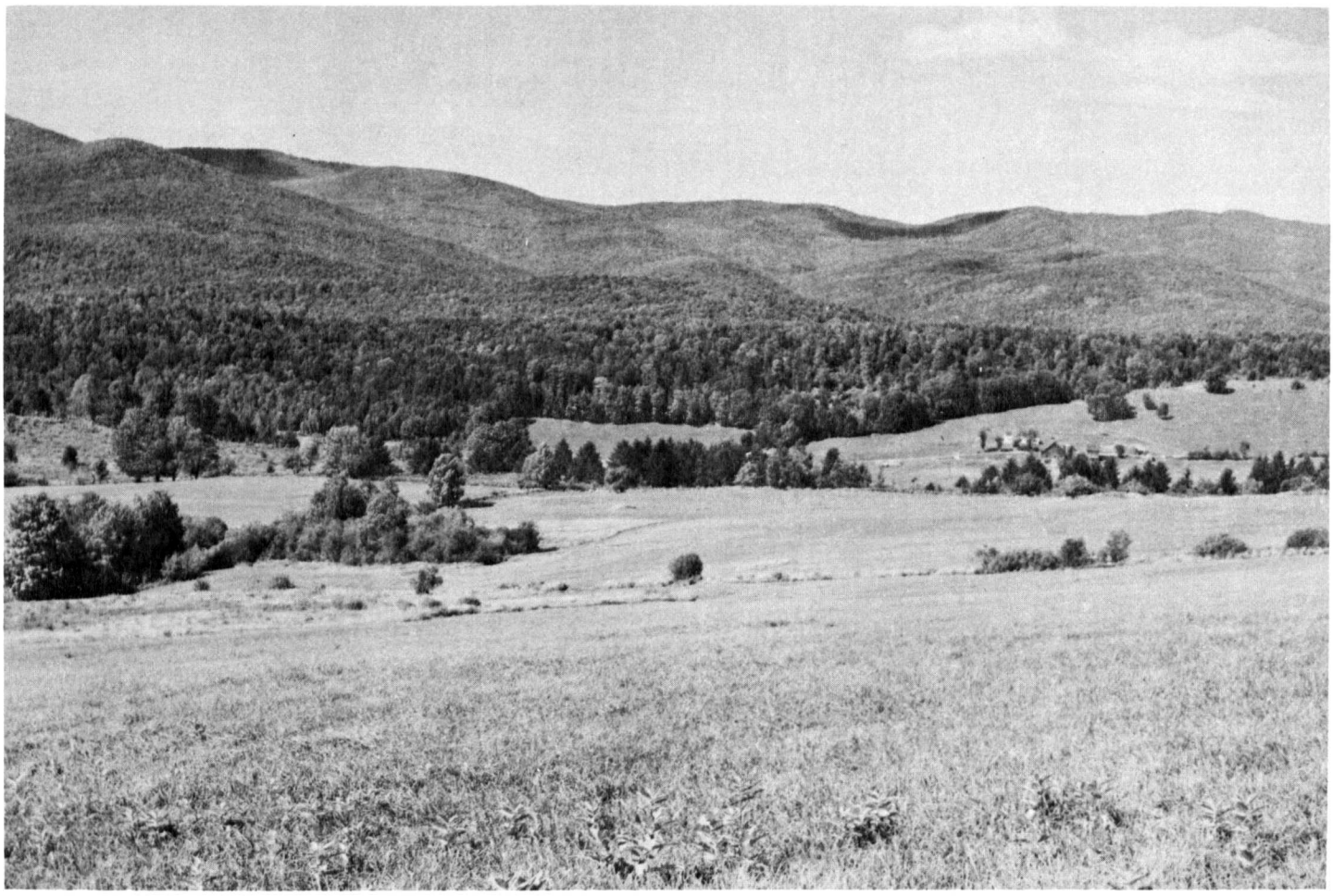
SOIL SURVEY OF

Orange County, Vermont



United States Department of Agriculture
Soil Conservation Service
in cooperation with
Vermont Agency of Environmental Conservation
and the Vermont Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1967-1974. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1975. This survey was made cooperatively by the Soil Conservation Service, the Vermont Agency of Environmental Conservation, and the Vermont Agricultural Experiment Station. Funds appropriated in 1973 and 1974 by the Vermont Legislature were used to accelerate the soil survey in Orange County. It is part of the technical assistance furnished to the White River Natural Resources Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, woodlands, and wildlife areas; in selected sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

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

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

Finding and Using Information

The "Contents" can be used to find information. The "Index to mapping units" lists all the soils of the county in alphabetic order by map symbol and shows the page where each soil is described.

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

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions in the section "Planning the use and management of the soils."

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

Wildlife managers and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the sections "Engineering" and "Recreation."

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

Scientists and others can read in the section "Formation and classification of the soils" how the soils of Orange County were formed, and how they are classified.

Newcomers in the area may be especially interested in the section "Soil map for general planning" where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General nature of the county."

Cover: **Typical area of Tunbridge-Woodstock-Stowe association in town of Braintree. Braintree Mountain in background.**

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Issued June, 1978

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SOIL SURVEY OF ORANGE COUNTY, VERMONT

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United States Department of Agriculture, Soil Conservation Service, in cooperation with the Vermont Agency of Environmental Conservation and the Vermont Agricultural Experiment Station

ORANGE COUNTY is in the east-central part of Vermont on the uplands east of the Green Mountains (fig. 1). The eastern boundary is the Connecticut River. The county occupies 441,600 acres, or 690 square miles. Randolph is the largest city in Orange County. Chelsea is the county seat.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are located, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes, the size of streams and the general pattern of drainage, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has been changed very little by leaching or by the action of plant roots.

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Soil series commonly are named for towns or other geographic features near the place where they were first observed and mapped. Stowe and Pomfret, 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 characteristics.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Agawam fine sandy loam, 0 to 3 percent slopes, is one of several phases within the Agawam series.

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

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

Some mapping units are made up of soils of different series, or of different phases within one series. Such kind of mapping units shown on the soil map of Orange County is a soil complex.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Vershire-Glover complex, 25 to 50 percent slopes, is an example.

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

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. Existing ratings of suitabilities and limitations (interpretations) of the soils are field tested and modified as neceessary during the course

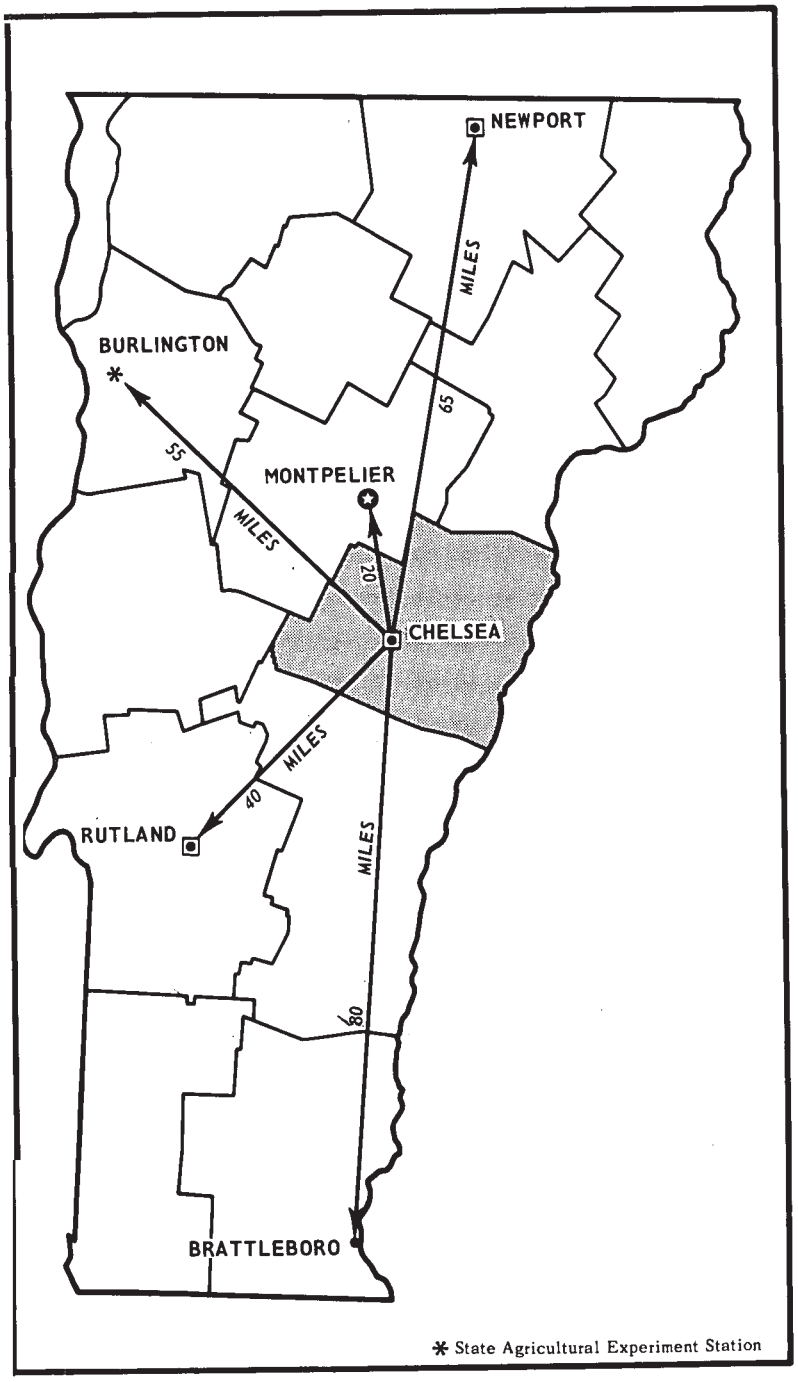

Figure 1.—**Location of Orange County in Vermont.**

of the survey, and new interpretations are added to meet local needs. This is done mainly through field observations of behavior of different kinds of soil for different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and other information available from state and local specialists. For example, data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and mapped on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so to be readily useful to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation. Presenting the detailed information in an organized, understandable manner is the purpose of this publication.

General nature of the county

Discussed in this section are climate; physiography, relief, and geology; recreation, industry and transportation; and farming.

Climate[1]

Orange County has ample rainfall, moderately warm summers, and fairly cold winters. The climate is continental.

Geographic features affect local weather in Orange County. The following are mostly oriented north to south: the main ridge of the Green Mountains, a short distance to the west of the county; the Connecticut River Valley, bordering on the east; and some lesser ridges and associated valleys. Winds tend to channel in a southerly direction in summer and in a northerly direction in winter.

Elevation ranges from about 400 feet above sea level near the Connecticut River, to about 1,000 feet in some interior valleys, to more than 1,500 feet on mountain peaks. The highest elevation, 3,166 feet, is on Butterfield Mountain. The average temperature decreases as elevation increases about 3.5° F per 1,000 feet. Rainfall tends to increase as elevation increases. Adjustments must be made to tabular data presented in this section for Chelsea (tables 1, 2, and 3), in a valley 750 feet above sea level, for estimates for highland areas. Warm-weather crops are generally planted on farms in valleys, while cool-weather crops, such as grasses, are more suited to the highlands.

Small-scale topographic features and kinds of soil affect climate near the ground. For example, low spots into which cold air may drain during calm, clear nights are frost prone. A soil that has a high organic matter content, such as Muck, is a poor conductor of stored heat. The surface layer of Muck may cool much more during a calm, clear night than the surface layer of a sandy soil in a comparable location. Swampy areas often combine these two effects and are frost pockets.

TEMPERATURE. July is the warmest month. Temperatures in July are in the upper 60's in valleys and about 60° at the highest elevation. The average number of days that have a temperature of 90° is less than 10 throughout the county; there are generally none at the highest elevations, but in the valleys, the number

[1]By ROBERT E. LAUTZENHEISER, climatologist for Vermont, National Weather Service, U.S. Department of Commerce.

