the shallow Hollis, the well-drained Charlton, the poorly drained Ridgebury, and the very poorly drained Whitman soils. Sutton soils have a finer textured solum than the Scituate soils and do not have the prominent fragipan that is in those soils. Sutton soils are similar to Peru soils but do not have a fragipan within 30 inches.

Profile of Sutton fine sandy loam in a pasture about 1½ miles southwest of the village of Northfield—

Ap—0 to 8 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, granular structure; very friable; many roots; 15 percent coarse skeleton of gravel less than 1 inch in diameter; strongly acid; abrupt, smooth boundary. 6 to 8 inches thick. The surface of this horizon is stony. Stones are 16 to 20 inches in diameter and are about 75 feet apart.

B21—8 to 14 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; massive; subangular blocky clods crush to fine granules; friable; many roots; 15 percent coarse skeleton of gravel less than 1 inch in diameter; medium acid; clear, smooth boundary. 6 to 8 inches thick.

B22—14 to 18 inches, yellowish-brown (10YR 5/4) fine sandy loam; massive; subangular blocky clods crush to fine granules; friable; few roots; 15 percent coarse skeleton of gravel; medium acid; clear, smooth boundary. 4 to 6 inches thick.

B23—18 to 24 inches, yellowish-brown (10YR 5/4) fine sandy loam with common, medium, distinct brown to dark-brown (7.5YR 4/4) mottles; massive; subangular blocky clods crush to fine granules; slightly firm in place, friable when removed; very few roots; 15 percent coarse skeleton of gravel; medium acid; clear, smooth boundary. 5 to 8 inches thick.

C—24 to 36 inches +, olive (5Y 5/4) fine sandy loam with common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; subangular blocky clods crush to fine granules; slightly firm in place, friable when removed; 15 percent coarse skeleton of gravel; medium acid.

Range of characteristics.—The texture of the solum and substratum is commonly fine sandy loam, but the texture of the substratum is sandy loam in places.

The color of the surface horizon is generally dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2) and, in some places, dark brown (7.5YR 3/2). The color of the B horizon is generally dark yellowish brown (10YR 4/4) to brown to dark brown (7.5YR 4/4) and fades with depth to yellowish brown (10YR 5/4) to light olive brown (2.5Y 5/4). The lowest part of the B horizon is slightly to highly mottled with faint to distinct, brown to dark-brown (7.5YR 4/4) or dark yellowish-brown (10YR 4/4) mottles. The substratum is generally olive (5Y 5/4) or olive brown (2.5Y 4/4) and is distinctly mottled with dark yellowish brown (10YR 4/4). The depth to mottling is generally about 20 inches but ranges from about 16 to 26 inches.

Below 36 inches the substratum is very firm in some places. The coarse skeleton is generally less than 20 percent, but ranges to as much as 50 percent, and consists of angular fragments of gravel that is schist, phyllite, gneiss, and, in some places, granite.

The Sutton soils are generally stony to extremely stony unless they have been cleared for cultivation.

SWANTON SERIES

The Swanton series consists of poorly drained Low-Humic Gley soils that developed in sandy glaciofluvial deposits overlying glaciolacustrine silt and clay. They are in depressions in old glacial lakebeds.

The Swanton soils are near the well-drained Agawam, silty substratum, and the moderately well drained Ninigret soils, silty substratum.

The Swanton soils are like the Walpole soils but are underlain by silt and clay, whereas the Walpole soils are underlain by sand or stratified sand and gravel.

Profile of Swanton very fine sandy loam in an abandoned hayfield about 1½ miles south of the village of Whately—

Ap—0 to 6 inches, very dark gray (N 3/0) very fine sandy loam, with common yellowish-red (5YR 4/8) root stains and few, greenish-gray (5BG 5/1), spheroidal inclusions that are apparently fragments of the underlying horizon; weak, medium, crumb structure; friable; many fine roots; medium acid; abrupt, smooth boundary. 6 to 8 inches thick.

A2g—6 to 7 inches, greenish-gray (5BG 5/1) loamy very fine sand with few, fine, prominent mottles of dark bluish gray (5B 4/1) and dark yellowish brown (10YR 4/4); single grain; loose; many roots; strongly acid; abrupt, smooth boundary. 1 to 1½ inches thick.

B21g—7 to 15 inches, gray (5Y 5/1) fine sandy loam with common, medium, prominent, light-olive brown (2.5Y 5/4) and yellowish-brown (10YR 5/6) mottles; very weak, fine and medium, subangular blocky structure; friable; few roots; medium acid; clear, smooth boundary. 5 to 9 inches thick.

IIA'2g—15 to 21 inches, gray (5Y 5/1), gritty silt loam with common, fine, prominent, light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/4) mottles; weak, medium, blocky structure; friable; thin silt films on most ped faces and moderate silt films in pores and wormholes; about 10 percent coarse skeleton of pebbles less than ½ inch in diameter, each pebble in a "pocket" lined with a thin to medium silt film; medium acid; abrupt, smooth boundary. 5 to 12 inches thick.

IIB'2—21 to 24 inches, olive (5Y 4/3) silty clay loam with common, fine, faint, olive-gray (5Y 4/2) and yellowish-brown (10YR 5/8) mottles; weak, very thick, platy structure, apparently controlled by the lamination of the original sediments, breaks to weak, medium, blocky structure; slightly firm; peds have thin clay films on top faces and a few on side faces; medium acid; abrupt, smooth boundary. 3 to 5 inches thick.

IIC—24 to 36 inches +, variegated olive (5Y 4/3), dark-brown (10YR 3/3), and grayish-brown (2.5Y 5/2) varved silt and clay; massive; firm; slightly acid.

Range of characteristics.—The texture of the surface horizon is commonly very fine sandy loam or loam. That of the B horizon is commonly fine sandy loam and, in some places, sandy loam or loamy sand. The substratum consists of varved silt and clay and, in many places, very thin strata of very fine sand.

The surface horizon ranges in color from very dark grayish brown (10YR 3/2) to very dark gray (N 3/0). The B horizon generally has a grayish color that ranges from dark grayish brown (10YR 4/2) to olive gray (5 Y 5/1) and has prominent mottles of light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/4 to 5/8). The substratum has a gray (5Y 5/1) to olive (5Y 4/3) color and is prominently mottled or variegated with dark brown (10YR 3/3) to strong brown (7.5YR 5/6).

The depth to silt and clay ranges from 15 to 36 inches within relatively short distances. The amount of coarse skeleton in the solum is generally very low, but may be as much as 25 or 30 percent in the horizon just above the silt and clay substratum.

WALPOLE SERIES

The Walpole series consists of poorly drained, Low-Humic Gley soils that formed in stratified glaciofluvial deposits. They are in depressions in glaciofluvial terraces and plains and may be gently sloping.

These soils are in the catena that includes the well-drained Agawam, and moderately well drained Ninigret soils. They are also near the very poorly drained Scarboro, the excessively drained Hinckley, the somewhat excessively drained Merrimac, and the moderately well drained Sudbury soils.

The Walpole soils are like the Swanton soils but are over stratified sand and gravel, whereas the Swanton soils are over silt and clay. The Walpole soils differ from the Rumney soils in having a genetic B horizon. They have a finer textured solum than the Wareham soils.

Profile of Walpole fine sandy loam in a pasture about 3 miles northeast of the village of Greenfield—

Ap—0 to 7 inches, very dark gray (10YR 3/1) fine sandy loam; weak, fine, crumb structure; friable; many roots; strongly acid; abrupt, smooth boundary. 6 to 8 inches thick.

B21—7 to 14 inches, very dark grayish-brown (10YR 3/2) fine sandy loam with common, coarse, distinct, dark reddish-brown (5YR 3/4) mottles; massive; friable; very few roots; medium acid; clear, smooth boundary. 5 to 8 inches thick.

B22g—14 to 26 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) fine sandy loam with common, coarse, distinct, brown to dark-brown (7.5YR 4/4) mottles that fade in color and decrease in number with depth; massive; friable; medium acid; abrupt, smooth boundary. 10 to 12 inches thick.

IIC—26 to 36 inches +, gray (10YR 4/1) and brown (10YR 5/3) stratified sand and gravel; single grain; loose; medium acid.

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Range of characteristics.—The texture of the solum is commonly fine sandy loam, but the range includes sandy loam and gravelly sandy loam, and the lower part of the solum may be loamy sand. The texture of the substratum ranges from very fine sand to gravel.

The A horizon is typically very dark gray (10YR 3/1), but the color ranges from very dark gray to very dark grayish brown (10YR 3/2). The B horizon ranges from dark gray (10YR 4/1) to dark grayish brown (10YR 4/2 to 2.5Y 4/2) in color and is distinctly to prominently mottled with brown to dark brown (7.5YR 4/4) to dark reddish brown (5YR 4/4). The color of the substratum ranges from gray (10YR 4/1) to light brownish gray (2.5Y 6/2) or light olive gray (5Y 6/2).

The amount of coarse skeleton ranges from less than 5 percent to 30 percent in the solum, and from 10 to more than 75 percent in the substratum. The depth to stratified sand and gravel is generally about 24 inches but ranges from 15 to more than 36 inches.

The reaction is medium acid to very strongly acid.

WAREHAM SERIES

The Wareham series consists of somewhat poorly drained and poorly drained Low-Humic Gley soils. These coarse-textured soils developed in deep, stratified deposits of sand or sand and gravel in depressions in glaciofluvial terraces.

The Wareham soils are in the catena that includes the excessively drained Windsor, the moderately well drained Deerfield, and the very poorly drained Scarboro soils.

The Wareham soils are also near the Hinckley, Merrimac, and Sudbury soils. They are similar to the Walpole soils but have a coarser texture in the subsoil.

Profile of Wareham fine sandy loam in a hayfield about 2 miles south of the village of Turners Falls—

Ap—0 to 7 inches, very dark gray (10YR 3/1) fine sandy loam with common reddish-brown (5YR 4/3) root stains; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary. 6 to 8 inches thick.

B2—7 to 16 inches, light olive-brown (2.5Y 5/4) loamy sand with common, medium, prominent mottles of yellowish red (5YR 4/8); massive; subangular clods break to weak, medium granules; friable; medium acid; clear, smooth boundary. 7 to 10 inches thick.

IIC1—16 to 30 inches, olive-gray (5Y 5/2) loamy coarse sand with common, medium, distinct mottles of yellowish brown (10YR 5/4); single grain; friable to loose; free water at 29 inches; medium acid; clear, smooth boundary. 14 to 16 inches thick

IIIC2—30 to 48 inches +, olive-gray (5Y 4/2), stratified, fine, medium, and coarse sand with many medium to coarse, distinct mottles of light olive brown; single grain; loose; medium acid.

Range of characteristics.—Fine sandy loam is the common type, but the texture of the surface layer ranges from sandy loam to loam. The texture of the B horizon directly below the Ap or equivalent depth is loamy sand or loamy coarse sand. The gravel content in the solum is generally less than 10 percent but may be as much as 20 percent. The texture of the substratum is variable; it ranges from very fine sand to gravel.

The color of the Ap horizon ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The color of the surface horizon in undisturbed areas is generally black (N 2/0) but ranges to very dark grayish brown (10YR 3/2). The B horizon is strongly mottled;

the matrix has a hue of 10YR, 2.5Y, or 5Y, a value of 4, 5, or 6, and a chroma of 2, 3, or 4.

The depth to stratified sand or sand and gravel is generally about 24 inches but ranges from 18 to 36 inches.

WARWICK SERIES

The Warwick series consists of well-drained Brown Podzolic soils that developed in stratified glaciofluvial deposits derived principally from dark-gray phyllite but containing some schist and quartzite. They are on outwash plains and terraces.

The Warwick soils are near the moderately well drained Sudbury, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

The Warwick soils are similar to the Merrimac but differ in lithology. The Merrimac soils are Brown Podzolic, but they developed in glaciofluvium derived principally from granite, gneiss, and schist and contain definitely fewer dark, fine-grained rock fragments in the B horizon than the Warwick soils.

Profile of Warwick gravelly fine sandy loam in a hayfield about 1½ miles northwest of the village of Gill—

Ap—0 to 8 inches, dark-brown (10YR 3/3) gravelly fine sandy loam; moderate, fine and medium, granular structure; very friable; many grass roots; 25 percent coarse skeleton of fine to coarse gravel composed mainly of dark-gray phyllite; slightly acid; abrupt, smooth boundary. 7 to 10 inches thick.

B21—8 to 14 inches, yellowish-brown (10YR 5/6) gravelly fine sandy loam; weak, fine, granular structure; very friable; many grass roots; 40 percent coarse skeleton of fine to coarse phyllite gravel and a few channers; medium acid; clear, smooth boundary. 6 to 9 inches thick.

B22—14 to 20 inches, light olive-brown (2.5Y 5/4) gravelly fine sandy loam; weak, fine, granular structure; very friable; grass roots are common; coarse skeleton is about the same as in the horizon above; medium acid; abrupt, smooth boundary. 8 to 10 inches thick.