TABLE 1.—*Temperature and precipitation*

[Data are from Chelsea, Vermont, 1938-67. Elevation is 750 feet]

Month	Temperature					Precipitation						
	Average daily			Average monthly		Average monthly total	One year in 10 will have		Snowfall average monthly	Days with—		
	Maximum	Minimum	Mean	Maximum	Minimum		Less than—	More than—		Snowfall 1 in. or more	Snow cover 1 in. or more	Precipitation 0.10 in. or more
	°F	°F	°F	°F	°F	In	In	In	In			
January	28.3	2.1	15.2	48	—23	2.39	1.1	3.6	18.8	6	30	6
February	31.1	2.6	16.9	49	—24	2.25	1.2	3.3	17.4	5	28	6
March	39.9	14.6	27.3	60	—10	2.44	1.2	4.1	13.6	4	26	6
April	52.9	28.0	40.5	74	12	2.83	1.4	4.8	3.9	2	6	7
May	66.3	37.6	52.0	85	23	3.50	1.7	5.7	0.3	(1)	(1)	8
June	76.3	47.4	61.9	91	32	3.34	1.2	5.7	0	0	0	7
July	80.6	51.8	66.2	91	39	3.87	1.7	5.6	0	0	0	7
August	78.5	49.3	63.9	90	35	3.27	1.2	5.6	0	0	0	6
September	70.5	41.6	56.1	87	24	3.55	1.3	6.6	(4)	0	(1)	7
October	60.4	31.8	46.1	79	17	3.03	1.3	5.5	0.3	(1)	(1)	6
November	45.3	24.0	34.7	65	4	3.15	1.8	5.0	5.8	2	6	7
December	31.8	9.1	20.5	50	—18	2.57	1.5	3.6	13.8	5	24	6
Year	55.2	28.3	41.8	[2]94	[3]—29	36.19	28.1	42.7	73.9	24	120	79

[1]Less than 0.5 day.
[2]Average annual highest maximum.
[3]Average annual lowest minimum.
[4]Trace.

TABLE 2.—*Frequencies of selected temperature levels and average of heating and growing degree-days*

[Data are from Chelsea, Vermont, 1938-67]

Month	Mean number of days with temperature (°F)				Accumulated heat units (Degree-days)		
	Maximum		Minimum		Heating	Growing	
	90° or higher	32° or lower	32° or lower	0° or lower	Base 65	Base 40	Base 50
January	0	20	31	15	1,537	0	0
February	0	15	28	13	1,352	0	0
March	0	6	29	5	1,162	0	0
April	(1)	(1)	21	(1)	728	116	20
May	(1)	0	10	0	403	404	140
June	2	0	1	0	135	673	365
July	2	0	(1)	0	60	841	525
August	2	0	(1)	0	80	770	455
September	1	0	6	0	290	511	220
October	0	0	18	0	579	224	45
November	0	3	24	1	902	48	0
December	0	16	30	9	1,373	0	0
Year	7	60	198	43	8,601	3,587	1,770

[1]Less than 0.5 day.

ranges from zero days in an occasional summer to 20 or more in the warmest summers. Nights are almost always cool, even in the warmest summers. For the entire 30-year period, the extremes were 98° and —47°. In table 1 values are given that are expected to occur about once a year.

Table 2 gives the average frequency of certain temperatures. Also given are heating and growing degree-days. Degree-days are computed daily by recording the average temperature variations from a selected temperature base. These variations are then summarized for the month, the season, or the year. The temperature selected as a base and the variations to be recorded depend on the purpose.

A base of 65° is used for heating degree-days, as this is the lowest daily average temperature for which no heating is required for homes. To get the variation for 1 day, the actual average temperature, if less than 65°, is subtracted from 65. For example, a day averaging 55° has 10 heating degree-days. In contrast, a

TABLE 3.—*Probabilities of dates of beginning and ending of freeze period (growing season) for several levels of freeze severity*

[Data are from Chelsea, Vermont, 1931-61]

Probability	Dates for given probability and temperature				
	32°F or lower	28°F or lower	24°F or lower	20°F or lower	16°F or lower
Spring:					
1 year in 10 later than	June 19	June 2	May 23	May 5	April 22
2 years in 10 later than	June 15	May 28	May 18	April 30	April 17
5 years in 10 later than	June 2	May 18	May 7	April 19	April 7
8 years in 10 later than	May 22	May 8	April 26	April 8	March 28
Fall:					
1 year in 10 earlier than	September 1	September 14	September 23	October 4	October 18
2 years in 10 earlier than	September 5	September 18	September 27	October 9	October 23
5 years in 10 earlier than	September 12	September 26	October 6	October 19	November 2
8 years in 10 earlier than	September 19	October 4	October 15	October 29	November 12

day averaging 65° or higher has no heating degree-days, because no heating is required. Heating degree-days are useful in calculating the amount of fuel needed in an average year and in comparing a particular season with the average. They are used by gas, electric, and fuel companies in estimating fuel and power requirements and in scheduling fuel delivery.

Knowledge of growing degree-days is useful in planning when to plant and harvest crops. Growing degree-days accumulate when the average temperature is higher than the lowest temperature at which plants continue to grow. They are calculated by subtracting this base temperature from the actual average for the day.

Data in table 2 are calculated for two standard bases: 40° for cool-weather crops such as grasses, potatoes, and peas; and 50° for warm-weather crops such as tomatoes and corn. Thus, a day that has an average temperature of 60° has 20 growing degree-days for cool-weather crops but only 10 for warm-weather crops. A substantial number of growing degree-days in a month does not necessarily mean that a sensitive crop can be safely planted. A damaging freeze may occur.

Table 3 gives the probability of freezes of several severities after specified dates in spring and before the given dates in fall. For example, at Chelsea there is a one out of two chance that the temperature will drop to 32° or lower after June 2, and a one out of ten chance after June 19. A 32° freeze is usually harmful to sensitive plants, but hardier plants can survive even lower temperatures.

These freeze dates vary considerably, sometimes even in short distances within the county. For most valleys that have cultivated areas, the average date of the last freeze in spring is late in May or early in June. The average date can be well into June at high elevations. The first freeze in fall is about the middle of September for many cultivated valleys but can be late in August at higher elevations.

PRECIPITATION. The annual rainfall ranges from about 35 inches in valley lowlands to about 40 to 50 inches at higher elevations. These values include the water equivalent of snow. There are no rainy or dry seasons, but the summer totals average about 50 percent more than the winter totals. This factor is favorable for good crop growth. The relatively ample annual total, as compared with that of much of the nation, provides adequate supplies for many uses. These uses include irrigation water for the generally short, but fairly common, dry spells in summer.

Snowfall varies considerably from one winter to another and from place to place in the same season. The average seasonal snowfall is 70 to 80 inches over much of the county, but is as much as 100 inches at higher elevations. A continuous snow cover, 1 inch or more deep, is expected to last at least a month, and the average duration ranges from 2½ to 3½ months.

At Chelsea, the average dates of a continuous snow cover are between December 16 and March 29. The average maximum depth of snow is 24 inches. The date of the maximum depth of snow at Chelsea is generally February 17. The snowpack is commonly deeper at higher elevations, and the date of the maximum snow depth occurs later. At lower elevations, the snow depth is less and the date of maximum snow depth is earlier. Table 1 contains additional data on snow.

STORMS. Thunderstorms occur on an average of 20 to 30 days a year. Most of these storms do little harm, and they bring beneficial rain. Heavy rain that accompanies the more severe storms, however, causes soil erosion and injures plants. These storms can produce hail once or twice a year at a given location, but the hailstones are seldom numerous enough to cause extensive crop or property damage. Some local damage can be severe.

Hurricanes affect this county about once in 20 years. Strong wind from coastal storms, or northeasters, is much more frequent. Effects of these storms are minimized by distance from the Atlantic and by sheltering effects of the mountains.

Tornadoes occur but are rarely reported because they are generally so small that they do not pose much of a

threat to a given area. However, although personal injuries and significant property damage are rare, the potential danger from these storms should not be minimized.

Physiography, relief, and geology[2]

Orange County is in the Vermont Piedmont Division of the New England Upland physiographic province. Topography is generally subdued. Low, north-south trending ridges and valleys make up most of the county. Relief is greater along the western boundary, which is on the extreme east flank of the Green Mountain anticlinorium. Terrain in the eastern half of the county is mostly rolling hills. The highest elevation in Orange County is 3,166 feet on Butterfield Mountain in the town of Orange. The lowest elevation is about 400 feet, along the Connecticut River.

Bedrock is largely Ordovician and Devonian metasediment with interspersed metavolcanics and igneous intrusives. These rocks have been subjected to at least two episodes of intensive folding and metamorphism during the Acadian and Appalachian Orogenys, 400 and 263 million years ago, respectively. There are no major faults in the region. Rock units generally dip steeply toward the east. Bedrock sequences become progressively younger from west to east across the county.

The bedrock underlying the western half of Orange County is mainly quartz mica schist, interbedded phyllites, carbonaceous slates, quartzites, and recrystallized limestone. Quartz lenses and pods are locally abundant. The eastern part of the county is underlain by rock of somewhat lower metamorphic grade. These rocks are phyllites and slates and some schist and quartzite.

A glacier covered the county during the most recent glacial re-advance in late Wisconsin time, about 13,000 years ago. Glacial erosion was minimal on the crests of ridges and mountains. However, river valleys were deepened and widened by the scouring action of ice that was channeled along their courses. When the ice retreated, these valleys received outwash and glaciofluvial and glaciolacustrine deposits.

Soils in the county formed mostly in glacial material over the past 11,000 to 13,000 years. Glacial till is the dominant material on the surface. It makes up approximately 92 percent of the county. This cobbly, unsorted, nonstratified debris is distributed as a blanket of varying thickness over the county.

Glaciofluvial kames and kame terraces are along major river valleys including the Ompompanoosuc, Waits, Wells, and Connecticut Rivers; the first, second, and third branches of the White River; and the Stevens branch of the Winooski River.

Glaciolacustrine littoral (shallow-water sandy material) and lake bottom (silt and clay) material are found mainly along the Ompompanoosuc, Waits, and Connecticut Rivers. These deposits indicate the presence of high-level lakes along these river valleys that were caused by glacial damming during glacial retreat.

[2]By E. STANLEY CORNEILLE, JR., sanitary specialist, White River Natural Resources Conservation District.

Recreation, industry, and transportation

The population of Orange County increased by 10 percent between 1968 and 1974. Many of the new people found employment in local industries. The most important of these industries are lumber and wood products, furniture, plastics, and wearing apparel.

Recreation makes a large contribution to the economy of the county. Some of the most important seasonal features that attract people to the area are deer hunting, fishing, fall foliage, summer camps, water-based facilities, skiing, and snowmobiling. From 1968 to 1973 there was a 40 percent increase in the number of out-of-state people who have purchased or built vacation homes.

The survey area has a good network of federal, state, and local highways. Two interstate highways serve the area. I-89 runs along the western edge of the county and I-91 runs north and south along the Connecticut River. U.S. and State highways generally follow the valleys that run north and south. East-west traffic, which is generally over the north-south ridges, uses local roads.

Railroads provide freight service, but no passenger service, to the area. Buslines provide service within the area.

Farming

In the 1880's Orange County had very diversified agriculture. About 11,000 acres of grain crops were grown and fed to a variety of livestock. The agricultural emphasis slowly switched to butter production, which was the main farming product until the 1930's. It then became more profitable to ship fluid milk to urban markets. Fluid milk is still the chief product of Orange County farms. Dairy enterprises produce approximately 80 percent of the gross farm income in the county at the present time.

Most of the farmland in the county is used for hay, pasture, and corn grown for silage. These crops are fed to dairy animals. Some minor farm enterprises are forest products, maple syrup, horses, beef, sheep, poultry, apple orchards, and truck crops.

In recent years, the trend has been toward fewer farms that have more acreage per farm and that have a larger number of cows per farm. Many farms that go out of business are combined into larger units by neighboring owners. This trend is expected to continue. Many family farms are transferred from father to son and continue to be cultivated. Orange County farmers have the lowest number of cows per farm of any county in Vermont, but they produce more milk per cow than any other county in the state.

Since most farmers have a limited number of tillable acres, they have had to use good management and conservation practices. Many Orange County farmers have about one animal unit per tillable acre.

Because small farms have become difficult to operate and unprofitable, many small farms have been absorbed by a neighboring farm or have become sites for vacation homes.

In the future, farming will be mostly along valleys, and on nearly level to gently sloping ridges where large areas of good tillable land can be farmed economically.

Soil map for general planning

The general soil map at the back of this publication shows, in color, the soil associations described in this survey. Each soil association is a unique natural landscape unit that has a distinctive pattern of soils and relief and drainage features. It normally consists of one or more soils of major extent and some soils of minor extent, and it is named for the major soils. The kinds of soil in one association may occur in other soil associations, but in a different pattern (fig. 2).