IIC1—20 to 26 inches, olive-brown (2.5Y 4/4) very gravelly sand; single grain; loose; grass roots are common; about 75 percent fine and medium phyllite gravel and a few channers; medium acid; abrupt, wavy boundary. 4 to 8 inches thick.

IIC2—26 to 35 inches +, variegated, black (5Y 2/1) and yellowish-brown (10YR 5/4) stratified sand and gravel; single grain; loose; very few grass roots in upper 6 inches, none below.

Range of characteristics.—The texture of the surface horizon is generally gravelly fine sandy loam but may range from gravelly loam to gravelly sandy loam. The texture of the B horizon ranges from sandy loam to loam and is generally gravelly. The texture of the C horizon is extremely variable; it ranges from stratified sand to stratified sand and gravel.

The color of the A horizon is typically some shade of dark brown and ranges from very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 3/4). The B horizon has a brighter color, ranging from dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/6). The C horizon has a wide range of colors because of the color of uncoated particles. The color of the C horizon ranges from black (5Y 2/1) to very dark grayish brown (2.5Y 3/2) or dark gray (5Y 4/1).

The depth to the contrasting substratum ranges from 16 to 26 inches but is commonly 20 inches. The content of coarse skeleton is as high as 50 percent in the solum and 75 to 80 percent in the substratum. The coarse skeleton consists of gravel and a few cobbles of dark-gray phyllite and other dark rock fragments. In the B and C horizons the content of dark, fine-grained sand, gravel, and channers is 25 to 75 percent.

The reaction ranges from medium acid to strongly acid.

WESTMINSTER SERIES

The Westminster series consists of well-drained to excessively drained, shallow Brown Podzolic soils. They developed in a thin mantle of glacial till derived from dark-gray mica schist and, in places, an admixture of siliceous limestone. They are generally hilly, but their slopes range from gentle to very steep.

The Westminster soils are near the Marlow, dark subsoil, Berkshire, dark subsoil, Colrain, and Shelburne soils, all of which are well drained. They are also near the moderately well drained Buckland and Peru soils, the poorly drained Ridgebury soils, the very poorly drained Whitman soils, and the poorly and very poorly drained Cabot soils.

The B horizon of the Westminster soils lacks the reddish color of the Lyman soils, which are Podzols; is finer textured than the Shapleigh soils, which are Brown Podzolic; is coarser textured than the Nassau soils, which are Lithosols intergrading to Sols Bruns Acides; and has duller and more uniform colors throughout than the Hollis soils, which are Brown Podzolic. In addition the Westminster soils contain more organic matter in their B horizon than all of these soils except the Lyman.

Profile of Westminster loam in woods east of Bray Road 2 miles southeast of Shelburne Falls—

O1—4 inches to 1 inch, litter of leaves, mainly sugar maple, white birch, red oak, and white oak.

O2—1 inch to 0, partly decomposed litter.

A1—0 to 4 inches, black (5YR 2/1) loam; moderate and strong, fine and medium, granular structure; very friable; many fine and medium tree roots; 5 to 10 percent coarse skeleton of 2-millimeter to 6-inch flat fragments and some gravel; very strongly acid; abrupt, wavy boundary. 2 to 5 inches thick. (Rock outcrops are about 20 feet apart.)

B21—4 to 10 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; massive; breaks to fine and medium granules; very friable; 5 to 10 percent coarse skeleton of 2-millimeter to 6-inch flat fragments and some gravel; very strongly acid; clear, smooth, boundary. 4 to 7 inches thick.

B22—10 to 18 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; massive; breaks to fine and medium granules; very friable; medium tree roots are common, and 2-inch mat of medium and coarse tree roots on rock below; 5 to 10 percent coarse skeleton of 2-millimeter to 6-inch flat fragments and some gravel; very strongly acid; abrupt, wavy boundary. 6 to 9 inches thick.

IIR—18 inches +, dark-gray schist bedrock with hard, smooth surface.

Range of characteristics.—The texture of the surface soil is generally loam but is fine sandy loam in some places.

The color is noticeably dull; it ranges from very dark gray (10YR 3/1) to dark brown (10YR 3/3) in the A horizon, to olive brown (2.5Y 4/4) in the B horizon. The B horizon generally has a hue of 10YR, a value of 3, and a chroma of 3 or 4.

The rock outcrops are 10 to 150 feet apart. The slopes are commonly 10 to 25 percent but range from 3 to 75 percent. The depth to bedrock is generally about 18

inches but ranges from the exposed bedrock to 2 feet or more.

The reaction is commonly very strongly acid to strongly acid. In places where the proportion of siliceous limestone is high, the reaction in the lower horizons is medium to slightly acid.

WHITMAN SERIES

The Whitman series consists of very poorly drained Humic Gley soils that formed in acid glacial till derived from granite, gneiss, and mica schist. They are in the bottoms of depressions in the uplands west of the Connecticut River.

These soils are near the well-drained Charlton, Berkshire, Marlow, and Cheshire soils, the moderately well drained Peru and Sutton soils, and the poorly drained Ridgebury soils.

Profile of Whitman fine sandy loam in a swampy depression about 1 mile west of East Hawley—

A1—0 to 6 inches, very dark brown (10YR 2/2) fine sandy loam, weak, fine, granular structure; very friable; very many roots; very strongly acid; abrupt, wavy boundary. 6 to 9 inches thick.

A2g—6 to 15 inches, gray (N 5/0) gravelly very fine sandy loam with light olive-brown (2.5Y 5/4) root stains; massive in places; breaks to weak, fine and medium, subangular blocky clods; firm in place, friable when removed; many roots; about 40 percent coarse skeleton consisting mainly of gneiss, granite, and quartzite pebbles, 2 to 3 inches in diameter, and a few small schist fragments and flagstones; very strongly acid; clear, wavy boundary. 7 to 9 inches thick.

Bg—15 to 19 inches, dark-gray (N 4/0) gravelly fine sandy loam, with common, medium, prominent mottles of light olive brown (2.5Y 5/4) and yellowish red (5YR 4/8); massive; breaks to weak, fine and medium, subangular blocky clods; firm in place, friable when removed; roots are common; about 40 percent coarse skeleton like that in the A2g horizon but lacking the flagstones; very strongly acid; abrupt, wavy boundary. 4 to 7 inches thick.

C—19 to 36 inches +, olive (5Y 4/3) gravelly sandy loam with few to common, fine, distinct mottles of gray (N 5/0) and dark yellowish brown (10YR 4/4); massive; breaks to weak, fine and medium, subangular blocky clods; firm in place, friable when removed; few roots in upper 6 to 8 inches; about 40 percent coarse skeleton consisting of gravel mostly less than ¾ inch in diameter and a few pebbles as large as 2 inches; strongly acid. Ground water at 22 inches.

Range of characteristics.—The texture of the A1 horizon is generally fine sandy loam but ranges from silt loam to fine sandy loam. In places the soil has a mucky or peaty surface layer. The texture below the surface horizon, to a depth of about 20 inches, is generally fine sandy loam but ranges from very fine sandy loam to sandy loam. Below 20 inches the texture is generally sandy loam but ranges from fine sandy loam to light sandy loam.

The coarse skeleton is extremely variable but generally ranges from 20 to 50 percent.

The color of the surface horizon is black (10YR 2/1) to very dark brown (10YR 2/2). The color of the A2g horizon is generally gray (N 5/0) but ranges from dark gray (N 4/0 or 10YR 4/1) to gray (N 6/0 or 10YR 6/1). The A2 horizon has few to common, fine to medium mottles. The color of the Bg horizon generally is dark gray (N 4/0) but ranges from dark gray (N 4/0) or gray (N 6/0) to olive gray (5Y 5/2). This horizon generally has common to many prominent or distinct mottles, except where the base chroma is 2, in which case the mottles are none to common. The C horizon is commonly olive (5Y 4/3) but has a hue of 10YR, 2.5Y, or 5Y, a value of 3 to 6, and a chroma of 1 to 3.

The Whitman soils generally have a fine, granular structure in the surface horizon. Below the surface horizon these soils are generally massive (structureless) and are firm to very firm but range from friable to very firm.

WINDSOR SERIES

The Windsor series consists of excessively drained, coarse-textured Brown Podzolic soils that developed in deep, wind or water-sorted sand deposits. They are nearly level to steep. The Windsor soils are in the catena that includes the moderately well drained Deerfield, the poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils.

The Windsor soils have a coarser texture than the closely associated Agawam soils and are not underlain by stratified sand, gravel, and cobbles as the Hinckley soils are.

Profile of Windsor loamy fine sand in woods, formerly cultivated, about 2 miles north of the village of Montague—

O1—2 inches to 1 inch, loose litter of oak leaves and some pitch pine needles.

O2—1 inch to 0, partly decomposed litter.

Ap—0 to 4 inches, very dark brown (10YR 2/2) loamy fine sand; weak, medium, granular structure; very friable; many roots; very strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B—4 to 20 inches, yellowish-brown (10YR 5/6) loamy fine sand that fades with depth to light yellowish brown (10YR 6/4); weak, medium, granular structure; very friable; roots are common; very strongly acid; gradual, smooth boundary. 12 to 20 inches thick.

C—20 to 42 inches +, very pale brown (10YR 7/3) to pale-yellow (2.5Y 7/4) fine and medium sand; single grain; loose; few roots; very strongly acid.

Range of characteristics.—The texture of the surface layer is generally loamy fine sand, but the range is from loamy very fine sand to loamy sand. The texture of the B horizon is loamy fine sand but ranges to loamy sand and sand. The texture of the C horizon is sand. These soils are generally free of gravel in the solum, but may contain as much as 20 percent fine gravel. In places there are gravel strata at a depth of 4 or 5 feet. The thickness of the solum is generally about 2 feet.

The A horizon is dark brown (10YR 3/3) to very dark brown (10YR 2/2). The B horizon is generally yellowish brown (10YR 5/4 to 5/6) in the upper part and fades with depth to very pale brown (10YR 7/3 to 7/4) or light yellowish brown (2.5Y 6/4). The C horizon is still paler, the color ranging from very pale brown (10YR 7/3) to pale yellow (2.5Y 7/4).

The reaction is medium to very strongly acid.

WINOOSKI SERIES

The Winooski series consists of deep, moderately well drained Alluvial soils in medium-textured sediments derived mainly from schist, gneiss, granite, and phyllite. They are members of the catena that includes the well-drained Hadley, the poorly drained Limerick, and the very poorly drained Saco soils.

The Winooski soils have a finer texture than the Podunk soils, which are also Alluvial.

Profile of Winooski very fine sandy loam in a hayfield about 1½ miles northwest of the village of Montague—

Ap—0 to 11 inches, very dark brown (10YR 2/2) very fine sandy loam; weak, fine, granular structure; friable; neutral reaction; abrupt, smooth boundary. 10 to 12 inches thick.

C1—11 to 23 inches, brown to dark-brown (10YR 4/3) very fine sandy loam; massive; friable; slightly acid; clear, smooth boundary. 10 to 12 inches thick.

C2—23 to 30 inches, brown (10YR 5/3) very fine sandy loam with many, fine, distinct, dark reddish-brown (5YR 3/4) mottles; massive; very friable; slightly acid; clear, smooth boundary. 6 to 9 inches thick.

IIC3—30 to 42 inches +, pale-brown (10YR 6/3) very fine sand interbedded with olive-gray (5Y 4/2) silt that has many, fine, prominent, dark reddish-brown (5YR 3/4) mottles; single grain; very friable; slightly acid.

Range of characteristics.—The texture of the A and C horizons is generally very fine sandy loam, but the range includes silt loam. The texture of the IIC horizon is extremely variable; it ranges from silt loam to gravelly sand. The depth to this horizon is generally between 24 and 30 inches but is several feet in places.

The color of the A horizon is dull. Generally, it is a very dark brown (10 YR 2/2), ranging to very dark grayish brown (2.5Y 3/2). The C and IIC horizons are commonly a shade of brown (10YR 4/4 to 10YR 6/3) that ranges to olive (5Y 4/3) or olive gray (5Y 4/2). Both the C2 and IIC horizons are distinctly to prominently mottled with dark reddish brown.

Laboratory Data for Selected Soils

Physical and chemical properties of five selected soil profiles are discussed in this subsection. The laboratory data for these soils are in tables 11 and 12. These data are helpful in characterizing and classifying the soils and in understanding their genesis. The information is also useful in making interpretations for use and management.

The soils from which the samples were collected are considered to be representative or nearly representative of their respective series. The laboratory analyses were made at the soil survey laboratories of the Soil Conservation Service at Beltsville, Md., and Lincoln, Nebr.

Particle-size distribution and other data for the five selected soils are shown in table 11. Particle-size distribution was determined by the pipette method (*8, 9*).

Moisture-retention values were determined by the use of a pressure plate and pressure membrane apparatus on fragmented samples (*17*). For the Westminster soil,

TABLE 11.—*Particle size distribution*

[Dashes in columns indicate sample

Soil type and sample number	Horizon	Depth	Particle-size distribution			
			Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*
Gloucester sandy loam; S56 Mass-6-6-(1-6).	AP	0–6	5.8	13.2	12.6	23.7
	B21	6–11	7.2	14.4	13.2	24.2
	B22	11–17	6.6	15.3	14.3	27.0
	B23	17–31	6.9	16.0	15.0	26.3
	C1	31–35	6.0	12.1	12.3	25.0
	C2	35–42	.5	3.2	7.6	32.5
Gloucester sandy loam; S56 Mass-6-7-(1-6).	A1	0–4	5.8	14.8	11.6	20.1
	B21	4–15	8.4	15.0	11.2	17.7
	B22	15–23	11.4	22.9	15.4	22.8
	B23	23–33	12.3	22.2	14.8	22.3
	C1	33–45	12.9	20.6	14.5	26.0
	C2	45+	5.4	15.3	20.3	36.0
Marlow loam, dark subsoil; S56 Mass-6-4-(1-5).	Ap	0–9	4.6	5.2	5.8	16.8
	B21	9–13	2.4	4.7	5.2	15.4
	B22	13–21	3.3	6.2	6.3	18.0
	B23	21–32	3.3	7.4	8.4	21.2
	Cx	32–38	3.6	7.6	8.7	21.5
Sudbury fine sandy loam; S58 Mass-6-1-(1-6).	Ap	0–10	2.2	8.3	8.7	43.3
	B21	10–17	1.0	4.2	5.7	54.8
	B22	17–23	.5	2.0	3.5	74.2
	IIC1	23–28	15.0	30.3	25.4	21.8
	IIC2	28–34	7.5	37.3	23.4	26.8
	IIIC3	34–52+	3.9	48.5	24.1	19.3
Westminster extremely rocky loam; S62 Mass-6-1-(1-3).	A1	0–4	5.5	7.7	6.2	14.8
	B21	4–10	7.4	7.8	6.2	13.6
	B22	10–18	10.3	10.0	6.8	14.6
	IIR	18+	----------	----------	----------	----------

moisture determinations at 15 atmospheres pressure were made by using the pressure membrane apparatus of Richards (*17*) on fragmented samples. In addition to the moisture-retention values obtained by using fragmented samples, the moisture retained at one-tenth atmosphere of pressure was determined on core samples of Sudbury soil.

Bulk densities for all but the Westminster soil were calculated from oven-dried, known-volume core samples. Bulk densities for the Westminster soil were determined by the plastic-coated clod method. Volumes were determined by water displacement. In addition, bulk densities for the Westminster soil were determined on clods that had been equilibrated at one-third atmosphere. The coarse fraction was removed from the clods after the water percentages and bulk densities had been determined, and the results calculated to represent the fine-earth fraction.

Chemical data for the five soils are shown in table 12. The reaction (pH) was determined with a glass electrode and a 1 : 1 soil-water ratio (*11*, *17*). Organic carbon was determined by a modified Walkley-Black wet combustion method (*11*); nitrogen, by a semi-micro Kjeldahl method (*11*). The cation-exchange capacity and extractable cations were determined by a method developed by Peech, Alexander, and others (*11*) except that sodium and potassium were determined by flame spectrophotometry.

Free iron oxide in the Sudbury soil was determined by a method developed by Kilmer but unpublished. Free iron oxide in the rest of the soils was determined by using a modification of Deb's method (*3*). Free iron oxide in the Westminster soil was determined by using this same method, but it is reported as "extractable iron"; that is, as percent Fe (elemental iron).

The Sudbury soil has a particle-size distribution typical of glacial outwash material. The particle-size distribution varies between horizons of the solum, probably because of the stratification of the parent material. The IIIC horizon has a marked textural difference from the overlying solum. The main features of profile development in this Brown Podzolic soil are the distribution of organic carbon in the profile and the color of the B2 horizon. An additional feature is the development of mottles in the lower part of the B2 horizon.

The Gloucester soils are well-drained Brown Podzolic soils that were derived from coarse-textured granite till. The particle-size distribution in the profiles of these soils indicates a prominent lithologic break at 15 inches in one

and moisture data for selected soils

not taken or test not run]

Particle-size distribution				Moisture held at tension of—		Bulk density (core (sample)	Bulk density (oven dried)	⅓ atmos. bulk density
Very fine sand (0.10–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)	Coarse fragments (larger than 2 mm.)	15 atmos. (fragmented samples)	1/10 atmos. (core sample)			
Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*gm./cc.*	*gm./cc.*	*gm./cc. of material less than 2 mm.*
15.8	24.0	4.9	22	----------	----------	1.11	----------	----------
16.3	21.4	3.3	25	----------	----------	1.54	----------	----------
17.2	18.5	1.1	28	----------	----------	1.60	----------	----------
16.0	19.1	.7	24	----------	----------	----------	----------	----------
19.2	23.9	1.5	28	----------	----------	----------	----------	----------
30.9	23.6	1.7	2	----------	----------	----------	----------	----------
13.0	20.0	14.7	45	----------	----------	.89	----------	----------
11.4	29.1	7.2	19	----------	----------	1.17	----------	----------
11.2	13.7	2.6	67	----------	----------	1.47	----------	----------
13.1	13.2	2.1	54	----------	----------	1.58	----------	----------
12.4	12.2	1.4	19	----------	----------	1.52	----------	----------
14.8	7.5	.7	31	----------	----------	1.60	----------	----------
17.4	38.1	12.1	14	----------	----------	.97	----------	----------
18.2	43.2	10.9	11	----------	----------	1.04	----------	----------
18.7	36.3	11.2	9	----------	----------	1.35	----------	----------
18.4	30.9	10.4	12	----------	----------	1.74	----------	----------
18.2	29.3	11.1	12	----------	----------	1.08	----------	----------
13.0	20.5	4.0	3	4.1	27.88	1.12	----------	----------
14.2	16.7	3.4	5	2.3	15.20	1.43	----------	----------
12.3	6.7	.8	2	1.0	7.16	1.30	----------	----------
3.4	3.7	.4	54	.8	----------	----------	----------	----------
2.1	2.5	.4	14	.5	----------	----------	----------	----------
1.7	2.3	.2	2	.4	3.16	1.37	----------	----------
15.9	38.0	11.9	6	16.1	----------	----------	.99	.84
16.6	37.5	10.9	15	9.6	----------	----------	1.02	.94
15.6	33.6	9.1	4	7.1	----------	----------	1.22	1.16
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TABLE 12.—*Chemical properties of selected soils*

[Dashes in columns indicate sample not taken or material not present]

Soil type and sample number	Horizon	Depth	Reaction (1:1)	Organic matter: Organic carbon	Organic matter: Nitrogen	Organic matter: Carbon-nitrogen (C/N ratio)	Free iron Fe_2O_3	Cation exchange capacity (sum)	Extractable cations (milliequivalents per 100 grams of soil): Calcium	Magnesium	Sodium	Potassium	Hydrogen	Base saturation (sum)
		Inches	*pH*	*Percent*	*Percent*		*Percent*	*Meq./100 gm.*						*Percent*
Gloucester sandy loam; S56 Mass-6-6-(1-6).	Ap	0-6	4.5	1.35	0.089	15	0.6	11.7	0.4	<0.1	<0.1	0.1	11.1	5
	B21	6-11	4.8	.51	.035	14	.6	6.5	.5	<.1	<.1	.1	5.9	9
	B22	11-17	4.3	.21	------	--------	<.1	4.0	.4	<.1	<.1	<.1	3.6	10
	B23	17-31	4.4	.03	------	--------	.2	2.1	.2	<.1	.1	<.1	1.8	14
	C1	31-35	4.1	.06	------	--------	<.1	2.7	.2	<.1	<.1	.1	2.4	11
	C2	35-42	4.1	------	------	--------	1.3	2.1	.1	<.1	<.1	<.1	1.8	14
Gloucester sandy loam; S56 Mass-6-7-(1-6).	A1	0-4	4.0	2.74	.145	19	1.7	20.0	.3	.3	<.1	.2	19.2	4
	B21	4-15	4.0	.72	.047	15	2.7	8.9	.1	.1	<.1	.2	8.5	4
	B22	15-23	5.0	.29	------	--------	3.4	5.6	.1	.4	<.1	.1	5.0	11
	B23	23-33	5.0	.10	------	--------	2.4	3.9	.1	.1	<.1	<.1	3.6	8
	C1	33-45	4.9	.04	------	--------	2.3	2.6	.1	.1	<.1	<.1	2.4	38
	C2	45+	5.1	.04	------	--------	1.4	1.3	.1	.2	<.1	<.1	1.0	23
Marlow loam, dark subsoil; S56 Mass-6-4-(1-5).	Ap	0-9	5.1	4.16	.252	16	1.1	26.9	.8	.9	.1	.4	24.6	8
	B21	9-13	5.1	2.42	.153	16	2.4	23.4	.7	.4	<.1	.2	22.0	6
	B22	13-21	5.2	.60	.047	13	2.9	10.8	.1	.1	<.1	.1	10.5	3
	B23	21-32	5.0	.15	------	--------	1.9	6.7	.1	.1	<.1	.1	6.4	4
	Cx	32-38	4.8	.06	------	--------	1.3	5.6	.2	.1	<.1	.1	5.2	7
Sudbury fine sandy loam; S58 Mass-6-1-(1-6).	Ap	0-10	4.5	1.82	.111	16.4	1.6	7.7	.1	.3	<.1	.2	11.9	5
	B21	10-17	4.8	.30	.023	13	1.4	2.1	.1	.5	<.1	.1	3.5	17
	B22	17-23	5.1	.13	.012	11	.7	1.2	<.1	.3	<.1	<.1	2.0	13
	IIC1	23-28	5.6	.12	.011	11	.9	1.1	.1	.3	<.1	.1	1.9	21
	IIC2	28-34	5.6	.07	------	--------	.5	1.0	<.1	.2	<.1	.1	1.2	20
	IIIC3	34-52+	5.5	.04	------	--------	.5	.6	<.1	.3	<.1	<.1	.6	40
Westminster extremely rocky loam; S62 Mass-6-1-(1-3).	A1	0-4	5.0	6.54	.395	16	[1] 2.0	29.7	3.8	.6	<.1	.4	24.9	16
	B21	4-10	4.7	3.14	.199	16	[1] 2.2	21.6	1.0	.3	<.1	.1	20.2	6
	B22	10-18	------	1.64	.124	13	[1] 2.4	17.8	.5	.1	<.1	.1	17.1	4
	IIR	18+	------	------	------	--------	------	------	------	------	------	------	------	------

[1] Extractable iron reported as percent Fe (elemental iron) rather than Fe_2O_3.

profile and a less prominent break in the other profile. The higher clay content of the A1, Ap, and B21 horizons is probably caused by an overlay of different material. The C horizon of both profiles has a particle-size distribution indicative of a higher degree of sorting than in the material of the solum. Field observations and the laboratory data indicate that the solum has developed in a sandy till, while the C horizon consists of outwash or deltaic deposits.

The Westminster soils are finer textured than the Gloucester soils. They are Brown Podzolic soils that have a particle-size distribution typical of glacial till, and the texture of the horizons ranges from loam to fine sandy loam. The C/N ratios, the content of extractable iron, the content of organic matter, and the presence of pellets and amorphous coatings are sufficient in the B horizon to qualify it as a Podzol B horizon. In addition to these primary characteristics, the Westminster soils have low bulk densities, low base saturation, high cation-exchange capacity in relation to the amount of clay present, and high retention of water for the textural class, all of which are accessory characteristics of a Podzol B horizon. The hue of the Podzol B horizon is not as red as that of many such horizons. The normally reddish colors are probably masked to some extent by the type of organic matter and by the presence of dark minerals that are revealed by an examination of the soil material with a microscope.

The Marlow soils also have a well-developed Podzol B horizon. They are Podzols that have textures comparable to those of the Westminster soils but have a thicker solum and also a fragipan. The Marlow soils have the same primary and accessory characteristics in the Podzol B horizon as the Westminster soils, except that no determination was made regarding the presence or absence of pellets and amorphous coatings in the Marlow soils.

Following is a profile description of one of the soils sampled. In this profile description all colors are for moist soils. Descriptions of the other four profiles are given in the preceding subsection "Morphology of Soils."

Gloucester sandy loam S 56 Mass 6-6-(1-6).—A profile in a forested area on a slope of about 10 percent about 1 mile southeast of the village of Locks on the South side of Locks Pond Road in the town of Shutesbury.

Ap—0 to 6 inches, dark-brown (10YR 4/2-4/3) sandy loam; very weak, fine, granular structure; very friable; 10 to 15 percent coarse skeleton; clear, abrupt boundary.