The map provides a broad perspective of the soils and landscapes in the survey area. It also provides a basis for comparing the potential of large areas of the county for general kinds of land use. Areas of soils that are generally suitable for certain kinds of farming or other land uses can be identified from the map. Areas with soil properties distinctly unfavorable for certain land uses can also be located.

Because of the small scale of the map, the kind of soil at a specific site is not shown. This is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure. This is because the kinds of soil in any one soil association ordinarily differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The soil associations in the survey area vary widely in their potential for major land uses, as indicated in table 4. General ratings of the potential of each soil association, in relation to other soil associations, are given for each major land use. Adverse soil properties that pose limitations to the use are indicated. The ratings of soil potential assume that practices in common use in the county are used to overcome soil limitations. These ratings reflect the relative ease of overcoming such limitations and the probability of soil-related problems persisting after such practices are adapted. A rating of *good* indicates that soil properties are favorable for the specified use and that any limitation is minor and easily overcome; *fair* indicates that soil properties and site features are unfavorable, but the limitations can be overcome or minimized by special planning and design; and *poor* indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive management is required. The ratings do not consider location in relation to existing transportation systems or other kinds of facilities.

Major land uses considered are for farming, wood-

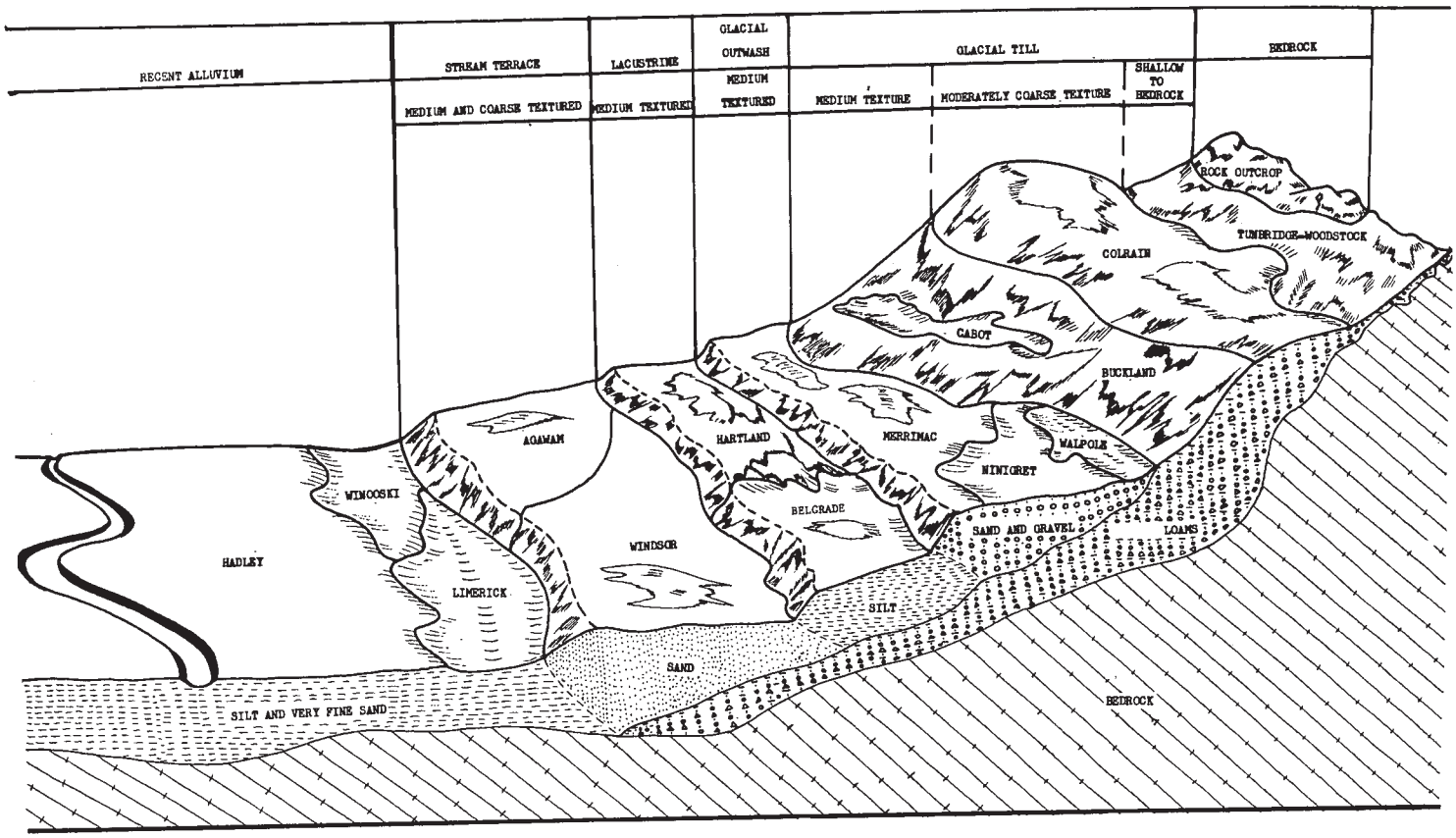

Figure 2.—**Relation of several soil associations on the landscape.**

TABLE 4.—*Soil associations and their potential and limitations for specified use*

Soil association	Extent of area	Farming	Woodland	Buildings with onsite sewage disposal	Local roads and streets	Recreational developments
	Pct					
1. Hadley-Winooski-Limerick.	1	Good	Good	Poor: floods, frost action, wetness.	Poor: floods, frost action, wetness.	Fair to poor: floods, wetness.
2. Belgrade-Hartland	1	Good	Good	Fair to poor: slope, frost action, wetness.	Poor: slope, frost action, wetness.	Fair to good: slope, wetness.
3. Merrimac-Agawam-Windsor-Winooski.	5	Good	Fair: droughty	Good	Good	Good.
4. Buckland-Cabot	10	Good to fair: wetness, stones.	Good to fair: wetness.	Poor: slope, frost action, wetness, stones.	Poor: slope, frost action, wetness, stones.	Fair to poor: slope, wetness, stones.
5. Vershire-Glover-Buckland.	16	Fair to poor: slope, depth to rock.	Good	Poor: slope, depth to rock, frost action.	Poor: slope, depth to rock, frost action.	Fair to poor: slope, depth to rock.
6. Colrain-Buckland-Tunbridge.	12	Fair to good: slope, stones.	Good	Fair to poor: slope, wetness, stones, depth to rock.	Fair to poor: slope, depth to rock, frost action.	Fair to poor: slope, depth to rock.
7. Pomfret-Tunbridge-Buckland.	11	Fair: slope, stones, droughty.	Good to fair: droughty.	Fair to poor: slope, depth to rock, wetness, stones.	Fair to poor: slope, depth to rock, frost action.	Fair to poor: slope, depth to rock.
8. Tunbridge-Woodstock-Colrain-Buckland.	18	Fair to poor: slope, depth to rock.	Good	Poor: slope, depth to rock.	Poor: slope, depth to rock.	Fair to poor: slope, depth to rock.
9. Tunbridge-Woodstock-Buckland.	20	Fair to poor: slope, depth to rock.	Good	Poor: slope, depth to rock, wetness.	Poor: slope, depth to rock, frost action.	Poor: slope, depth to rock.
10. Tunbridge-Woodstock-Stowe.	6	Fair to poor: slope, depth to rock.	Good	Poor: slope, depth to rock, frost action.	Poor: slope, depth to rock.	Fair to poor: slope, depth to rock.

land, buildings with onsite sewage disposal, local roads and streets, and recreational developments. Farming includes those cultivated farm crops grown extensively by farmers in the survey area. Woodland refers to land that is producing trees native to the area, or introduced species. Buildings with onsite sewage disposal refers to buildings of three stories or less that are used as dwellings. The ratings for local roads and streets apply to use of soils for construction of roads and streets that have all-weather surfacing—commonly of asphalt or concrete—that are expected to carry automobile traffic all year. Excluded from consideration are highways designed for fast-moving trucks. Recreational developments are campsites, picnic areas, ball diamonds, and similar areas that are subject to heavy foot traffic.

Soils that formed in water-deposited material in valleys

Three associations are in this group. The soils formed in water-deposited material in the Connecticut River valley and along smaller streams throughout the county. The material in which the soils formed ranges from medium to coarse in texture. Many of the soils are level, but slope ranges from level to steep. The soils nearest the streams are subject to flooding. These associations make up only a small percentage of the county, but they are important to farming. Many villages are located within these associations.

1. Hadley-Winooski-Limerick association

Level, well drained to poorly drained, medium textured soils subject to flooding; on bottom lands

This association is next to the major streams in the county. The largest areas are adjacent to the Connecticut River. Other areas of the soils in this association are adjacent to small streams and brooks throughout the county, but they are too small to show on the general soil map.

This association makes up about 1 percent of the county, or about 5,000 acres. It is about 60 percent Hadley soils, 15 percent Winooski soils, 15 percent Limerick soils, and 10 percent soils of minor extent.

The Hadley soils are well drained and medium textured. They are on higher natural levees and rises near present stream channels. Hadley soils are flooded less frequently than the other major soils, because they are higher above stream level. Some areas of Hadley soils are above normal overflow and are seldom flooded.

The Winooski soils are moderately well drained and medium textured. They are in broad, intermediate positions between Hadley and Limerick soils.

The Limerick soils are poorly drained and medium textured. They are in old stream channels and depressions. Because of their low position, Limerick soils are flooded more frequently than the higher soils in the association (fig. 3).

Soils of minor extent in this association are the very poorly drained Saco soils, the well drained Merrimac and Agawam soils, the excessively drained Windsor soils, and a few small areas of Muck.

Most areas of this association have been cleared of trees and are farmed. The main crops are corn for silage, hay, and pasture. The most poorly drained and inaccessible areas are idle or are in trees. The major limitation for farming is the hazard of flooding during spring and in other wet periods. The Limerick soils have a high water table and are excessively wet unless artificially drained. Flooding and excess wetness also are limitations for houses, septic tank absorption fields, highways, recreational facilities, and other community developments.

2. *Belgrade-Hartland association*

Level to steep, moderately well drained and well

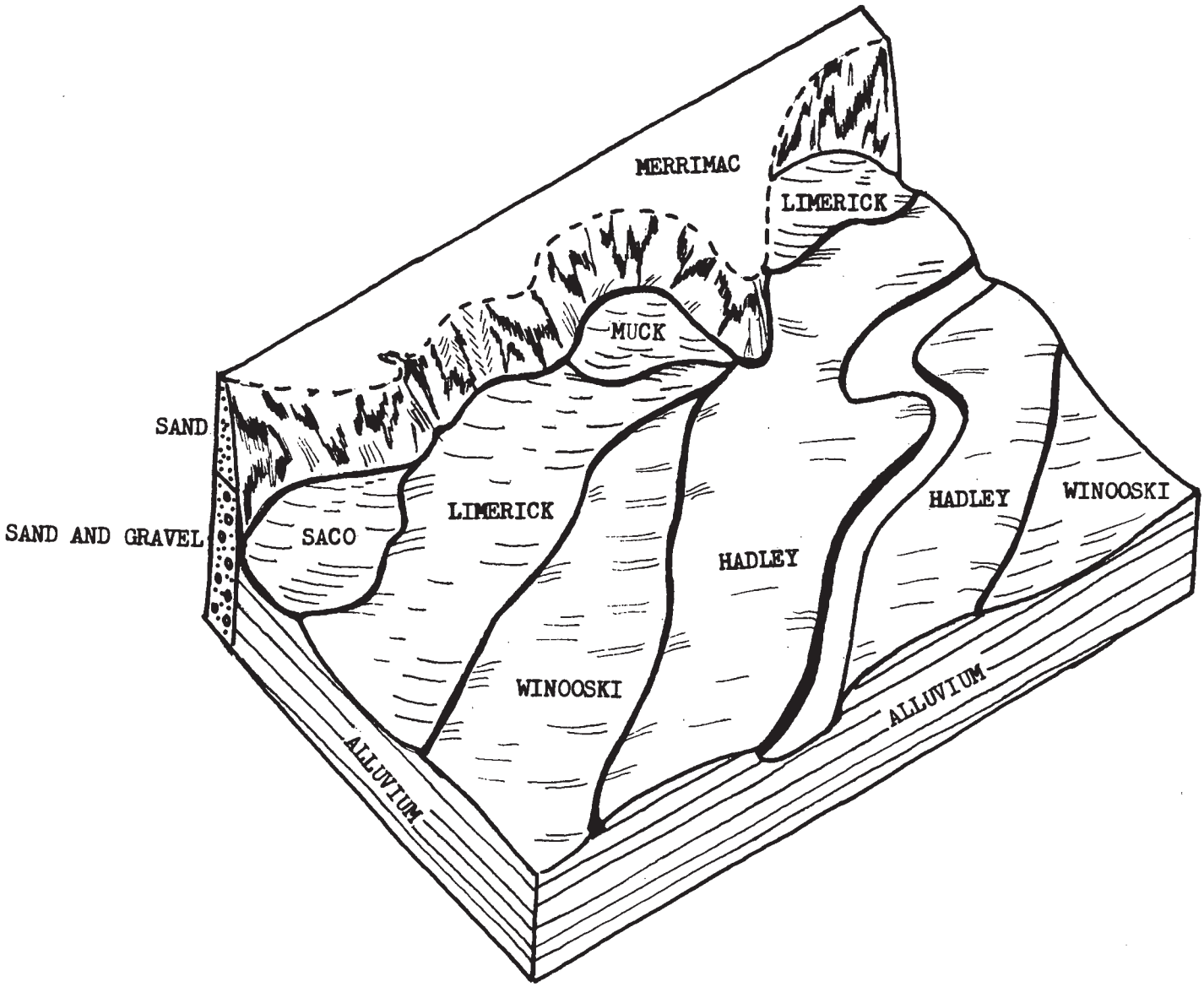

Figure 3.—**Relation of soils, parent material, and relief on the Hadley-Winooski-Limerick association**

drained, medium textured soils; on dissected stream terraces

This association is on dissected terraces along major streams of the county. The largest areas are along the Connecticut River. Other areas are on terraces along some of the small streams throughout the county, but are too small to show on the general soil map.