B21—6 to 11 inches, yellowish-brown (10YR 5/4) loamy sand; very weak, fine, granular structure; 15 to 20 percent coarse skeleton; clear, gradual boundary.

B22—11 to 17 inches, pale-brown (10YR 6/3) to light yellowish-brown (10YR 6/4) loamy sand; single grain; loose; 15 to 20 percent coarse skeleton; smooth, gradual boundary.

B23—17 to 31 inches, light-gray (10YR 6/1) loamy coarse sand; single grain; loose; about 30 percent coarse skeleton.

C1—31 to 35 inches, light-gray (10YR 6/1) loamy sand; single grain; loose; about 30 percent coarse skeleton; root stains 3 to 4 inches wide and pale brown (10YR 6/3) to light yellowish brown (10YR 6/4).

C2—35 to 42 inches, gray (10YR 6/1 and 10YR 5/1) loamy fine sand; single grain; loose; very low percentage of coarse skeleton.

The textures of the B21, B22, B23, C1, and C2 horizons were estimated in the field and adjusted to coincide with the textures determined in the laboratory.

Additional Facts About the County

This section contains information about the early settlement of Franklin County, the water supply, industries, transportation, climate, and agriculture.

Settlement and Development

The area that is now Franklin County was explored by settlers from the Massachusetts Bay Colony as early as 1633, but the first permanent settlement, which was at Deerfield, was not established until 1671. In 1811 Franklin County was created from a part of Hampshire County.

Water Supply

Franklin County is entirely within the watershed of the Connecticut River. Its two main tributaries, the Millers River and the Deerfield River, drain the east and west halves of the county. The Swift River in New Salem and the Mill River in Whately flow southward out of the county before they join the Connecticut. The Swift River feeds Quabbin Reservoir, which supplies water to metropolitan Boston.

During the 1800's, nearly every stream was used intensively to furnish the power for gristmills, sawmills, and many small, family-operated industries that turned out such diverse products as grindstones, whetstones, brooms, and barrel spigots. This source of power is now rarely used except to generate electricity at hydroelectric plants on the major rivers.

Increasing industrial requirements, an expanding population, new home appliances, and increasing irrigation requirements are taxing the capacity of the present water supply.

The major streams are polluted with industrial wastes and untreated sewage from overloaded municipal treatment plants and inadequate home disposal units. Consequently, the reclamation of water for domestic use generally is not feasible.

Industries and Transportation

Franklin County is primarily agricultural, but it supports about a hundred industries. These are located in the population centers on the major streams. Major products of these industries are lumber and wood products, electric power, paper, taps and dies, hand tools, textile machinery, cutlery, precision tools, and sterling silverware.

The county has good transportation facilities. Major highways cross the county, and a network of paved local roads connect these with most parts of the county. A few places have dirt roads, which are maintained locally and are passable most of the time. The county is served by two railroads, the Boston and Maine and the Central Vermont, but service on these lines has declined for several years and most materials are transported by trucks.

Climate [5]

Warm summers, moderately severe winters, and ample rainfall characterize the climate of Franklin County. The Atlantic Ocean, 80 to 100 miles to the east and south, occasionally affects the weather, but the prevailing winds are from the southwest in summer and from the northwest in winter. The climate, therefore, is influenced more by air moving over the continent than by air moving in from the ocean. As is typical of a dominantly continental climate, temperature ranges widely from winter to summer and from day to night. Day-to-day variation in temperature is common because the county is near the paths of weather systems that alternately bring in warm air from the south and cool air from the north. Further variation results from the topography of the county. Both temperature and precipitation differ somewhat between the Connecticut River valley and the higher areas east and west of the valley.

Variations in temperature and rainfall from one part of the county to another are reflected in the types of agriculture. Dairying is important throughout the county, especially in the western highlands and on the eastern plateau, where the growing season is short and cool, rainfall is abundant, and grasses and forage crops grow better than other crops. In the foothills east of the highlands, the growing season is somewhat longer and a combination of dairying and apple growing is common. Hot-weather crops thrive in the Connecticut River valley where the growing season is longest and temperatures are highest. Tobacco and other high-value specialty crops are grown in this valley area, but dairying is also important.

Three weather stations are in Franklin County. These are at Turners Falls, Shelburne Falls, and Heath. Weather data recorded at Turners Falls are typical of the Connecticut River valley. Those recorded at Shelburne Falls are typical of the foothills west of the Connecticut Valley, the plateau east of the Connecticut Valley, and the valleys in the western highlands. Precipitation data only are recorded at Heath and are typical of the western highlands. Temperature data for the western highlands are not available.

Tables 13 and 14 contain data on temperature and precipitation at Turners Falls and Shelburne Falls. These tables do not give the extreme high and low temperatures that have been recorded, but rather the probability of occurrence of specified temperatures. For purposes of planning, these probabilities may be more useful than the recorded extremes. In general, however, monthly extremes averaged over many years would differ only slightly

[5] By Robert E. Lautzenheizer, State climatologist, U.S. Weather Bureau, Boston, Mass.

TABLE 13.—*Temperature and precipitation at Turners Falls* [1]

[Elevation, 190 feet]

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 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 of 1 inch or more	Snow cover 1 inch deep or more [1]	Precipitation of 0.10 inch or more
	°F.	°F.	°F.	°F.	°F.	In.	In.	In.	In.	Days	Days	Days
January	34.5	15.0	24.8	48	−7	3.6	1.8	5.5	16.4	5	24	7
February	36.5	15.5	26.0	50	−6	2.8	1.7	3.9	14.5	4	24	6
March	45.3	24.4	34.9	62	8	3.7	1.8	6.5	9.7	3	16	7
April	59.2	35.0	47.1	77	24	3.7	2.2	5.2	1.4	(2)	2	8
May	72.6	45.1	58.9	87	33	4.0	1.5	6.5	.1	(2)	(2)	8
June	80.8	54.6	67.7	94	43	3.7	1.5	6.7	0	0	0	7
July	85.3	59.2	72.3	94	48	4.0	2.2	6.4	0	0	0	7
August	83.2	57.4	70.3	95	44	3.6	1.4	7.1	0	0	0	6
September	75.2	50.0	62.6	88	35	4.0	1.4	6.6	0	0	0	6
October	64.4	39.7	52.1	80	27	3.1	1.2	5.2	(3)	0	0	5
November	50.3	30.4	40.4	65	18	4.0	1.0	6.5	2.4	1	2	7
December	37.2	18.9	28.1	54	−2	3.4	1.3	5.6	9.1	3	13	7
Year	60.4	37.1	48.8	[4] 95	[5] −8	43.6	35.1	52.9	53.6	16	81	81

[1] From record at Vernon, Vt.
[2] Less than 0.5 day.
[3] Trace.
[4] Average annual highest maximum.
[5] Average annual lowest minimum.

TABLE 14.—*Temperature and precipitation at Shelburne Falls*

[Elevation, 400 feet]

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 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 of 1 inch or more	Snow cover 1 inch deep or more	Precipitation of 0.10 inch or more
	°F.	°F.	°F.	°F.	°F.	In.	In.	In.	In.	Days	Days	Days
January	32.6	13.1	22.9	46	−5	3.8	1.9	5.8	17.8	5	22	8
February	33.9	12.9	23.4	48	−7	3.2	2.0	4.5	17.8	4	26	6
March	42.3	22.5	32.4	58	7	4.1	1.7	7.0	12.5	4	20	8
April	55.7	33.3	44.5	75	24	4.2	2.2	6.5	2.0	1	2	8
May	68.4	43.2	55.8	85	33	4.1	1.3	7.8	(1)	0	0	8
June	77.5	52.7	65.1	90	42	3.8	1.6	6.0	0	0	0	7
July	82.2	57.6	69.9	92	48	4.0	2.2	6.5	0	0	0	8
August	80.2	55.6	67.9	92	45	3.5	1.4	6.2	0	0	0	7
September	72.3	48.0	60.2	86	34	4.2	1.4	8.0	0	0	0	6
October	62.0	37.4	49.7	77	25	3.7	1.7	7.4	(1)	0	0	6
November	48.0	28.7	38.4	65	15	4.5	1.4	7.2	3.0	1	2	7
December	35.1	17.0	26.1	50	−6	3.9	1.3	6.0	10.2	3	14	7
Year	57.5	35.2	46.4	[2] 95	[3] −17	47.0	37.4	56.9	63.2	18	86	86

[1] Trace.
[2] Average annual highest maximum.
[3] Average annual lowest minimum.

from the values shown in the tables for the high and low temperatures that are likely to occur on 4 days in the month in 2 years out of 10. That is, the values in the tables are also useful as estimates of the single high or low value for any month.

Table 15 contains precipitation data for Heath; table 16 contains data on the frequency of specified temperature levels and accumulated heat units (degree-days) at Shelburne Falls and Turners Falls; and table 17 contains data on the growing season at these two stations.

TABLE 15.—*Precipitation at Heath*

[Elevation, 1,450 feet]

Month	Precipitation (inches)					
	Average total	One year in 10 will have—		Average snowfall	Days with—	
		Less than—	More than—		Snowfall of 1 inch or more	Precipitation of 0.10 inch or more
	In.	*In.*	*In.*	*In.*	*Days*	*Days*
January	4.0	2.4	6.5	18.9	6	8
February	3.3	2.2	4.8	19.5	6	7
March	4.3	2.2	7.1	16.5	5	8
April	4.2	2.2	5.8	6.8	2	8
May	4.7	1.8	7.6	.3	0	9
June	4.1	1.8	7.1	0	0	8
July	4.3	2.3	7.3	0	0	9
August	4.0	1.7	6.7	0	0	7
September	4.7	1.2	9.4	0	0	7
October	4.0	1.6	6.7	.2	(1)	6
November	4.4	1.3	6.4	5.4	2	8
December	4.0	1.5	6.3	12.7	4	7
Year	50.0	41.2	59.4	80.3	25	92

[1] Trace.

TABLE 16.—*Frequencies of selected temperature levels and mean heating and growing degree-days*

Month	Shelburne Falls (elevation, 400 ft.)							Turners Falls (elevation, 190 ft.)						
	Mean number of days with—				Accumulated heat units (degree-days) by months			Mean number of days with—				Accumulated heat units (degree-days) by months		
	Maximum temperature of—		Minimum temperature of—		Heating	Growing		Maximum temperature of—		Minimum temperature of—		Heating	Growing	
	90° F. or higher	32° F. or lower	32° F. or higher	0 or lower	Base 65° F.	Base 40° F.	Base 50° F.	90° F. or higher	32° F. or lower	32° F. or lower	0 or lower	Base 65° F.	Base 40° F.	Base 50° F.
	Days	*Days*	*Days*	*Days*	*Degree-days*	*Degree-days*	*Degree-days*	*Days*	*Days*	*Days*	*Days*	*Degree-days*	*Degree-days*	*Degree-days*
January	0	15	30	5	1,300	0	0	0	13	30	4	1,240	0	0
February	0	12	28	5	1,160	0	0	0	8	27	4	1,110	0	0
March	0	5	28	1	1,005	60	0	0	2	25	1	925	90	0
April	(1)	(1)	14	0	610	180	40	(1)	0	11	0	530	250	70
May	(1)	0	2	0	290	495	210	1	0	2	0	200	590	285
June	2	0	0	0	65	760	460	4	0	(1)	0	40	840	540
July	4	0	0	0	10	930	620	7	0	0	0	0	1,010	700
August	3	0	0	0	40	870	560	5	0	0	0	25	945	635
September	1	0	1	0	170	610	310	1	0	1	0	120	685	385
October	(1)	0	10	0	480	315	60	0	0	7	0	395	380	130
November	0	1	21	(1)	805	70	0	0	1	18	(1)	735	100	5
December	0	12	29	3	1,210	0	0	0	9	28	2	1,140	10	0
Year	10	45	163	14	7,145	4,290	2,260	18	33	149	11	6,460	4,900	2,750

[1] Less than 0.5 day.

TABLE 17.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Shelburne Falls					Turners Falls				
	Dates for given probability and temperature level					Dates for given probability and temperature level				
	32° F. or lower	28° F. or lower	24° F. or lower	20° F. or lower	16° F. or lower	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	Apr. 26	Apr. 15	Apr. 4	May 20	May 9	Apr. 22	Apr. 9	Mar. 27
2 years in 10, later than	May 19	May 4	Apr. 20	Apr. 9	Mar. 30	May 15	May 3	Apr. 17	Apr. 4	Mar. 23
5 years in 10, later than	May 12	Apr. 24	Apr. 9	Mar. 28	Mar. 19	May 5	Apr. 22	Apr. 4	Mar. 25	Mar. 16
8 years in 10, later than	May 4	Apr. 14	Mar. 29	Mar. 16	Mar. 10	Apr. 25	Apr. 11	Mar. 26	Mar. 15	Mar. 8
Fall:										
1 year in 10, earlier than	Sept. 22	Oct. 3	Oct. 15	Nov. 1	Nov. 9	Sept. 22	Oct. 1	Oct. 16	Oct. 26	Nov. 12
2 years in 10, earlier than	Sept. 25	Oct. 8	Oct. 20	Nov. 6	Nov. 14	Sept. 27	Oct. 7	Oct. 22	Nov. 1	Nov. 18
5 years in 10, earlier than	Oct. 1	Oct. 16	Oct. 30	Nov. 14	Nov. 23	Oct. 6	Oct. 20	Nov. 3	Nov. 13	Nov. 28
8 years in 10, earlier than	Oct. 7	Oct. 25	Nov. 9	Nov. 23	Dec. 2	Oct. 15	Nov. 1	Nov. 14	Nov. 24	Dec. 9

Temperature

For at least 5 months of the year, the mean monthly temperature in the county is 50° F. or higher. Almost everywhere in the county, the mean temperature in January, the coldest month, is below 25°. In the Connecticut River valley, the mean temperature in July is 72° or higher, and in an average summer the temperature reaches 90° or more on as many as 15 to 20 days. In the higher areas east and west of the Connecticut Valley, a temperature of 90° is likely on only 5 to 10 days in a summer, and nights are nearly always cool.

Table 16 shows the average frequency of specified temperatures, by months, for Shelburne Falls and Turners Falls. Also given are heating degree-days and growing degree-days. Degree-days are computed by recording significant mean departures from a selected temperature for each day and summarizing these departures for the month and for the year. The temperature selected as a base and the departures to be recorded depend on the purpose of the computation. A base of 65° is selected for computing heating degree-days, as this is the lowest mean daily temperature at which no heat is required for homes. To get the departure for 1 day, the actual mean temperature for the day, if less than 65°, is subtracted from 65°. For example, a day with a mean temperature of 55° has a value of 10 heating degree-days. In contrast, a day with a mean temperature of 65° or more 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 frequently used by gas, electric, and fuel companies in estimating fuel and power requirements.

Data on growing degree-days are useful in planning for the planting and harvesting of crops. Growing degree-days accumulate when the mean temperature is higher than the minimum mean temperature at which plants continue to grow and develop. They are calculated by subtracting this base temperature from the actual mean temperature for the day. The figures in table 16 are calculated from two standard bases: 40° for cool-weather crops, such as peas and grasses; and 50° for warm-weather crops, such as corn and tobacco. Thus, a day on which the mean temperature is 60° accounts for 20 growing degree-days for cool-weather crops and 10 growing degree-days for warm-weather crops.

A substantial number of growing degree-days in a given month, as shown in table 16, does not necessarily indicate that crops can be planted safely. There may still be a possibility of frost. Table 17 shows the probability of freezing temperatures after specified dates in spring and before specified dates in fall. At Shelburne Falls, for example, there is 1 chance in 10 that the temperature will drop to 32° or lower on or after May 23, and 8 chances in 10 that it will drop to 32° or lower on or after May 4. The chance of a freeze on or after May 12 is 50–50. A 32° freeze is seriously damaging to sensitive plants, though hardier ones may withstand even lower temperatures. Dates for several more severe freeze levels are also in table 16.

At Turners Falls the average length of the freeze-free season is 154 days; at Shelburne Falls, it is 142 days; and at higher locations, it may be considerably less. In some parts of the eastern plateau, the length of the growing season may be only 110 to 120 days; and in the western highlands, it may be only 100 days. In low pockets in the highlands, a freeze is possible even in midsummer.

Precipitation

About 44 inches of rain falls each year on the lowlands and on the eastern plateau, and about 50 inches falls on the western highlands, as shown in tables 13, 14, and 15. The rainfall is distributed remarkably well throughout the year. About 4 inches a month falls during the growing season, and only slightly less during the winter. Plenty of water is usually available for domestic and industrial needs, for the generation of electric power, and for the irrigation of crops during the short but fairly common dry spells.

Snowfall varies from year to year, and in any given year it varies from one part of the county to another. In the Connecticut River valley, the average is about 50 inches a year, but in some parts of the highlands, it is 80 inches.

Records of the weather station at Shelburne Falls show that 6 out of 31 years did not have a continuous snow cover

of 1 inch or more for as long as a month. In most years, however, the ground is covered with snow at least 1 inch deep from about the beginning of January until near the end of March. Sometimes snow is on the ground continuously from the end of November, and sometimes it remains until well into April.

In the 31-year period for which records have been kept at Shelburne Falls, the maximum depth of snow on the ground ranged from 9 to 42 inches and averaged 22 inches. The snow is generally deepest about the middle of February. In the highlands west of Shelburne Falls, the snow cover lasts longer and gets deeper. It reaches its greatest depth a little later in February.

From data recorded at Shelburne Falls, the probabilities of inches of snowfall in a day have been calculated as follows:

Amount	*Distribution*
2 inches or more	5 to 19 times per season; average, 12 times.
4 inches or more	1 to 10 times per season; average, 5 times.
8 inches or more	0 to 6 times per season; average, 3 times.
10 inches	1 time in most seasons; none in some seasons; more than 1 time in 1 season out of 4.

Tables 13, 14, and 15 summarize snowfall data recorded at Turners Falls, Shelburne Falls, and Heath.

Storms

Wind or heavy rains from hurricanes cause some damage in the county about once in 10 years. Tornadoes are more frequent, but most of these affect only a small area, and few cause personal injuries or significant property damage.

Thunderstorms can be expected on from 15 to 25 days each year. They are most frequent in June and July but may occur in any month. The heavy rains that accompany thunderstorms cause soil erosion, injure plants, and probably do more damage than lightning. Spring and summer thunderstorms are occasionally accompanied by hail. Hailstorms occur two or three times a year, but the hailstones are seldom large enough or numerous enough to cause extensive damage.

Agriculture in the County

The first part of this subsection was prepared by Dr. Martin Weeks, extension agronomist, University of Massachusetts. It is a discussion of the two main farming regions, the general practices, and some of the farming problems in Franklin County. The second part contains mostly statistics on the principal kinds of farming.

There are two rather distinct farming regions in Franklin County. One is the uplands, or hill region, and the other, the Connecticut Valley. The uplands are divided into the eastern and western sections. Agriculture is less intensive in the uplands, as most of the soils are suited to forestry. Even the open agricultural soils are rather steep and stony, and many are shallow and quite droughty. Also, some of the deeper soils have a compact substratum that restricts internal drainage. Most of the hill areas are used for forestry, and the more favorable areas, for dairy farming, raising poultry, and growing fruit. Maple syrup and many wood products are sold, and the sale of fruit brings a good income to a few farmers. Some 28,000 apple trees provide an income of about $400,000. Blueberries, raspberries, and strawberries are grown on a limited acreage.

In the Connecticut Valley dairying and poultry farming are increasing, whereas the tobacco, onions, and other special crops are decreasing. Both of these crops are grown intensively and require a ton or more of commercial fertilizer per acre annually.

Growing potatoes for early table use is becoming popular among farmers, and they are encouraging agronomists and breeders to develop improved varieties that would be suitable for potato chips. The problems of potato growers include overcoming the effects of strongly acid soils without aggravating the problem of scab, and at the same time correcting toxic conditions and deficiencies caused by soils that have a pH value well below 5.0.

Dairying, poultry raising, and some general livestock farming are carried on in all parts of the county. Forage and feed are grown on most of the cropland and on a variety of soil types. Hay and pasture crops are grown in fairly long rotations. Improved pastures consist of the higher yielding mixed legumes and grasses. Low fertility, weeds, and late harvests are the greatest limitations to efficient production. Even on improved meadows, yields are only slightly more than 2 tons per acre. The average application of nitrogen ranges from 50 to 75 pounds per acre. Phosphate and potash are applied in about equal amounts. Experiments at Amherst indicate that, if the hay is cut early and split applications of nitrogen are used, an additional 50 to 75 pounds of nitrogen may increase yields of better grasses by ½ to 1 ton per acre. Thus, there is ample opportunity to improve the yield and quality of hay and pasture.

Alfalfa is the highest yielding and best liked legume for hay mixtures in the county, though most stands do not last more than 3 to 5 years. Stands are lost for a number of reasons, but frequently because of smothering under ice sheets that form over the land in the winter and last for several weeks. Sometimes spreading manure over the ice prevents it from melting and thereby smothers the alfalfa.

Corn is the highest yielding and most dependable forage crop for dairy farming. If properly managed, it grows well on most cultivated soils in the county. Even on the more droughty Hinckley and Windsor soils and on some of the less well drained soils, corn produces more dependably than other crops. Yields of corn silage have been 12 to 14 tons, and yields of grain 65 to 70 bushels per acre, if mixed fertilizer has been applied at the rate of 400 to 600 pounds. The fertilizer formula ranges from 8-16-16 to 15-10-10, depending on the soil and the farmer's judgment. By increasing this rate or by sidedressing with 60 to 80 pounds of nitrogen, in addition to the farm manure usually used, the yield could readily be increased to 20 or more tons of silage and more than 100 bushels of grain per acre. In addition to inadequate fertilizing, yields of corn are often limited by late planting, which results in immature crops that contain much moisture.

Most farmers are planting some acreage to corn continuously or in short rotations. They are also planting corn profitably as a cleanup crop to help destroy weeds and old sod that compete with new seedlings.

The level of farm management is high in the county. Farmers readily try out and accept new practices. Their problems of management are largely associated with high costs, especially of capable and responsible labor.

Principal kinds of farming

The bottom lands of the Connecticut Valley were the first areas of the county to be used for agriculture. As settlements in these areas grew, agriculture spread to all parts of the county until, in 1880, about 80 percent of the land was in farms and about 65 percent of this was improved land. Since then farming has declined steadily. At present about 76 percent of the land is forested and only about 33 percent is in farms. Some farms include forested areas.

The principal kinds of farming are dairying and tobacco and field crop production. Apple orchards are numerous in the towns of Colrain, Shelburne, Buckland, and Ashfield.

According to the 1959 Census of Agriculture, the acreage and yield of the main crops and the number of apple and peach trees of bearing age are as follows:

	1954	1959
	Acres	*Acres*
Corn:		
For all purposes	3, 771	3, 624
Cut for silage	3, 088	3, 097
Hay crops, total	27, 808	24, 844
Alfalfa and alfalfa mixtures	3, 019	1, 691
Clover, timothy, and mixtures of clover and grasses	19, 038	16, 670
Other hay, including small grains cut for hay	4, 489	5, 496
Silage made from grasses, alfalfa, clover, or small grains	1, 262	987
Irish potatoes harvested for home use or for sale	1, 406	1, 700
Tobacco, total	1, 659	488
Binder	1, 659	438
Wrapper	------	50
Vegetables for sale, excluding potatoes	1, 027	760
	Number	*Number*
Apple trees	34, 514	27, 857
Peach trees	3, 685	2, 820

The production of tobacco and other field crops is concentrated in the Connecticut Valley. Most of the dairy farms and orchards are in the western foothills, though some are scattered throughout the county. On many dairy farms, especially in the uplands of the county, maple products supplement the income.

Tobacco has been important in the economy of the county for a long time. The value of the crop, which is grown on less than 500 acres, nearly equals that of dairy products. Two types of tobacco are grown in the county. The Havana seed variety is the principal type, and it is used as binder in the manufacture of cigars. Because the industry has developed a process of homogenizing binder tobacco, much less binder tobacco is required, and the acreage decreased sharply from the year 1954 to 1959. Shade-grown tobacco is produced primarily by large commercial companies and is used for the outer layer, or wrapper, on cigars.

Potatoes are grown on about 1,700 acres. Most of this acreage is in the Connecticut Valley, but a small part is in the highland area of Hawley. Other major truck crops grown in the Connecticut Valley are sweet corn, cucumbers, asparagus, onions, squash, and tomatoes. Hay crops are grown on more acreage than any other crops in the county.

According to the U.S. Census of Agriculture, the numbers of livestock and poultry on farms in 1954 and 1959 are as follows:

	1954	1959
	Number	*Number*
Cattle and calves	23, 250	18, 997
Milk cows	12, 477	10, 809
Horses and mules	762	512
Sheep and lambs	837	1, 105
Hogs and pigs	1, 802	1, 921
Chickens	178, 546	158, 937

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Glossary

Bleicherde. The light-colored, leached A2 horizon of a Podzol.

Boulder. A rounded or partly rounded fragment of rock more than 10 inches in diameter.

Catena, soil. A group of soils within a specific soil zone, formed from similar parent materials, but differing in profile characteristics because of differences in relief or drainage.

Cobble, or cobblestone. A rounded or partly rounded fragment of rock 3 to 10 inches in diameter.

Consistence. The combination of properties of soil material that determines its resistance to crushing and its ability to be molded or changed in shape. The feel of the soil and the ease with which it can be crushed by the fingers. Consistence depends mainly on the forces of attraction between soil particles. Terms commonly used to describe consistence are as follows:

Loose.—Noncoherent.