This association makes up about 1 percent of the county, about 5,000 acres. It is about 50 percent Belgrade soils, 40 percent Hartland soils, and 10 percent soils of minor extent.

Belgrade soils are moderately well drained and medium textured. They formed in lacustrine material. They are level to moderately steep and are in depressions and on lower side slopes of dissected terraces. These soils have a seasonal high water table.

Hartland soils are well drained and medium textured. They formed in lacustrine material. They are level to steep and are on the upper side slopes of dissected terraces. These soils have steeper slopes than other soils in this association.

Soils of minor extent in this association are the somewhat excessively drained and excessively drained Merrimac and Windsor soils, the well drained Agawam soils, the moderately well drained Ninigret and Winooski soils, and the poorly drained Limerick and Raynham Variant soils. Merrimac, Windsor, Agawam, and Ninigret soils are on terraces and are underlain by stratified sand and gravel. Winnoski and Limerick soils are along streams and are subject to flooding. The Raynham Variant soils are in depressions on terraces.

The soils in this association are used mainly for farming or woodland. The main crops are hay, pasture, and corn for silage. Areas that are steep or inaccessible are in trees or hay or are idle and are growing up to brush. The major soils have a high frost-action potential and provide poor subgrade for highways, streets, and other surfaced areas. The steep soils are very unstable when wet and are readily eroded unless protected by vegetation. Permeability is moderately slow to slow, severely restricting the absorption of effluent from septic tank absorption fields. Steep slopes in many places and a seasonal high water table in some places limit the installation of sewage disposal systems, streets, and other community developments.

3. Merrimac-Agawam-Windsor-Winooski association

Level to steep, excessively drained to well drained, moderately coarse textured and coarse textured soils on stream terraces, and moderately well drained, medium textured soils on bottom lands subject to flooding

This association is along streams (fig. 4). The larger areas are long and narrow and follow the valleys of the smaller rivers and brooks. Areas are smaller along the Connecticut River. Other areas are along some of the small streams that have narrow valleys, but these areas are too small to show on the general soil map.

This association makes up about 5 percent of the county, about 18,000 acres. It is 35 percent Merrimac

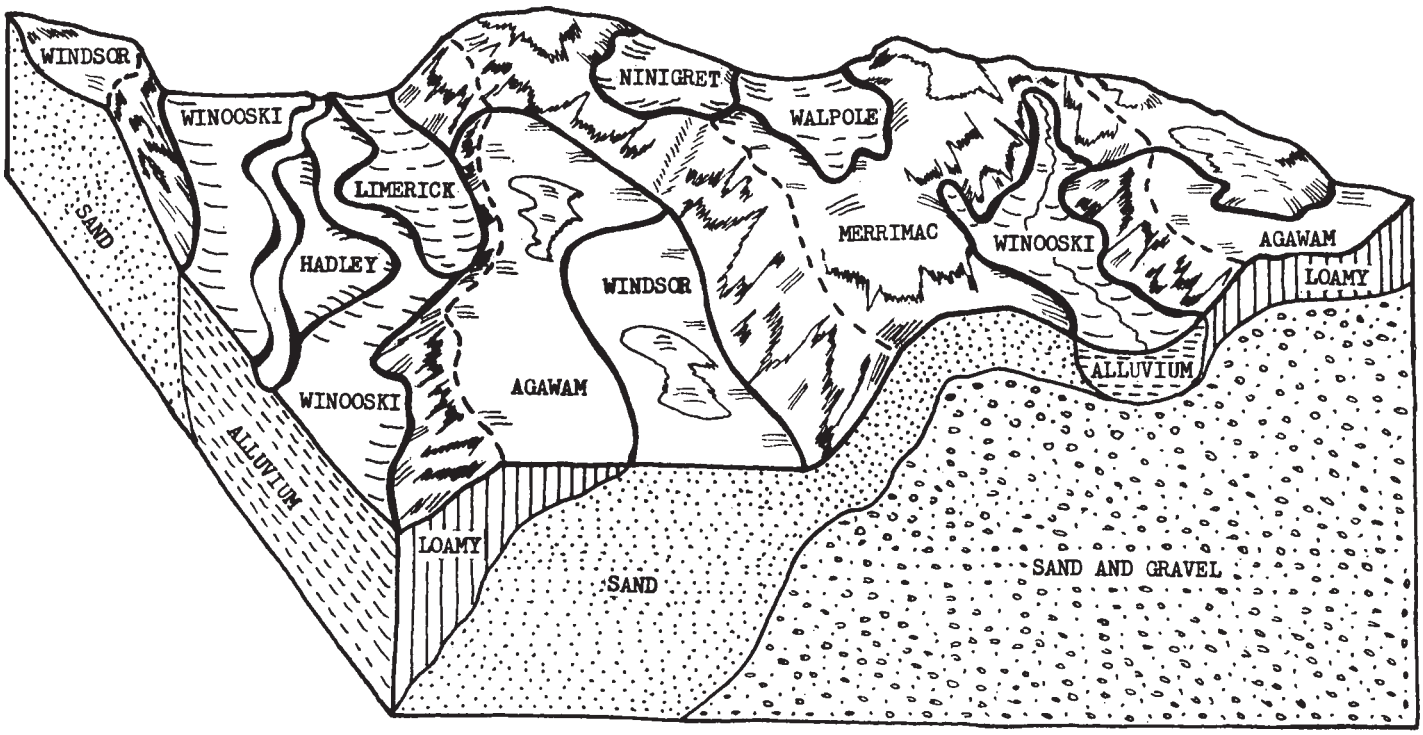

Figure 4.—Relation of soils, parent material, and relief on the Merrimac-Agawam-Windsor-Winooski association.

soils, 20 percent Agawam soils, 15 percent Windsor soils, 10 percent Winooski soils, and 20 percent soils of minor extent.

Merrimac soils are somewhat excessively drained and moderately coarse textured. They formed in water-deposited sand and gravel. They are level to steep and are on stream terraces.

Agawam soils are well drained and moderately coarse textured. They formed in water-deposited fine sandy loam over sand and gravel. They are level to steep and are on stream terraces.

Windsor soils are excessively drained and coarse textured. They formed in water-deposited sand. They are level to steep and are on stream terraces.

Winooski soils are moderately well drained and medium textured. They are in broad depressions on bottom lands that are subject to flooding.

Soils of minor extent in this association are the well drained Hadley and Hartland soils; the moderately well drained Belgrade and Ninigret soils; and the poorly drained Limerick, Raynham Variant, and Walpole soils. Ninigret and Walpole soils are on terraces that are underlain by sand and gravel. Hadley and Limerick soils are along streams and are subject to flooding. Hartland, Belgrade, and Raynham Variant soils are medium textured soils on dissected stream terraces.

The soils in this association are used primarily for farming. The main crops are hay, pasture, and corn for silage. Steep areas and inaccessible areas are in trees or are idle. Soils in this association are the main source of sand and gravel in the county. Many villages and roads are within this association. Merrimac, Agawam, and Windsor soils have few limitations for community developments where slope is not a consideration. Flooding limits the use of Winooski soils for community developments.

Soils on uplands

Seven associations are in this group. They make up about 93 percent of the county. The soils on upper side slopes, hilltops, and ridgetops are shallow to deep over bedrock and have bedrock outcrop in places; many of the soils on the lower side slopes are underlain by a fragipan. These associations are mostly wooded because of the moderately steep and steep slopes, bedrock outcrop, and surface stones. However, small farms are present throughout the area.

4. Buckland-Cabot association

Level to steep, well drained to poorly drained, deep, medium textured soils that formed in glacial till; on uplands

This association is on gently sloping to steep, middle and lower side slopes and in depressions on bedrock-controlled hills and ridges (fig. 5). It has a higher percentage of poorly drained soils than other associations of soils that formed in glacial till in this county. The soils have many stones on the surface unless they have been cleared for farming.

This association makes up about 10 percent of the county, about 45,000 acres. It is 45 percent Buckland soils, 40 percent Cabot soils, and 15 percent soils of minor extent.

Buckland soils are well drained and moderately well drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are mainly gently sloping to sloping, but slopes range from level to steep. Most areas are on the middle and lower side slopes of hills and ridges.

Cabot soils are somewhat poorly drained and poorly drained and are medium textured. A slowly permeable fragipan is at a depth of less than 24 inches. These soils are on lower side slopes and in depressions. They are mainly level to sloping, but slopes range to moderately steep.

Soils of minor extent in this association are the somewhat excessively drained Glover and Woodstock soils and the well drained Tunbridge and Vershire soils on upper side slopes and on tops of hills and ridges, the very poorly drained Peacham soils and Muck in depressions and along drainageways, small areas of soils on bottom lands that are subject to flooding, and small areas of soils on terraces along some small streams.

Much of this association has been cleared of trees and surface stones and is farmed. The soils are used mainly for hay and pasture. Some of the better drained and less sloping soils are used for corn for silage. Stone walls are common within this association. Many areas were never cleared because the soils are steep and have excess surface stones. These areas are in woodland. The major limitations for farming are excess wetness, surface stoniness, and slope. Community developments are limited by a seasonal high water table, slow permeability, and slope. Septic tank absorption fields become saturated during wet periods, and sewage effluent surfaces. Water seeps into basements, and roads are subject to frost heaving in many areas.

5. Vershire-Glover-Buckland association

Level to steep, somewhat excessively drained to moderately well drained, shallow to deep, medium textured soils that formed in glacial till; on rolling uplands

This association is on side slopes and tops of hills and ridges that are bedrock controlled. These soils are naturally very stony, but many areas have been cleared of surface stones and boulders. Most hills and ridges are gently sloping to moderately steep.

This association makes up about 16 percent of the county, about 71,000 acres. It is 30 percent Vershire soils, 25 percent Glover soils, 15 percent Buckland soils, and 30 percent soils of minor extent.

Vershire soils are well drained and medium textured. Bedrock is at a depth of 20 to 40 inches. These soils are gently sloping to steep. They are mostly on side slopes and on tops of ridges and hills in a complex pattern with Glover soils.