Friable.—When moist, crushes easily under moderate pressure between thumb and forefinger and can be pressed into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Hard.—When dry, moderately resistant to pressure; barely breakable between thumb and forefinger.

Cemented.—Hard and brittle and little affected by moistening.

Plastic.—When wet, readily deformed by moderate pressure and 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 and pull apart rather than to pull free from other material.

Contour cultivation. Furrows plowed at right angles to the direction of slope or parallel with terrace grades, at the same level throughout, and ordinarily at comparatively close intervals.

Diversion terraces. An embankment or ridge with a shallow ditch on the upper side constructed nearly parallel to the slope to direct runoff to an outlet and thus protect areas downslope from erosion.

Drumlin. An oval hill of glacial drift, normally compact and unstratified, usually with its longer axis parallel to the movement of the ice responsible for its deposition.

Esker. A narrow ridge or mound of gravelly and sandy drift deposited by a subglacial stream.

Flood plain. The nearly level areas, consisting of stream sediments, that occur along streams and are subject to flooding.

Fragipan. (Referred to as a compact layer in some sections of the report.) A compact horizon, rich in silt, sand, or both, and generally low in clay. A fragipan occurs in many gently sloping or nearly level soils in a humid, warm-temperate climate. It commonly interferes with root penetration. When dry, the compact material appears to be indurated, but it breaks suddenly under pressure when the soil is moistened. A fragipan may occur in soils formed from residual or from transported material.

Glacial drift. The material picked up, mixed, disintegrated, transported, and deposited by glacial ice or by water melted from the glacial ice. In many places the glacial drift is covered by windblown sediments.

Glacial till. Material picked up, mixed, disintegrated, transported, and deposited by glacial ice.

Glaciofluvial deposits. The materials moved by glaciers and subsequently sorted and deposited by water that originated mainly from the melting of glacial ice.

Gleization. The process of soil formation leading to the development, under the influence of excessive moisture, of a gley horizon in the lower part of the solum or in the substratum. In a "gleyed" horizon the material ordinarily is bluish gray or olive gray, is sticky and compact, and, in many places, is structureless.

Gneiss. A crystalline rock in which the component minerals are arranged in parallel bands or layers. This rock tends to cleave into slabs.

Granite. A light-colored (acid) igneous rock that is coarse grained and composed mainly of quartz and feldspar but contains some other minerals.

Gravel. Rounded or partly rounded fragments of rock up to 3 inches in diameter. An individual piece of gravel is a pebble. The term "gravel" refers to a mass of pebbles.

Great soil group. Any one of several broad groups of soils that have fundamental characteristics in common. It includes one or more families of soils.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, with characteristics produced by soil-forming processes. Horizons are identified by letters of the alphabet and may be subdivided.

O Horizon.—The organic horizon of mineral soils. A horizon formed or forming in the upper part of mineral soils above the mineral part and dominated by fresh or partly decomposed organic material.

A Horizon.—(1) A mineral horizon of organic matter accumulation formed or forming at or adjacent to the surface; (2) a horizon that has lost clay, iron, or aluminum and, as a result, has a concentration of quartz or other resistant minerals of sand or silt size.

B Horizon.—A mineral horizon in which the dominant feature is an accumulation of silicate clay, iron, aluminum, or humus, alone or in combination. The accumulations give a conspicuously darker, stronger, or redder color than that of the overlying or underlying horizon.

C Horizon.—A mineral horizon, either like or unlike the material from which the solum is presumed to have formed, that is, relatively unaffected by soil-forming processes and that lacks properties diagnostic of A and B horizons.

R Horizon.—Underlying consolidated bedrock, such as granite or sandstone.

Lithologic discontinuity.—Changes in lithology from one of the master horizons. Such changes are identified by Roman numerals.

Gleyed horizon.—A strongly mottled horizon that occurs in wet soils and is designated by subscript g.

Internal soil drainage. The downward movement of water through soil.

Kame. A short irregular ridge, hill, or hillock of stratified glacial drift. Most kames are interspersed with depressions, called kettles, that have no surface drainage.

Liquid limit. The moisture content at which a soil passes from a plastic state to a liquid state.

Maximum dry density. The highest density to which a soil can be compacted by mechanical manipulation at a certain moisture content called the optimum moisture.

Modal profile. The profile of a taxonomic unit representing the most usual condition of each property designated for the unit.

Mottling, soil. Contrasting color patches that vary in number and size. Descriptive terms are as follows: Contrast—faint, distinct, and prominent; abundance—few, common, and many; and size—fine, medium, and coarse. The size measurements are the following: Fine, commonly less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, commonly ranging from 5 to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and coarse, commonly more than 15 millimeters in diameter along the greatest dimension.

Munsell color system. 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.

Permeability, soil. That quality of the soil that enables water or air to move through it.

Phase, soil. A subdivision of a soil type based on features that affect its management but do not affect its classification. Steepness or character of slope, number of rock outcrops, degree of erosion, depth of soil over the substratum, and natural drainage are features that are the basis for dividing a soil type into phases.

Plowsole. A compacted layer in the soil immediately below the plowed layer; formed by tillage. A plowpan.

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 or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated and partly weathered mineral material (residuum) that accumulates over disintegrating rock. Residual material is not soil but is frequently the material in which a soil has formed.

Runoff. The surface flow of water over an area. The amount and rapidity of runoff are affected by texture, structure, and porosity of the surface soil; by vegetation; by prevailing climate; and by slope. The degree of runoff is expressed by the terms, *very rapid, rapid, medium, slow, very slow,* and *ponded.*

Series, soil. A group of soils that, except for the texture of the surface soil, are similar in profile characteristics and in horizon arrangement. The soils of one series have developed from a particular type of parent material. A series includes two or more soil types, which differ primarily in texture of the surface soil.

Soil. The natural medium, composed of organic and mineral materials, for the growth of land plants on the surface of the earth.

Solum. The upper part of the soil profile above the parent material. The processes of soil formation take place in this part of the profile. The solum in a mature soil includes the A and B horizons.

Stone. A rock fragment greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat. Soils are stony if they contain stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of soil particles into lumps, granules, or other aggregates. Structure is described by grade (weak, moderate, or strong), that is, the distinctness and durabiltiy of the aggregates; by the size of the aggregates (very fine, fine, medium, coarse, or very coarse); and by their shape (platy, prismatic, columnar, blocky, granular, or crumb). A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

Angular blocky.—Aggregates are block-shaped; they may have flat or rounded surfaces that join at sharp angles.

Subangular blocky.—Aggregates have some rounded and some plane surfaces; vertices are rounded.

Granular.—Aggregates are roughly spherical, firm, and may be hard or soft but are generally firmer than crumb and without the distinct faces of blocky structure.

Platy.—Aggregates are generally horizontal.

Prismatic.—Aggregates have flat vertical surfaces; soil particles are arranged around a vertical line.

Subsoil. Technically, the B horizon; roughly, that part of the profile below plow depth.

Substratum. Material underlying the subsoil.

Terrace (geological). An old alluvial plain, generally flat or undulating, bordering a stream, a lake, or the sea; frequently called second bottom as contrasted to flood plain; seldom subject to overflow.

Texture, soil. Size of the individual particles making up the soil mass. The proportions of sand, silt, and clay determine soil texture. A coarse soil contains a large amount of sand; a fine-textured soil contains a large proportion of clay.

Clay.—As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Silt.—Small mineral soil grains ranging from 0.05 millimeter to 0.002 millimeter in diameter. As a soil textural class, soil that contains 80 percent or more silt and less than 12 percent clay.

Sand.—Small rock or mineral fragments that have diameters ranging from 0.05 millimeter to 2.0 millimeters. As a textural class, soil that contains 85 percent or more sand and not more than 10 percent clay.

Tilth, soil. The physical condition of a soil in respect to its fitness for the growth of a specified plant or sequence of plants. Ideal soil tilth is not the same for each kind of crop, nor is it uniform for the same kind of crop growing on different kinds of soil.

Type, soil. A subdivision of the soil series made on the basis of difference in texture of the surface layer.

Upland (geological). Land consisting of material unworked by water in recent geologic time and ordinarily lying at a higher elevation than the alluvial plain or stream terrace.

Weathering, soil. The physical and chemical disintegration and decomposition of rocks and minerals.

Wisconsin glaciation (geological). The last glaciation that covered North America with a continental ice sheet estimated to be several thousands of feet thick.

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GUIDE TO MAPPING UNITS

[See table 1, p. 26, for estimated yields of soils, table 2 p. 38, for the productivity of the soils for trees, and table 9, p. 109, for the approximate acreage and proportionate extent of the soils. See the section beginning on p. 54 for the engineering properties of the soils and the section beginning on p. 95 for use of the soils in urban development]

Map symbol	Soil	Described on page	Capability unit	Page	Woodland suitability group	Page
AfA	Agawam fine sandy loam, 0 to 3 percent slopes	112	I-5	8	5	44
AfB	Agawam fine sandy loam, 3 to 8 percent slopes	113	IIe-5	10	5	44
AfC	Agawam fine sandy loam, 8 to 15 percent slopes	113	IIIe-5	14	5	44
AfD	Agawam fine sandy loam, 15 to 25 percent slopes	113	IVe-5	17	5	44
AgA	Agawam fine sandy loam, silty substratum, 0 to 3 percent slopes	113	I-5	8	6	45
AgB	Agawam fine sandy loam, silty substratum, 3 to 8 percent slopes	113	IIe-5	10	6	45
AgC	Agawam fine sandy loam, silty substratum, 8 to 20 percent slopes	113	IIIe-5	14	6	45
BaA	Belgrade silt loam, 0 to 3 percent slopes	113	IIw-4	11	1	42
BaB	Belgrade silt loam, 3 to 8 percent slopes	113	IIw-4	11	1	42
BbB	Berkshire fine sandy loam, 3 to 8 percent slopes	114	IIe-3	9	1	42
BbC	Berkshire fine sandy loam, 8 to 15 percent slopes	114	IIIe-3	13	1	42
BbD	Berkshire fine sandy loam, 15 to 25 percent slopes	114	IVe-8	19	1	42
BcB	Berkshire very stony fine sandy loam, 3 to 8 percent slopes	114	VIs-3	21	1	42
BcC	Berkshire very stony fine sandy loam, 8 to 15 percent slopes	115	VIs-3	21	1	42
BcD	Berkshire very stony fine sandy loam, 15 to 25 percent slopes	115	VIs-3	21	1	42
BdB	Berkshire extremely stony fine sandy loam, 3 to 8 percent slopes	115	VIIs-2	22	2	42
BdD	Berkshire extremely stony fine sandy loam, 8 to 25 percent slopes	115	VIIs-2	22	2	42
BdF	Berkshire extremely stony fine sandy loam, 25 to 65 percent slopes	115	VIIs-2	22	2	42
BeB	Berkshire fine sandy loam, dark subsoil, 3 to 8 percent slopes	115	IIe-3	9	1	42
BeC	Berkshire fine sandy loam, dark subsoil, 8 to 15 percent slopes	115	IIIe-3	13	1	42
BeD	Berkshire fine sandy loam, dark subsoil, 15 to 25 percent slopes	116	IVe-8	19	1	42
BfB	Berkshire very stony fine sandy loam, dark subsoil, 3 to 8 percent slopes	116	VIs-3	21	1	42
BfC	Berkshire very stony fine sandy loam, dark subsoil, 8 to 15 percent slopes	116	VIs-3	21	1	42
BfD	Berkshire very stony fine sandy loam, dark subsoil, 15 to 25 percent slopes	116	VIs-3	21	1	42
BgB	Berkshire extremely stony fine sandy loam, dark subsoil, 3 to 8 percent slopes	116	VIIs-2	22	2	42
BgD	Berkshire extremely stony fine sandy loam, dark subsoil, 8 to 25 percent slopes	116	VIIs-2	22	2	42
BgF	Berkshire extremely stony fine sandy loam, dark subsoil, 25 to 55 percent slopes	116	VIIs-2	22	2	42
BhB	Bernardston channery silt loam, 3 to 8 percent slopes	117	IIe-2	8	3	43
BhC	Bernardston channery silt loam, 8 to 15 percent slopes	117	IIIe-2	13	3	43
BhD	Bernardston channery silt loam, 15 to 25 percent slopes	117	IVe-2	17	3	43
BmB	Bernardston very stony silt loam, 3 to 8 percent slopes	117	VIs-2	21	3	43
BmC	Bernardston very stony silt loam, 8 to 15 percent slopes	117	VIs-2	21	3	43
BmD	Bernardston very stony silt loam, 15 to 25 percent slopes	117	VIs-2	21	3	43
BmF	Bernardston very stony silt loam, 25 to 55 percent slopes	117	VIIs-2	22	4	44
Bn	Biddeford silt loam	118	VIw-4	21	13	47
BsB	Broadbrook very fine sandy loam, 3 to 8 percent slopes	118	IIe-2	8	3	43
BsC	Broadbrook very fine sandy loam, 8 to 15 percent slopes	118	IIIe-2	13	3	43
BsD	Broadbrook very fine sandy loam, 15 to 25 percent slopes	118	IVe-2	17	3	43
BtC	Broadbrook very stony very fine sandy loam, 3 to 15 percent slopes	118	VIs-2	21	3	43
BtD	Broadbrook very stony very fine sandy loam, 15 to 25 percent slopes	118	VIs-2	21	3	43
BuA	Buckland fine sandy loam, 0 to 3 percent slopes	119	IIw-2	11	1	42
BuB	Buckland fine sandy loam, 3 to 8 percent slopes	119	IIw-2	11	1	42
BuC	Buckland fine sandy loam, 8 to 15 percent slopes	119	IIIe-22	14	1	42
BuD	Buckland fine sandy loam, 15 to 25 percent slopes	119	IVe-22	19	1	42
BvB	Buckland very stony fine sandy loam, 3 to 8 percent slopes	119	VIs-22	22	1	42
BvC	Buckland very stony fine sandy loam, 8 to 15 percent slopes	120	VIs-22	22	1	42
BvD	Buckland very stony fine sandy loam, 15 to 25 percent slopes	120	VIs-22	22	1	42
BwB	Buckland extremely stony fine sandy loam, 3 to 8 percent slopes	120	VIIs-2	22	2	42
BwC	Buckland extremely stony fine sandy loam, 8 to 25 percent slopes	120	VIIs-2	22	2	42
BxA	Buxton silt loam, 0 to 3 percent slopes	120	IIw-4	11	3	43
BxB	Buxton silt loam, 3 to 10 percent slopes	121	IIw-4	11	3	43
CaA	Cabot fine sandy loam, 0 to 3 percent slopes	121	IIIw-2	14	7	45
CaB	Cabot fine sandy loam, 3 to 8 percent slopes	121	IIIw-2	14	7	45
CbB	Cabot extremely stony fine sandy loam, 0 to 10 percent slopes	121	VIIs-23	23	7	45
CcA	Cabot loam, black surface, 0 to 3 percent slopes	121	Vw-2	20	13	47
CdA	Cabot very stony loam, black surface, 0 to 3 percent slopes	121	VIIs-24	23	13	47
CdB	Cabot very stony loam, black surface, 3 to 8 percent slopes	122	VIIs-24	23	13	47
CeA	Carver loamy coarse sand, 0 to 3 percent slopes	122	IVs-9	19	12	47
CeB	Carver loamy coarse sand, 3 to 8 percent slopes	122	IVs-9	19	12	47
CeC	Carver loamy coarse sand, 8 to 15 percent slopes	122	VIIs-9	23	12	47
CeD	Carver loamy coarse sand, 15 to 25 percent slopes	122	VIIs-9	23	12	47
CkB	Charlton fine sandy loam, 3 to 8 percent slopes	123	IIe-3	9	6	45
CkC	Charlton fine sandy loam, 8 to 20 percent slopes	123	IIIe-3	13	6	45
CmC	Charlton very stony fine sandy loam, 3 to 15 percent slopes	123	VIs-3	21	6	45
CmD	Charlton very stony fine sandy loam, 15 to 25 percent slopes	123	VIs-3	21	6	45