Glover soils are somewhat excessively drained and medium textured. Bedrock is at a depth of 10 to 20 inches. These soils are gently sloping to steep. They are on upper side slopes and on tops of ridges and hills in a complex pattern with Vershire soils. Bedrock out-

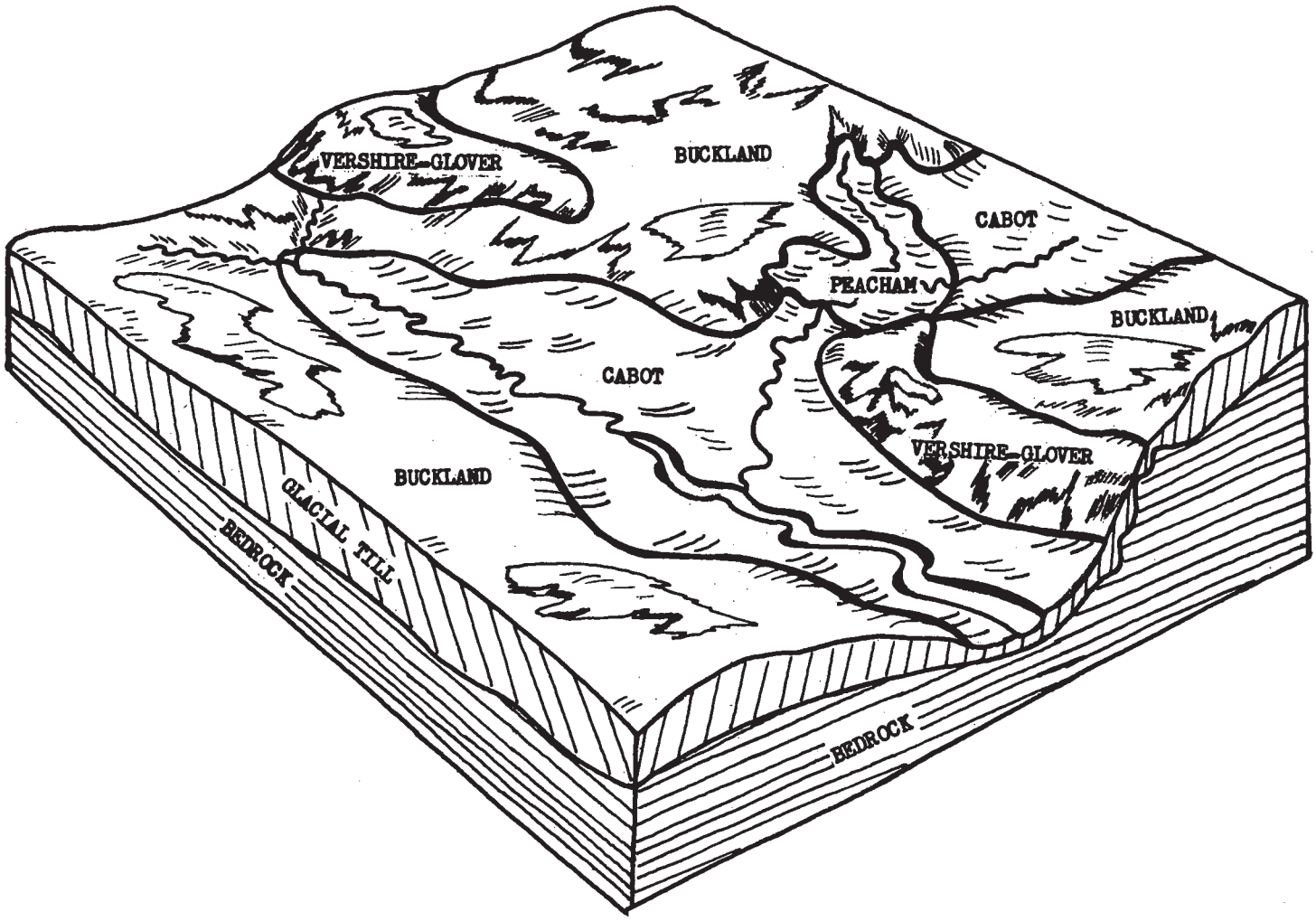

Figure 5.—**Relation of soils, parent material, and relief in the Buckland-Cabot association.**

crop is common. These soils are higher and steeper than the other soils in this association.

Buckland soils are well drained and moderately well drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are mainly gently sloping to sloping, but slopes range from level to steep. They are mostly on lower and middle side slopes of hills and ridges.

Soils of minor extent in this association are the somewhat excessively drained Woodstock soils, the well drained Colrain and Tunbridge soils on tops and upper side slopes of hills and ridges, the poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands that are subject to flooding and small areas of soils on terraces are along some small streams.

Much of this association has been cleared of trees and stones and is farmed. The soils are used mainly for hay and pasture. Corn is grown for silage on the less sloping soils. Stone walls along field boundaries are common. Some areas that were once farmed have been abandoned and are growing up to brush and trees. Some areas were never cleared because of frequent bedrock outcrop, surface stones, and steep slopes. These areas are in woodland. The major limitations for farming are bedrock outcrop, surface stones, and slope. Shallow excavations are limited by the depth to bedrock and by a slowly permeable fragipan, which causes septic tank effluent to surface during wet periods.

6. *Colrain-Buckland-Tunbridge association*

Level to steep, well drained and moderately well drained, deep to moderately deep, moderately coarse textured and medium textured soils that formed in glacial till; on hilly uplands

This association is on side slopes and tops of hills and ridges that are bedrock controlled. The soils are naturally very stony, but many areas have been cleared of surface stones and boulders. Most hills and ridges are sloping to steep.

This association makes up about 12 percent of the county, about 54,000 acres. It is about 40 percent Colrain soils, 25 percent Buckland soils, 20 percent Tun-

bridge soils, and 15 percent soils of minor extent.

Colrain soils are well drained, moderately coarse textured, and deep. They are gently sloping to steep and are on upper side slopes and tops of hills and ridges.

Buckland soils are well drained and moderately well drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are mainly gently sloping to sloping, but slopes range from level to steep. Most areas are on lower and middle side slopes.

Tunbridge soils are well drained and moderately coarse textured. Bedrock is at a depth of 20 to 40 inches. These soils are steeper than other soils in this association in some areas, but slopes range from gently sloping to steep. These soils are on tops and steep side slopes of hills and ridges. They share the highest positions in the association with Colrain soils.

Soils of minor extent in this association are the somewhat excessively drained Woodstock and Pomfret soils on the upper side slopes, the poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands that are subject to flooding and small areas of soils on terraces are along some small streams.

Much of this association has been cleared of trees and surface stones and is farmed. These soils are used mainly for hay and pasture. Some areas of less sloping soils are used for corn for silage. Stone walls are common within the association. Many old farms have been abandoned and are growing up to brush and trees. Many areas were never cleared because of steep slopes and excess surface stones. These areas are in woodland. The major limitations for farming are surface stones and steep slopes. Limitations are few for community developments on Colrain soils where slope is favorable. In Buckland and Tunbridge soils, the slowly permeable fragipan and depth to bedrock are major limitations. Septic tank effluent surfaces during wet periods, and the bedrock makes excavation difficult.

7. *Pomfret-Tunbridge-Buckland association*

Level to steep, somewhat excessively drained to moderately well drained, deep to moderately deep, coarse textured to medium textured soils that formed in glacial till; on hilly uplands

This association is on side slopes and on tops of hills and ridges that are bedrock controlled. The soils are naturally very stony, but many areas have been cleared of surface stones and boulders. The soils generally are moderately steep and steep.

This association makes up about 11 percent of the county, about 48,000 acres. It is about 35 percent Pomfret soils, 20 percent Tunbridge soils, 20 percent Buckland soils, and 25 percent soils of minor extent.

Pomfret soils are somewhat excessively drained, coarse textured, and deep. They have a high mica content. Most areas are sloping to steep and are on convex upper side slopes and on rounded hilltops.

Tunbridge soils are well drained and moderately coarse textured. Bedrock is at a depth of 20 to 40 inches. The soils are steeper than other soils in this association in some areas, but slopes range from gently sloping to steep.

Buckland soils are well drained and moderately well drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. Buckland soils are mainly gently sloping to sloping, but slopes range from level to steep. The soils are on lower and middle side slopes.

Soils of minor extent in this association are the somewhat excessively drained Woodstock soils and the well drained Colrain soils on upper side slopes, the poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands that are subject to flooding and small areas of soils on terraces are along some small streams.

Much of this association has been cleared of trees and surface stones and is farmed. The soils are used mainly for hay and pasture. A few areas of less sloping soils are used for corn for silage. Steep pastured hillsides or old pastures that are growing up to trees are characteristic of the association. Many areas were never cleared because of steep slopes and excess surface stones. These areas are in woodland. The major limitations for farming are surface stones and steep slopes. In Tunbridge and Buckland soils, the depth to bedrock and the slowly permeable fragipan limit community developments. Bedrock makes excavation difficult, and the slowly permeable fragipan causes septic tank effluent to surface during wet periods.

8. *Tunbridge-Woodstock-Colrain-Buckland association*

Gently sloping to steep, somewhat excessively drained to moderately well drained, shallow to deep, moderately coarse textured to medium textured soils that formed in glacial till; on hilly uplands

This association is on hills and ridges that are mostly covered by forest (fig. 6). Bedrock outcrop is prominent throughout the association. The soils are naturally very stony, but some areas have been cleared of surface stones and boulders.

This association makes up about 18 percent of the county, about 80,000 acres. It is about 25 percent Tunbridge soils, 20 percent Woodstock soils, 20 percent Colrain soils, 10 percent Buckland soils, and 25 percent soils of minor extent.

Tunbridge soils are well drained and moderately coarse textured. Bedrock is at a depth of 20 to 40 inches. These soils are dominantly steep, but slopes range from gently sloping to steep. They are on upper side slopes and on tops of hills and ridges in a complex pattern with Woodstock soils.

Woodstock soils are somewhat excessively drained and moderately coarse textured. Bedrock is at a depth of 10 to 20 inches. Bedrock outcrop is closely spaced. These soils are dominently steep, but slopes range from sloping to steep. They are on tops of hills and ridges in a complex pattern with Tunbridge soils.

Colrain soils are well drained, moderately coarse textured, and deep. These soils are sloping to steep. They are on middle and upper side slopes.

Buckland soils are well drained to moderately well

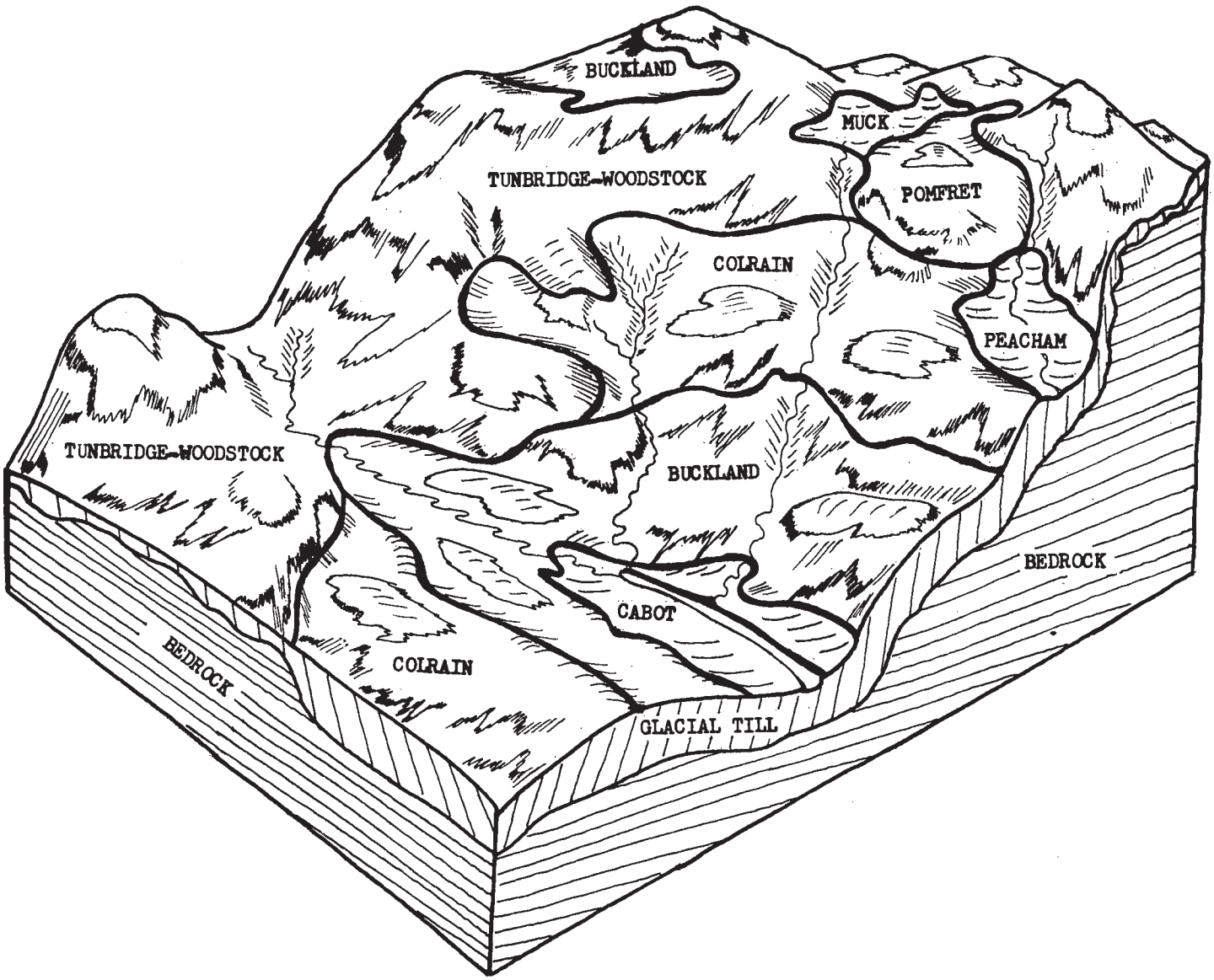

Figure 6.—**Relation of soils, parent material, and relief in the Tunbridge-Woodstock-Colrain-Buckland association.**

drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are gently sloping to steep. They are on middle and lower side slopes.

Soils of minor extent in this association are the somewhat excessively drained Pomfret soils on upper side slopes, the poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands that are subject to flooding and small areas of soils on terraces are along streams.

Some areas of this association have been cleared of trees and surface stones and are farmed. The soils are mainly used for hay and pasture. A few areas of the less sloping soils are used for corn for silage. Stone walls are common. Many old farms have been abandoned and are growing up to brush and trees. Many areas were never cleared because of bedrock outcrop, steep slopes, and surface stones. These areas are in woodland. The major limitations for farming are depth to bedrock, surface stones, and steep slopes. Depth to bedrock makes excavation difficult on Tunbridge and Woodstock soils. A slowly permeable fragipan in Buckland soils causes septic tank effluent to surface during wet periods. The sloping Colrain soils have better potential for community developments than other soils.

9. *Tunbridge-Woodstock-Buckland association*

Gently sloping to steep, somewhat excessively drained to moderately well drained, shallow to deep, moderately coarse textured to medium textured soils that formed in glacial till; on hilly uplands and mountains

This association is on hills and ridges that have scattered areas of open land and on mountains that are

covered by forest. Bedrock outcrop is prominent throughout the association. These soils are naturally very stony, but some areas have been cleared of surface stones and boulders.

This association makes up about 20 percent of the county, about 88,000 acres. It is about 25 percent Tunbridge soils, 25 percent Woodstock soils, 20 percent Buckland soils, and 30 percent soils of minor extent.

Tunbridge soils are well drained and moderately coarse textured. Bedrock is at a depth of 20 to 40 inches. These soils are dominantly steep, but slopes range from gently sloping to steep. Tunbridge soils are at higher elevations in complexes with Woodstock soils.

Woodstock soils are somewhat excessively drained and moderately coarse textured. Bedrock is at a depth of 10 to 20 inches. Bedrock outcrop is closely spaced. These soils are dominantly steep, but slopes range from sloping to steep. The soils are at higher elevations in complexes with Tunbridge soils.

Buckland soils are well drained to moderately well drained and are medium textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are dominantly sloping but range from gently sloping to steep. They are on lower side slopes.

Soils of minor extent in this association are the somewhat excessively drained Pomfret and Glover soils on higher elevations, the well drained Colrain and Vershire soils on upper side slopes, the poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands and on stream terraces are along some narrow valleys. Areas of rock outcrop are at higher elevations.

Trees and surface stones have been cleared from some areas in this association, and some of these areas are presently farmed. Stone walls are common. Abandoned farmland is idle or is growing up to brush and trees. The main crops are hay and pasture, and a small acreage is in corn for silage. Most areas were never cleared because of bedrock outcrop, surface stones, boulders, and steep slopes. These areas are in woodland. The major limitations for farming are depth to bedrock, surface stones, and steep slopes. Bedrock in Tunbridge and Woodstock soils limits the function of septic tank drainage fields and causes effluent to surface during wet periods.

10. Tunbridge-Woodstock-Stowe association

Gently sloping to steep, somewhat excessively drained to moderately well drained, shallow to deep, moderately coarse textured soils that formed in glacial till; on hilly uplands and mountains

This association is on hills and ridges that have small areas of open land and on Braintree Mountain, which is covered by forests. Rock outcrop, surface stones, and boulders are prominent in this association.

This association makes up about 6 percent of the county, about 27,000 acres. It is about 30 percent Tunbridge soils, 25 percent Woodstock soils, 15 percent Stowe soils, and 30 percent soils of minor extent.

Tunbridge soils are well drained and moderately coarse textured. Bedrock is at a depth of 20 to 40 inches. These soils are dominently steep, but slopes range from gently sloping to steep. They are on upper side slopes in complexes with Woodstock soils.

Woodstock soils are somewhat excessively drained and moderately coarse textured. Bedrock is at a depth of 10 to 20 inches. Bedrock outcrop is closely spaced. These soils are dominantly steep, but range from sloping to steep. They are on upper side slopes in a complex pattern with Tunbridge soils.

Stowe soils are well drained and moderately well drained and are moderately coarse textured. A slowly permeable fragipan is at a depth of less than 33 inches. These soils are dominantly moderately steep but range from gently sloping to steep. They are convex side slopes and rounded ridgetops.

Soils of minor extent in this association are the well drained to moderately well drained Buckland soils on middle side slopes, the somewhat poorly drained and poorly drained Cabot soils on lower side slopes, and the very poorly drained Peacham soils and Muck in depressions. Small areas of soils on bottom lands and terraces are along small streams. Rock outcrop is at higher elevations.

Trees and surface stones have been cleared from some areas, and some of these areas are presently farmed. The main crops are hay and pasture. Some farms have been abandoned and are idle or growing up to brush or trees. Stone walls are common throughout this association. Most areas were never cleared because of bedrock outcrop, surface stones, and steep slopes. These areas are in woodland. The major limitations for farming and community developments are depth to bedrock, surface stones, and steep slopes. Bedrock in Tunbridge and Woodstock soils makes excavation difficult. In Stowe soils, a slowly permeable fragipan causes septic tank effluent to surface during wet periods.

Descriptions of the soils

In this section the soils of Orange County are described in detail and their use and management are discussed. Each soil series is described in detail, and then, briefly, the mapping units in that series are described. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the soil series is

representative of mapping units in that series. If a given mapping unit has a profile in some ways different from the one described in the series, these differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit. The description of each mapping unit contains suggestions on how the soil can be managed.

As mentioned in the section "How this survey was made," not all mapping units are members of a soil series. Rock outcrop, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order with the soil series.

Preceding the name of each mapping unit is a symbol. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability subclass and woodland suitability subclass in which the mapping unit has been placed.

The acreage and proportionate extent of each mapping unit are shown in table 5. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*8*).[3]

Agawam series

The Agawam series consists of deep, well drained, level to steep soils on stream terraces (fig. 7). These soils formed in stratified outwash derived mainly from schist, granite, gneiss, and phyllite.

In a representative profile in a cultivated area, the surface layer is very dark grayish brown fine sandy loam 9 inches thick. The subsoil is between the depths of 9 and 34 inches; the upper part is dark yellowish brown and olive brown fine sandy loam, and the lower part is light olive brown loamy fine sand. The underlying material is between depths of 34 and 60 inches and is light olive gray fine sand.

Agawam soils have moderate available water capacity. Natural fertility is low. Permeability is moderately rapid, and the shrink-swell potential is low. If farmed, these soils are used mainly for hay, pasture, or corn for silage. Steep areas are in woodland or are idle.

Representative profile of Agawam fine sandy loam, 3 to 8 percent slopes, about 0.5 mile southeast of Bradford Village, 300 feet east of railroad, and 100 feet south of field road; 43°59′19″ N. and 72°6′50″ W.:

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

B21—9 to 15 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; common roots; slightly acid; clear smooth boundary.

B22—15 to 23 inches; olive brown (2.5Y 4/4) fine sandy loam; weak fine granular structure; very friable; common roots; slightly acid; clear smooth boundary.

IIB3—23 to 34 inches; light olive brown (2.5Y 5/4) loamy fine sand; single grained; loose; few roots; medium acid; clear smooth boundary.

IIC—34 to 60 inches; light olive gray (5Y 6/2) fine sand; single grained; loose; 10 percent coarse fragments; slightly acid.

Bedrock is at a depth of more than 5 feet. The solum is 18 to 34 inches thick. It is dominantly fine sandy loam but ranges to very fine sandy loam in the upper part and loamy fine sand in the lower part. Unless limed, the profile is medium acid to slightly acid throughout. The A and B

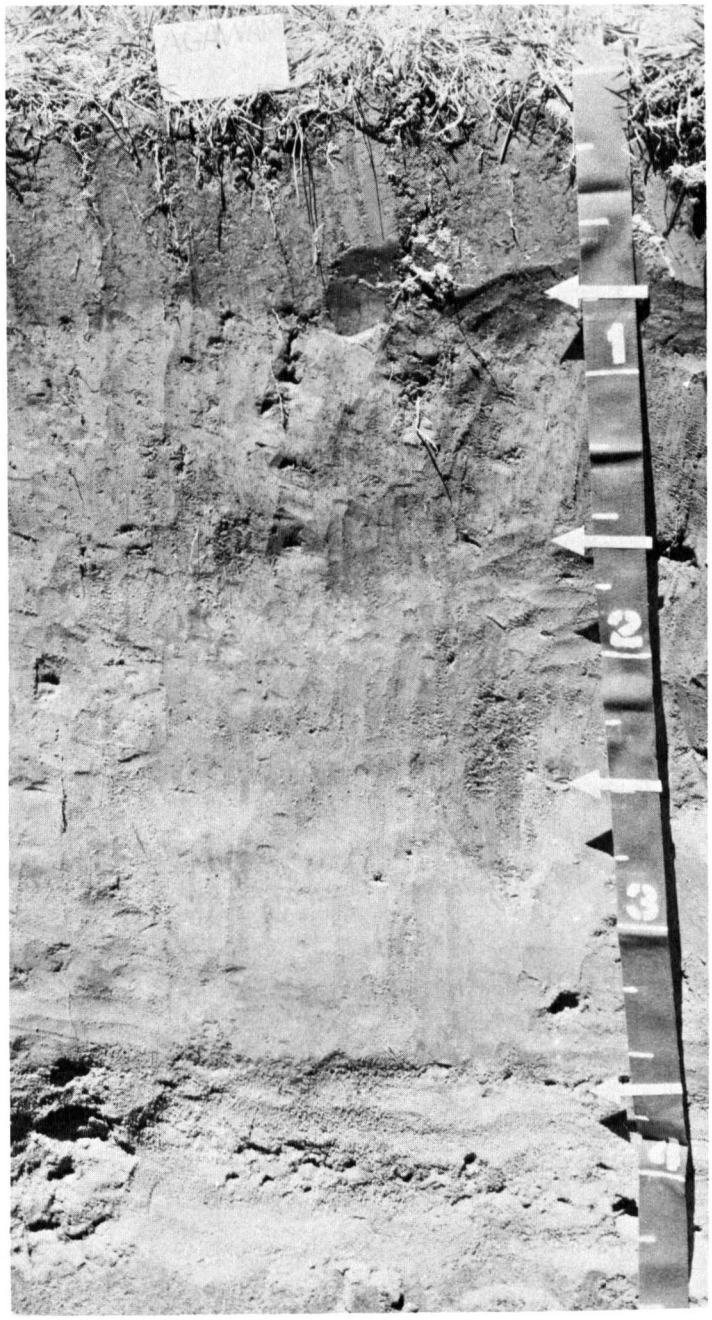

Figure 7.—**Profile of an Agawam soil showing sandy material at a depth of about 30 inches.**

[3]Italic numbers in parentheses refer to Literature Cited, p. 88.