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Map symbol	Soil	Described on page	Capability unit	Page	Woodland suitability group	Page
CnB	Charlton extremely stony fine sandy loam, 3 to 8 percent slopes	123	VIIs-2	22	4	44
CnD	Charlton extremely stony fine sandy loam, 8 to 25 percent slopes	123	VIIs-2	22	4	44
CnE	Charlton extremely stony fine sandy loam, 25 to 45 percent slopes	123	VIIs-2	22	4	44
CoB	Cheshire fine sandy loam, 3 to 8 percent slopes	124	IIe-3	9	6	45
CoC	Cheshire fine sandy loam, 8 to 15 percent slopes	124	IIIe-3	13	6	45
CoD	Cheshire fine sandy loam, 15 to 25 percent slopes	124	IVe-8	19	6	45
CpB	Cheshire very stony fine sandy loam, 3 to 8 percent slopes	124	VIs-3	21	6	45
CpC	Cheshire very stony fine sandy loam, 8 to 15 percent slopes	124	VIs-3	21	6	45
CpD	Cheshire very stony fine sandy loam, 15 to 25 percent slopes	124	VIs-3	21	6	45
CrB	Cheshire extremely stony fine sandy loam, 3 to 8 percent slopes	124	VIIs-2	22	4	44
CrD	Cheshire extremely stony fine sandy loam, 8 to 25 percent slopes	125	VIIs-2	22	4	44
CrE	Cheshire extremely stony fine sandy loam, 25 to 45 percent slopes	125	VIIs-2	22	4	44
CsB	Colrain fine sandy loam, 3 to 8 percent slopes	125	IIe-3	9	1	42
CsC	Colrain fine sandy loam, 8 to 15 percent slopes	125	IIIe-3	13	1	42
CsD	Colrain fine sandy loam, 15 to 25 percent slopes	125	IVe-8	19	1	42
CvB	Colrain very stony fine sandy loam, 3 to 8 percent slopes	125	VIs-3	21	1	42
CvC	Colrain very stony fine sandy loam, 8 to 15 percent slopes	125	VIs-3	21	1	42
CvD	Colrain very stony fine sandy loam, 15 to 25 percent slopes	126	VIs-3	21	1	42
CxB	Colrain extremely stony fine sandy loam, 3 to 8 percent slopes	126	VIIs-2	22	2	42
CxD	Colrain extremely stony fine sandy loam, 8 to 25 percent slopes	126	VIIs-2	22	2	42
CxF	Colrain extremely stony fine sandy loam, 25 to 50 percent slopes	126	VIIs-2	22	2	42
DfA	Deerfield loamy fine sand, 0 to 3 percent slopes	126	IIIw-9	16	6	45
DuB	Dutchess silt loam, 3 to 8 percent slopes	127	IIe-3	9	3	43
DuC	Dutchess silt loam, 8 to 15 percent slopes	127	IIIe-3	13	3	43
DuD	Dutchess silt loam, 15 to 25 percent slopes	127	IVe-8	19	3	43
DvC	Dutchess very stony silt loam, 3 to 15 percent slopes	127	VIs-3	21	3	43
DvD	Dutchess very stony silt loam, 15 to 25 percent slopes	127	VIs-3	21	3	43
DxD	Dutchess extremely stony silt loam, 8 to 25 percent slopes	127	VIIs-2	22	4	44
DxF	Dutchess extremely stony silt loam, 25 to 55 percent slopes	128	VIIs-2	22	4	44
EfB	Essex fine sandy loam, 3 to 8 percent slopes	128	IIe-2	8	6	45
EfC	Essex fine sandy loam, 8 to 15 percent slopes	128	IIIe-2	13	6	45
EfD	Essex fine sandy loam, 15 to 25 percent slopes	128	IVe-2	17	6	45
EvB	Essex very stony fine sandy loam, 3 to 8 percent slopes	128	VIs-2	21	6	45
EvC	Essex very stony fine sandy loam, 8 to 15 percent slopes	128	VIs-2	21	6	45
EvD	Essex very stony fine sandy loam, 15 to 25 percent slopes	129	VIs-2	21	6	45
ExB	Essex extremely stony fine sandy loam, 3 to 8 percent slopes	129	VIIs-2	22	4	44
ExC	Essex extremely stony fine sandy loam, 8 to 25 percent slopes	129	VIIs-2	22	4	44
ExE	Essex extremely stony fine sandy loam, 25 to 45 percent slopes	129	VIIs-2	22	4	44
GfA	Gloucester fine sandy loam, 0 to 3 percent slopes	129	I-5	8	6	45
GfB	Gloucester fine sandy loam, 3 to 8 percent slopes	130	IIe-3	9	6	45
GfC	Gloucester fine sandy loam, 8 to 15 percent slopes	130	IIIe-3	13	6	45
GfD	Gloucester fine sandy loam, 15 to 25 percent slopes	130	IVe-8	19	6	45
GmB	Gloucester sandy loam, 3 to 8 percent slopes	130	IIs-8	12	6	45
GmC	Gloucester sandy loam, 8 to 15 percent slopes	130	IIIe-3	13	6	45
GmD	Gloucester sandy loam, 15 to 25 percent slopes	130	IVe-8	19	6	45
GvB	Gloucester very stony sandy loam, 3 to 8 percent slopes	130	VIs-3	21	6	45
GvC	Gloucester very stony sandy loam, 8 to 15 percent slopes	131	VIs-3	21	6	45
GvD	Gloucester very stony sandy loam, 15 to 25 percent slopes	131	VIs-3	21	6	45
GxB	Gloucester extremely stony sandy loam, 3 to 8 percent slopes	131	VIIs-2	22	4	44
GxC	Gloucester extremely stony sandy loam, 8 to 25 percent slopes	131	VIIs-2	22	4	44
GxE	Gloucester extremely stony sandy loam, 25 to 45 percent slopes	131	VIIs-2	22	4	44
HaA	Hadley silt loam, 0 to 3 percent slopes	131	I-6	8	3	43
HaB	Hadley silt loam, 3 to 8 percent slopes	132	IIe-6	10	3	43
HbA	Hadley very fine sandy loam, 0 to 3 percent slopes	133	I-6	8	3	43
HbB	Hadley very fine sandy loam, 3 to 8 percent slopes	133	IIe-6	10	3	43
HcA	Hadley very fine sandy loam, overflow, 0 to 3 percent slopes	133	IIw-61	12	3	43
HdA	Hartland silt loam, 0 to 3 percent slopes	133	I-6	8	3	43
HdB	Hartland silt loam, 3 to 8 percent slopes	133	IIe-4	10	3	43
HdC	Hartland silt loam, 8 to 15 percent slopes	134	IIIe-4	13	3	43
HdD	Hartland silt loam, 15 to 35 percent slopes	134	VIe-4	20	3	43
HgA	Hinckley gravelly very fine sandy loam, 0 to 3 percent slopes	134	IIIs-9	17	8	46
HgB	Hinckley gravelly very fine sandy loam, 3 to 8 percent slopes	134	IIIs-9	17	8	46
HgC	Hinckley gravelly very fine sandy loam, 8 to 15 percent slopes	134	IVs-9	19	8	46
HgD	Hinckley gravelly very fine sandy loam, 15 to 25 percent slopes	134	VIs-9	22	8	46
HkA	Hinckley sandy loam, 0 to 3 percent slopes	135	IIIs-9	17	8	46
HkB	Hinckley sandy loam, 3 to 8 percent slopes	135	IIIs-9	17	8	46

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Map symbol	Soil	Described on page	Capability unit	Page	Woodland suitability group	Page
HkC	Hinckley sandy loam, 8 to 15 percent slopes--	135	IVs-9	19	8	46
HkD	Hinckley sandy loam, 15 to 35 percent slopes-	135	VIs-9	22	8	46
HmB	Hollis fine sandy loam, 3 to 8 percent slopes----------	135	IIe-7	10	10	46
HmC	Hollis fine sandy loam, 8 to 15 percent slopes----------	135	IIIe-7	14	10	46
HnC	Hollis very rocky fine sandy loam, 3 to 15 percent slopes----------	135	VIs-7	22	10	46
HnD	Hollis very rocky fine sandy loam, 15 to 25 percent slopes----------	136	VIs-7	22	10	46
HoD	Hollis extremely rocky fine sandy loam, 3 to 25 percent slopes----------	136	VIIs-7	23	11	47
HoF	Hollis extremely rocky fine sandy loam, 25 to 60 percent slopes----------	136	VIIs-7	23	11	47
HvC	Holyoke and Sunderland very rocky very fine sandy loams, 3 to 15 percent slopes--------	136	VIs-7	22	10	46
HvD	Holyoke and Sunderland very rocky very fine sandy loams, 15 to 25 percent slopes-------	136	VIs-7	22	10	46
HxD	Holyoke and Sunderland extremely rocky very fine sandy loams, 8 to 25 percent slopes---	136	VIIs-7	23	11	47
HxF	Holyoke and Sunderland extremely rocky very fine sandy loams, 25 to 90 percent slopes--	137	VIIs-7	23	11	47
Lk	Limerick silt loam----------	137	IIIw-6	16	7	45
Ls	Limerick-Saco silt loams----------	137	VIw-6	21	7;13	45;47
LvC	Lyman very rocky loam, 3 to 15 percent slopes----------	137	VIs-7	22	10	46
LvD	Lyman very rocky loam, 15 to 25 percent slopes----------	138	VIs-7	22	10	46
LxC	Lyman extremely rocky loam, 3 to 25 percent slopes----------	138	VIIs-7	23	11	47
LxF	Lyman extremely rocky loam, 25 to 80 percent slopes----------	138	VIIs-7	23	11	47
MaB	Marlow loam, 3 to 8 percent slopes----------	138	IIe-2	8	3	43
MaC	Marlow loam, 8 to 15 percent slopes----------	138	IIIe-2	13	3	43
MaD	Marlow loam, 15 to 25 percent slopes---------	139	IVe-2	17	3	43
MbB	Marlow very stony loam, 3 to 8 percent slopes----------	139	VIs-2	21	3	43
MbC	Marlow very stony loam, 8 to 15 percent slopes----------	139	VIs-2	21	3	43
MbD	Marlow very stony loam, 15 to 25 percent slopes----------	139	VIs-2	21	3	43
McB	Marlow extremely stony loam, 3 to 8 percent slopes----------	139	VIIs-2	22	4	44
McD	Marlow extremely stony loam, 8 to 35 percent slopes----------	139	VIIs-2	22	4	44
MdB	Marlow loam, dark subsoil, 3 to 8 percent slopes----------	139	IIe-2	8	3	43
MdC	Marlow loam, dark subsoil, 8 to 15 percent slopes----------	139	IIIe-2	13	3	43
MdD	Marlow loam, dark subsoil, 15 to 25 percent slopes----------	139	IVe-2	17	3	43
MeB	Marlow very stony loam, dark subsoil, 3 to 8 percent slopes----------	140	VIs-2	21	3	43
MeC	Marlow very stony loam, dark subsoil, 8 to 15 percent slopes----------	140	VIs-2	21	3	43
MeD	Marlow very stony loam, dark subsoil, 15 to 25 percent slopes----------	140	VIs-2	21	3	43
MfB	Marlow extremely stony loam, dark subsoil, 3 to 8 percent slopes----------	140	VIIs-2	22	4	44
MfD	Marlow extremely stony loam, dark subsoil, 8 to 25 percent slopes----------	140	VIIs-2	22	4	44
MfE	Marlow extremely stony loam, dark subsoil, 25 to 45 percent slopes----------	140	VIIs-2	22	4	44
MgA	Merrimac fine sandy loam, 0 to 3 percent slopes-	141	I-5	8	5	44
MgB	Merrimac fine sandy loam, 3 to 8 percent slopes-	141	IIe-5	10	5	44
MgC	Merrimac fine sandy loam, 8 to 15 percent slopes----------	141	IIIe-5	14	5	44
MgD	Merrimac fine sandy loam, 15 to 25 percent slopes----------	141	IVe-5	17	5	44
MmA	Merrimac sandy loam, 0 to 3 percent slopes------	141	IIs-8	12	5	44
MmB	Merrimac sandy loam, 3 to 8 percent slopes------	141	IIs-8	12	5	44
MmC	Merrimac sandy loam, 8 to 15 percent slopes-----	142	IIIe-3	13	5	44
MmE	Merrimac sandy loam, 15 to 35 percent slopes----	142	IVe-8	19	5	44
Ms	Muck, shallow----------	142	VIIw-1	22	13	47
Mu	Muck----------	142	VIIw-1	22	13	47
NaC	Nassau very rocky silt loam, 3 to 15 percent slopes----------	142	VIs-7	22	10	46
NaD	Nassau very rocky silt loam, 15 to 25 percent slopes----------	143	VIs-7	22	10	46
NeC	Nassau extremely rocky silt loam, 3 to 25 percent slopes----------	143	VIIs-7	23	11	47
NeF	Nassau extremely rocky silt loam, 25 to 75 percent slopes----------	143	VIIs-7	23	11	47
NfA	Ninigret fine sandy loam, 0 to 3 percent slopes-	143	IIw-5	12	3	43
NfB	Ninigret fine sandy loam, 3 to 10 percent slopes----------	143	IIw-5	12	3	43
NgA	Ninigret fine sandy loam, silty substratum, 0 to 3 percent slopes----------	144	IIw-5	12	3	43
NgB	Ninigret fine sandy loam, silty substratum, 3 to 8 percent slopes----------	144	IIw-5	12	3	43
Of	Ondawa fine sandy loam----------	144	I-6	8	5	44
Pa	Peat----------	144	VIIw-1	22	13	47
PbA	Peru loam, 0 to 3 percent slopes----------	144	IIw-2	11	1	42
PbB	Peru loam, 3 to 8 percent slopes----------	145	IIw-2	11	1	42
PbC	Peru loam, 8 to 15 percent slopes----------	145	IIIe-22	14	1	42
PcB	Peru very stony loam, 3 to 8 percent slopes-----	145	VIs-22	22	1	42
PcC	Peru very stony loam, 8 to 15 percent slopes----	145	VIs-22	22	1	42
PcD	Peru very stony loam, 15 to 25 percent slopes---	145	VIs-22	22	1	42
PeB	Peru extremely stony loam, 0 to 8 percent slopes----------	145	VIIs-2	22	2	42
PeC	Peru extremely stony loam, 8 to 25 percent slopes----------	145	VIIs-2	22	2	42
PnB	Pittstown silt loam, 3 to 8 percent slopes------	146	IIw-2	11	1	42
Po	Podunk fine sandy loam----------	146	IIw-6	12	3	43
RaA	Raynham silt loam, 0 to 3 percent slopes--------	146	IIIw-5	15	7	45
RdA	Ridgebury fine sandy loam, 0 to 3 percent slopes----------	147	IIIw-2	14	7	45
RdB	Ridgebury fine sandy loam, 3 to 8 percent slopes----------	147	IIIw-2	14	7	45
RgB	Ridgebury very stony and extremely stony fine sandy loams, 0 to 10 percent slopes----------	147	VIIs-23	23	7	45
Rs	Riverwash----------	147	VIIIs-2	24	None	--
Ru	Rumney fine sandy loam----------	147	IIIw-6	16	7	45
Sa	Saco silt loam----------	148	VIw-6	21	13	47
Sb	Saugatuck loamy sand----------	148	Vw-9	20	9	46
ScA	Scantic silt loam, 0 to 3 percent slopes--------	148	IVw-4	19	9	46
ScB	Scantic silt loam, 3 to 8 percent slopes--------	148	IVw-4	19	9	46

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Map symbol	Soil	Described on page	Capability unit	Page	Woodland suitability group	Page
Sd	Scarboro fine sandy loam, brownish subsoil variant	149	Vw-5	20	13	47
SeA	Scituate fine sandy loam, 0 to 3 percent slopes	149	IIw-2	11	6	45
SeB	Scituate fine sandy loam, 3 to 8 percent slopes	149	IIw-2	11	6	45
SeC	Scituate fine sandy loam, 8 to 15 percent slopes	149	IIIe-22	14	6	45
SfA	Scituate very stony fine sandy loam, 0 to 3 percent slopes	149	Vs-22	20	6	45
SfB	Scituate very stony fine sandy loam, 3 to 8 percent slopes	149	VIs-22	22	6	45
SfC	Scituate very stony fine sandy loam, 8 to 15 percent slopes	150	VIs-22	22	6	45
SgB	Scituate extremely stony fine sandy loam, 0 to 8 percent slopes	150	VIIs-2	22	4	44
SgC	Scituate extremely stony fine sandy loam, 8 to 25 percent slopes	150	VIIs-2	22	4	44
ShB	Shapleigh fine sandy loam, 3 to 8 percent slopes	150	IIe-7	10	10	46
ShC	Shapleigh fine sandy loam, 8 to 15 percent slopes	150	IIIe-7	14	10	46
SkC	Shapleigh very rocky fine sandy loam, 3 to 15 percent slopes	150	VIs-7	22	10	46
SkD	Shapleigh very rocky fine sandy loam, 15 to 25 percent slopes	150	VIs-7	22	10	46
SmC	Shapleigh extremely rocky fine sandy loam, 3 to 25 percent slopes	151	VIIs-7	23	11	47
SmF	Shapleigh extremely rocky fine sandy loam, 25 to 60 percent slopes	151	VIIs-7	23	11	47
SnB	Shelburne loam, 3 to 8 percent slopes	151	IIe-2	8	3	43
SnC	Shelburne loam, 8 to 15 percent slopes	151	IIIe-2	13	3	43
SnD	Shelburne loam, 15 to 25 percent slopes	151	IVe-2	17	3	43
SoB	Shelburne very stony loam, 3 to 8 percent slopes	151	VIs-2	21	3	43
SoC	Shelburne very stony loam, 8 to 15 percent slopes	151	VIs-2	21	3	43
SoD	Shelburne very stony loam, 15 to 25 percent slopes	152	VIs-2	21	3	43
SpB	Shelburne extremely stony loam, 3 to 8 percent slopes	152	VIIs-2	22	4	44
SpD	Shelburne extremely stony loam, 8 to 25 percent slopes	152	VIIs-2	22	4	44
SpF	Shelburne extremely stony loam, 25 to 50 percent slopes	152	VIIs-2	22	4	44
SrB	Stissing silt loam, 0 to 8 percent slopes	152	IIIw-2	14	7	45
SsB	Stissing very stony silt loam, 3 to 8 percent slopes	152	VIIs-23	23	7	45
StA	Sudbury fine sandy loam, 0 to 3 percent slopes	153	IIw-5	12	6	45
StB	Sudbury fine sandy loam, 3 to 8 percent slopes	153	IIw-5	12	6	45
SuB	Suffield silt loam, 3 to 8 percent slopes	153	IIe-4	10	3	43
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	153	IIIe-4	13	3	43
SuE2	Suffield silt loam, 15 to 35 percent slopes, eroded	154	VIe-4	20	3	43
Sv	Suncook loamy sand	154	IIIs-6	16	8	46
SwB	Sutton fine sandy loam, 3 to 8 percent slopes	154	IIw-3	11	3	43
SwC	Sutton fine sandy loam, 8 to 20 percent slopes	155	IIIe-22	14	3	43
SxB	Sutton very stony fine sandy loam, 3 to 8 percent slopes	155	VIs-22	22	3	43
SxC	Sutton very stony fine sandy loam, 8 to 15 percent slopes	155	VIs-22	22	3	43
SyB	Sutton extremely stony fine sandy loam, 0 to 8 percent slopes	155	VIIs-2	22	4	44
SyC	Sutton extremely stony fine sandy loam, 8 to 25 percent slopes	155	VIIs-2	22	4	44
SzA	Swanton very fine sandy loam, 0 to 3 percent slopes	156	IIIw-5	15	7	45
SzB	Swanton very fine sandy loam, 3 to 8 percent slopes	156	IIIw-5	15	7	45
WaA	Walpole and Wareham fine sandy loams, 0 to 3 percent slopes	156	IIIw-5	15	7	45
WaB	Walpole and Wareham fine sandy loams, 3 to 8 percent slopes	156	IIIw-5	15	7	45
WfA	Warwick gravelly fine sandy loam, 0 to 3 percent slopes	157	I-5	8	5	44
WfB	Warwick gravelly fine sandy loam, 3 to 8 percent slopes	157	IIe-5	10	5	44
WfC	Warwick gravelly fine sandy loam, 8 to 15 percent slopes	157	IIIe-5	14	5	44
WfD	Warwick gravelly fine sandy loam, 15 to 40 percent slopes	157	IVe-5	17	5	44
WgA	Warwick gravelly loam, 0 to 3 percent slopes	157	I-5	8	5	44
WgB	Warwick gravelly loam, 3 to 8 percent slopes	157	IIe-5	10	5	44
WgC	Warwick gravelly loam, 8 to 15 percent slopes	157	IIIe-5	14	5	44
WmB	Westminster loam, 3 to 8 percent slopes	158	IIe-7	10	10	46
WmC	Westminster loam, 8 to 15 percent slopes	158	IIIe-7	14	10	46
WmD	Westminster loam, 15 to 25 percent slopes	158	IVe-7	18	10	46
WnC	Westminster very rocky loam, 3 to 15 percent slopes	158	VIs-7	22	10	46
WnD	Westminster very rocky loam, 15 to 25 percent slopes	158	VIs-7	22	10	46
WrD	Westminster extremely rocky loam, 3 to 25 percent slopes	158	VIIs-7	23	11	47
WrF	Westminster extremely rocky loam, 25 to 75 percent slopes	158	VIIs-7	23	11	47
WsA	Whitman fine sandy loam, 0 to 3 percent slopes	159	Vw-2	20	13	47
WtA	Whitman extremely stony fine sandy loam, 0 to 3 percent slopes	159	VIIs-24	23	13	47
WuA	Windsor loamy fine sand, 0 to 3 percent slopes	159	IIIs-9	17	8	46
WuB	Windsor loamy fine sand, 3 to 8 percent slopes	160	IIIs-9	17	8	46
WuC	Windsor loamy fine sand, 8 to 15 percent slopes	160	IVs-9	19	8	46
WuE	Windsor loamy fine sand, 15 to 35 percent slopes	160	VIIs-9	23	8	46
WvB	Windsor loamy fine sand, wind-hummocky, 3 to 8 percent slopes	160	VIIs-9	23	8	46
Ww	Winooski very fine sandy loam	160	IIw-6	12	1	42

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