TABLE 5.—*Acreage and proportionate extent of the soils*

Map symbol	Soil name	Acres	Percent
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	1,818	0.4
AgB	Agawam fine sandy loam, 3 to 8 percent slopes	1,394	.3
AgC	Agawam fine sandy loam, 8 to 15 percent slopes	306	(1)
AgD	Agawam fine sandy loam, 15 to 25 percent slopes	622	.1
AgE	Agawam fine sandy loam, 25 to 50 percent slopes	587	.1
BeB	Belgrade silt loam, 0 to 8 percent slopes	1,315	.3
BeC	Belgrade silt loam, 8 to 15 percent slopes	519	.1
BeD	Belgrade silt loam, 15 to 25 percent slopes	872	.2
BuB	Buckland stony loam, 3 to 8 percent slopes	14,769	3.3
BuC	Buckland stony loam, 8 to 15 percent slopes	10,939	2.5
BuD	Buckland stony loam, 15 to 25 percent slopes	3,079	.7
BvC	Buckland very stony loam, 8 to 25 percent slopes	46,694	10.6
BwE	Buckland soils, 25 to 50 percent slopes	5,850	1.3
CaB	Cabot stony silt loam, 0 to 8 percent slopes	6,846	1.6
CaC	Cabot stony silt loam, 8 to 15 percent slopes	2,064	.5
CaD	Cabot stony silt loam, 15 to 25 percent slopes	363	(1)
CbB	Cabot very stony silt loam, 3 to 15 percent slopes	52,901	12.0
CbD	Cabot very stony silt loam, 15 to 25 percent slopes	1,383	.3
CoB	Colrain stony fine sandy loam, 3 to 8 percent slopes	1,175	.3
CoC	Colrain stony fine sandy loam, 8 to 15 percent slopes	4,524	1.0
CoD	Colrain stony fine sandy loam, 15 to 25 percent slopes	4,733	1.1
CsD	Colrain very stony fine sandy loam, 8 to 25 percent slopes	36,893	8.4
CsE	Colrain very stony fine sandy loam, 25 to 50 percent slopes	23,298	5.3
CxD	Colrain extremely stony fine sandy loam, 8 to 25 percent slopes	3,934	.9
CxE	Colrain extremely stony fine sandy loam, 25 to 50 percent slopes	195	(1)
Ha	Hadley very fine sandy loam	3,270	.7
HdB	Hartland silt loam, 0 to 8 percent slopes	1,107	.3
HdC	Hartland silt loam, 8 to 15 percent slopes	229	(1)
HdD	Hartland silt loam, 15 to 25 percent slopes	219	(1)
HdE	Hartland silt loam, 25 to 50 percent slopes	743	.2
Le	Limerick very fine sandy loam	2,365	.5
MeA	Merrimac fine sandy loam, 0 to 3 percent slopes	1,402	.3
MeB	Merrimac fine sandy loam, 3 to 8 percent slopes	2,039	.5
MeC	Merrimac fine sandy loam, 8 to 15 percent slopes	814	.2
MeD	Merrimac fine sandy loam, 15 to 25 percent slopes	1,227	.3
MeE	Merrimac fine sandy loam, 25 to 50 percent slopes	919	.2
Mu	Muck	3,139	.7
NnB	Ninigret fine sandy loam, 0 to 8 percent slopes	1,775	.4
NnC	Ninigret fine sandy loam, 8 to 15 percent slopes	297	(1)
Pc	Peacham soils	3,816	.9
PoC	Pomfret stony loamy fine sand, 8 to 15 percent slopes	1,682	.4
PoD	Pomfret stony loamy fine sand, 15 to 25 percent slopes	2,002	.5
PsD	Pomfret very stony loamy fine sand, 8 to 25 percent slopes	8,389	1.9
PtE	Pomfret soils, 25 to 50 percent slopes	6,415	1.5
Ra	Raynham Variant silt loam	709	.2
Ro	Rock outcrop	1,564	.4
Sa	Saco mucky silt loam	1,319	.3
SoB	Stowe stony fine sandy loam, 3 to 8 percent slopes	118	(1)
SoC	Stowe stony fine sandy loam, 8 to 15 percent slopes	257	(1)
SoD	Stowe stony fine sandy loam, 15 to 25 percent slopes	271	(1)
StD	Stowe very stony fine sandy loam, 8 to 25 percent slopes	1,960	.4
SwE	Stowe soils, 25 to 50 percent slopes	2,405	.5
TbB	Tunbridge-Woodstock rocky fine sandy loams, 3 to 8 percent slopes	743	.2
TbC	Tunbridge-Woodstock rocky fine sandy loams, 8 to 15 percent slopes	3,197	.7
TbD	Tunbridge-Woodstock rocky fine sandy loams, 15 to 25 percent slopes	5,101	1.2
TrD	Tunbridge-Woodstock-Rock outcrop complex, 8 to 25 percent slopes	56,382	12.8
TwE	Tunbridge-Woodstock complex, 25 to 50 percent slopes	51,087	11.6
VeB	Vershire-Glover rocky loams, 3 to 8 percent slopes	2,891	.7
VeC	Vershire-Glover rocky loams, 8 to 15 percent slopes	3,927	.9
VeD	Vershire-Glover rocky loams, 15 to 25 percent slopes	1,981	.4
VgD	Vershire-Glover-Rock outcrop complex, 8 to 25 percent slopes	20,886	4.7
VhE	Vershire-Glover complex, 25 to 50 percent slopes	10,564	2.4
Wa	Walpole fine sandy loam	1,785	.4
WnB	Windsor loamy fine sand, 0 to 8 percent slopes	1,443	.3
WnD	Windsor loamy fine sand, 8 to 25 percent slopes	685	.2
WnE	Windsor loamy fine sand, 25 to 50 percent slopes	636	.1
Wo	Winooski very fine sandy loam	2,767	.6
	Gravel pits	0	(1)
	Water	0	(1)
	Total	441,600	100.0

[1]Less than 0.1 percent.

horizons are generally less than 10 percent coarse fragments. The C horizon has from 0 to 30 percent coarse fragments. Stratified sand and gravel are below a depth of 40 inches in places.

The A horizon has hue of 10YR or 2.5Y and value and chroma of 2 or 3. A lighter colored A2 horizon, 2 to 4 inches thick is present in some undisturbed areas. The B horizon has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is commonly browner in the upper part. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7, and chroma of 2 to 4.

Agawam soils are near Hartland, Windsor, Merrimac, Ninigret, and Walpole soils. Agawam soils are coarser textured in the lower part of the profile than Hartland soils. They are finer textured in the upper part of the profile than Windsor soils. Agawam soils have fewer coarse fragments than Merrimac soils. They are better drained than Ninigret and Walpole soils.

AgA—Agawam fine sandy loam, 0 to 3 percent slopes. This level soil is on stream terraces. Areas are irregular in shape and are 3 to 50 acres in size.

Included with this soil in mapping are small areas of Windsor, Merrimac, Hartland, Ninigret, and Walpole soils. Also included are small areas of soils that are finer textured and wetter than this Agawam soil and a few small areas that have stones on the surface. Included in some mapped areas are long, narrow terrace breaks that have slopes of 15 to 50 percent.

This soil is used mainly for hay and pasture. Some areas are in corn for silage. Crops on this soil respond well to lime and fertilizer. Parts of many villages are on this soil. Where this soil has no plant cover, it is subject to soil blowing. Runoff is slow. The hazard of water erosion is slight. Capability class I; woodland suitability subclass 4o.

AgB—Agawam fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is on stream terraces. Areas are irregular in shape, are commonly twice as long as they are wide, and are 3 to 50 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Windsor, Merrimac, Hartland, and Ninigret soils. Also included are small areas of soils that are finer textured and wetter than this Agawam soil and a few small areas that have stones on the surface.

This soil is used mainly for hay and pasture. Some areas are in corn for silage. Crops on this soil respond well to lime and fertilizer. Parts of many villages are on this soil. Where this soil has no plant cover, it is subject to soil blowing. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIe; woodland suitability subclass 4o.

AgC—Agawam fine sandy loam, 8 to 15 percent slopes. This sloping soil is on dissected stream terraces. Areas are slightly elongated or irregular in shape and are 3 to 50 acres in size.

Included with this soil in mapping are small areas of Windsor, Merrimac, Hartland, and Ninigret soils. Also included are areas of soils in which the underlying material has layers of si' and very fine sand. Stones are on the surface in some places.

This soil is used mainly for hay and pasture. A few areas are in corn for silage. Crops grown on this soil respond well to management that maintains soil tilth, reduces soil loss, and includes lime and fertilizer. Where this soil has no plant cover, it is subject to soil blowing. Runoff is medium. The hazard of water erosion is moderate in cultivated areas. Capability subclass IIIe; woodland suitability subclass 4o.

AgD—Agawam fine sandy loam, 15 to 25 percent slopes. This moderately steep soil is on strongly dissected stream terraces. Areas are irregular in shape and are 3 to 70 acres in size.

Included with this soil in mapping are small areas of Windsor, Merrimac, and Hartland soils. Also included are areas of soils in which the underlying material has layers of silt and very fine sand, areas where stones are on the surface, and wet spots.

This soil is used mainly for hay and pasture. A few acres are idle or are in woodland. Crops grown on this soil respond well to management that reduces soil loss and that includes lime and fertilizer. Slope limits this soil for most nonfarm uses. Where this soil has no plant cover, it is subject to soil blowing. Runoff is rapid. The hazard of water erosion is severe. Capability subclass IVe; woodland suitability subclass 4r.

AgE—Agawam fine sandy loam, 25 to 50 percent slopes. This steep soil is on strongly dissected stream terraces and along sharp terrace breaks. Areas are long and narrow or irregular in shape and are 3 to 70 acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are small areas of Windsor, Merrimac, and Hartland soils. Also included are seep spots, areas of severely eroded soils, and a few gullies.

This soil is used mainly for woodland or unimproved pasture. The operation of modern farm machinery and logging equipment is hazardous. Slope limits this soil for most nonfarm uses. Where this soil has no plant cover, it is susceptible to soil blowing. Runoff is rapid. The hazard of water erosion is severe. Capability subclass VIIe; woodland suitability subclass 4r.

Belgrade series

The Belgrade series consists of deep, nearly level to moderately steep, moderately well drained to somewhat poorly drained soils on dissected stream terraces. These soils formed in silt loam and very fine sandy loam glaciolacustrine material.

In a representative profile in a cornfield, the surface layer is very dark grayish brown silt loam 9 inches thick. The upper 10 inches of the subsoil is olive brown silt loam and light olive brown very fine sandy loam, and the lower 5 inches is firm, distinctly mottled olive silt loam. The underlying material between depths of 24 and 60 inches is firm, olive gray silt loam that has faint and distinct mottles.

Belgrade silt loam has high available water capacity. Natural fertility is high. Permeability is slow. These soils have a seasonal high water table at a depth of ½ foot to 2 feet. If farmed, these soils are used for hay, pasture, and corn for silage. A few areas are idle or in woodland.

Representative profile of Belgrade silt loam, 0 to 8 percent slopes, approximately 2 miles south of Bradford on U.S. Route 5, 300 feet south of 4 corners, and 100 feet east of railroad; 43°57′57″N. and 72°6′49″W.:

Ap—0 to 9 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

B21—9 to 14 inches; olive brown (2.5Y 4/4) silt loam; weak fine granular structure; very friable; common roots; slightly acid; abrupt smooth boundary.

B22—14 to 19 inches; light olive brown (2.5Y 5/4) very fine sandy loam; weak fine granular structure; friable; few roots; neutral; abrupt smooth boundary.

B3—19 to 24 inches; olive (5Y 5/3) silt loam; common fine distinct olive brown (2.5Y 4/4) mottles; weak fine subangular blocky structure; firm; neutral; abrupt wavy boundary.

C—24 to 60 inches; olive gray (5Y 4/2) silt loam; many moderate distinct olive brown (2.5Y 4/4) mottles and common coarse faint olive gray (5Y 5/2) mottles; massive; firm; neutral.

Bedrock is at a depth of more than 5 feet. The solum is 24 to 30 inches thick. Reaction is medium acid to neutral throughout the profile. Distinct or prominent mottling is between depths of 15 and 24 inches. Coarse fragments are not present or are less than 1 percent of all horizons. The A and B horizons are silt loam or very fine sandy loam. The C horizon is dominantly very fine sandy loam or silt loam, but has layers of very fine sand and silty clay in places.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. The B horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 3 and 4. The C horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 2 to 4.

Belgrade soils are near Agawam, Hartland, Ninigret, Walpole, and Raynham Variant soils. They are wetter than Agawam and Hartland soils. Belgrade soils are finer textured than Ninigret soils. They are better drained and finer textured than Walpole soils and are better drained than Raynham Variant soils.

BeB—Belgrade silt loam, 0 to 8 percent slopes. This level to gently sloping soil is on lower side slopes and in depressions on stream terraces. Areas are irregular in shape and are 3 to 40 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Hartland soils on low ridges and Ninigret and Raynham soils in depressions. Also included are areas of soils that are sandy loam underlain by silt and clay, areas of soils that have layers of sand and gravel at a depth of more than 24 inches, areas of soils that have more than 5 percent coarse fragments, areas that have stones on the surface, and areas of soils in which the underlying material is varved very fine sand, silt, and silty clay.

This soil is used mainly for hay, pasture, and corn for silage. A few areas are in woodland or are idle. If this soil has not been artificially drained, the water table is near the surface during the wettest part of the year and drops below a depth of 3 feet during the driest part of the year. The seasonal high water table and slow permeability delay tillage in spring and after heavy rain. Crops respond well to lime and fertilizer. Wetness and permeability limit this soil for many nonfarm uses. Runoff is slow to medium. The hazard of water erosion is slight. Capability subclass IIw; woodland suitability subclass 3o.

BeC—Belgrade silt loam, 8 to 15 percent slopes. This sloping soil is on dissected stream terraces. Areas are irregular in shape and are 3 to 40 acres in size.

Included with this soil in mapping are areas of Hartland soils on ridges and Raynham soils along drainageways and in depressions. Also included are areas of soils that have layers of sand and gravel at a depth of more than 24 inches, areas of soils that have more than 5 percent coarse fragments, areas that have stones on the surface, and areas of soils in which the underlying material is varved silt and clay. Also included are eroded areas where 3 to 9 inches of the original soil has been lost.

This soil is mainly used for hay and pasture (fig. 8). A few areas are in corn for silage. A few, small areas are used for woodland or are idle. The water table is near the surface during the wettest part of the year and drops below a depth of 3 feet during the driest part of the year. The seasonal high water table and slow permeability delay tillage in spring and after heavy rain. Crops respond well to lime and fertilizer. Wetness, permeability, and slope limit the soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate if this soil is cultivated. Capability subclass IIIe; woodland suitability subclass 3r.

BeD—Belgrade silt loam, 15 to 25 percent slopes. This moderately steep soil is on strongly dissected stream terraces. Areas are irregular in shape and are 3 to 50 acres in size.

Included with this soil in mapping are areas of Hartland soils on ridges and Raynham soils in small depressions and along drainageways. Also included are areas of soils that are sandy loam underlain by silt and clay, areas of soils that have layers of sand and gravel at a depth of more than 24 inches, areas of soils that have more than 5 percent coarse fragments, areas that have stones on the surface, and areas of soils in which the underlying material is varved silts and clays. Also included are eroded areas where 6 to 12 inches of the original soil has been lost.

This soil is mainly used for hay and pasture. Many areas are in woodland or are idle. The water table is near the surface for short periods during the wettest part of the year. Crops respond well to lime and fertilizer (fig. 9). Use of farm machinery is difficult. Wetness, permeability, and slope limit this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe if this soil is cultivated. Capability subclass IVe; woodland suitability subclass 3r.

Buckland series

The Buckland series consists of nearly level to steep, deep, stony and very stony, well drained and moderately well drained soils that are underlain by a fragipan. These soils are mostly on the middle and lower side slopes of bedrock-controlled hills and ridges. These soils formed in glacial till derived mainly from schist, shale, and sandy limestone.

In a representative profile in an orchard, the surface layer is very dark brown loam 7 inches thick. The sub-

Figure 8.—**Improved pasture on an erodible Belgrade soil.**

soil is between depths of 7 and 22 inches; it is olive brown loam in the upper part and very dark grayish brown loam in the lower part. The underlying material is firm, mottled, dark olive gray loam and olive gray silt loam.

Buckland soils have moderate available water capacity. Natural fertility is high. Permeability is moderate above the fragipan and slow in the fragipan. A seasonal high water table is above a depth of 18 to 30 inches in spring and during wet periods. Originally, most of these soils were too stony for tillage. Many areas have been cleared of surface stones and are farmed. If the stones have been piled between fields to form stone walls, the soil boundary and field boundary in places coincide.

Representative profile of Buckland loam in an area of Buckland stony loam, 3 to 8 percent slopes, in the town of Vershire approximately ½ mile south of South Vershire and 900 feet east of road, in apple orchard; 43°55′9″ N. and 72°19′30″ W.:

Ap—0 to 7 inches; very dark brown (10YR 2/2) loam; moderate fine and medium granular structure; very friable; many roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B21ir—7 to 15 inches; olive brown (2.5Y 4/4) loam; weak fine granular structure; friable; common roots; 15 percent coarse fragments; medium acid; clear wavy boundary.

B22—15 to 22 inches; very dark grayish brown (2.5Y 3/2) loam; weak fine granular structure; friable; common roots; 5 percent coarse fragments; slightly acid; clear wavy boundary.

C1x—22 to 30 inches; dark olive gray (5Y 3/2) loam; many coarse faint very dark grayish brown (2.5Y 3/2) and common medium distinct olive brown (2.5Y 4/4) mottles; massive; firm; few roots; 15 percent coarse fragments; neutral; clear smooth boundary.

C2x—30 to 60 inches; olive gray (5Y 4/2) silt loam; many coarse faint very dark grayish brown (2.5Y 3/2) and many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; 15 percent coarse fragments; neutral.

Bedrock is at a depth of more than 5 feet. The solum is 15 to 30 inches thick. The fragipan is at a depth of 16 to 33 inches. Distinct or prominent mottling is below the spodic horizon in some profiles. Unless limed, the solum is strongly acid to slightly acid. The C horizon is slightly acid to neutral. The content of coarse fragments ranges from 5 to 35 percent throughout the profile. The B and C horizons are generally loam but range from very fine sandy loam to silt loam and include the gravelly analogs. The clay content is less than 18 percent.

The A1 or Ap horizons have hue of 10YR and 2.5Y, value of 2 or 3, and chroma of 1 to 3. An A2 horizon, 1 to 4 inches thick, is present in some places. The B horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. The C horizon has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 1 or 2.

Buckland soils are near Glover, Woodstock, Vershire, Tunbridge, Colrain, Pomfret, Cabot, and Peacham soils. Buckland soils are deeper to bedrock and not so well drained as Glover, Woodstock, Vershire, and Tunbridge soils. Buckland soils are finer textured than Colrain and Pomfret soils and have a fragipan, which Colrain and Pomfret soils do not. Buckland soils are better drained than Cabot and Peacham soils.

BuB — Buckland stony loam, 3 to 8 percent slopes. This gently sloping soil is on sides of ridges and hills.

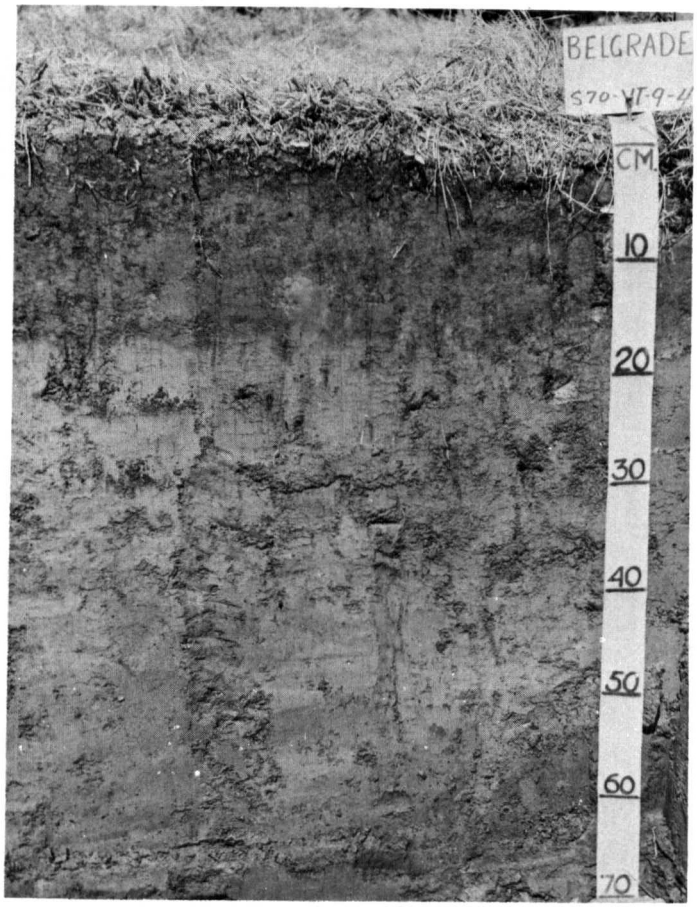

Figure 9.—**Profile of Belgrade silt loam, 15 to 25 percent slopes.**

Areas are irregular in shape and are 3 to 40 acres in size. Stones are 30 to 100 feet apart. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Glover, Vershire, and Colrain soils on slightly elevated ridges and Cabot soils in depressions and along drainageways. Also included are wet spots, bedrock outcrop, areas of soils that are underlain by sand and gravel, areas of fine sandy loam soils, and areas of soils that do not have a fragipan above a depth of 33 inches.

This soil is used mainly for hay, pasture, and corn for silage. Areas that are no longer farmed are in woodland or are idle. The seasonal high water table and the slowly permeable fragipan delay tillage in spring and after heavy rains. Surface stones hinder tillage and harvesting, but they do not prevent cultivation. Crops respond well to lime and fertilizer. Wetness, frost action, and permeability limit this soil for many nonfarm uses. Runoff is medium. If this soil is cultivated, the hazard of water erosion is slight. Capability subclass IIw; woodland suitability subclass 3o.

BuC — Buckland stony loam, 8 to 15 percent slopes. This sloping soil is on the sides of ridges and hills. Areas are irregular in shape and are 3 to 60 acres in size. Stones are commonly 30 to 100 feet apart.

Included with this soil in mapping are small areas of Glover, Vershire, and Colrain soils on ridges and Cabot soils in depressions and along drainageways. Also included are wet spots, outcrops of bedrock, areas of soils that are underlain by sand and gravel, areas of soils that are fine sandy loam throughout, and areas of soils that do not have a fragipan above a depth of 33 inches.

This soil is used mainly for hay and pasture. A few areas are in corn for silage. Areas no longer farmed are in woodland or are idle. Because surface water moves off this soil faster than off the less sloping Buckland soils, tillage is not delayed so long in spring and after heavy rains. Surface stones hinder but do not prevent cultivation. Crops respond well to lime and fertilizer. Wetness, slope, frost action, and permeability limit this soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate if this soil is cultivated. Capability subclass IIIe; woodland suitability subclass 3o.

BuD — Buckland stony loam, 15 to 25 percent slopes. This moderately steep soil is on the sides of hills and ridges. Areas are irregular in shape and are 3 to 60 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are small areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Cabot soils in depressions and along narrow drainageways. Also included are outcrops of bedrock, areas of soils that are underlain by sand and gravel, areas of fine sandy loam soils, and areas of soils that do not have a fragipan above a depth of 33 inches.

This soil is used mainly for hay and pasture. Areas no longer farmed are in woodland or are idle. Surface stones hinder but do not prevent cultivation. Crops respond well to lime and fertilizer. Use of modern farm machinery is limited on steeper slopes. Wetness, slope, frost action, and permeability limit this soil for many nonfarm uses. Runoff is rapid. The hazard of water erosion is severe if this soil is cultivated. Capability subclass IVe; woodland suitability subclass 3r.

BvC — Buckland very stony loam, 8 to 25 percent slopes. This sloping to moderately steep soil is on the sides of hills and ridges. Areas are irregular in shape and are 5 to 120 acres in size. Stones are 5 to 30 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are small areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Cabot soils in depressions and along drainageways. Also included are areas that have been cleared of surface stones but are no longer farmed, areas of a Buckland soil that has slopes of less than 8 percent, and areas of fine sandy loam soils. Also included are areas of soils that do not have a fragipan above a depth of 33 inches, areas of soils underlain by sand and gravel, outcrops of bedrock, and wet spots.

This soil is used mainly for woodland. Some areas have been cleared of trees and are used for unimproved pasture or are idle. This soil is too stony for cultivation or for the use of modern farm machinery.

Sound woodland management that includes control of erosion on logging roads is needed. Wetness, slope, frost action, permeability, and large stones limit this soil for most nonfarm uses. Runoff is medium to rapid. The hazard of erosion is moderate to severe if the soil has no plant cover. Capability subclass VIs; woodland suitability subclass 3r.

BwE — Buckland soils, 25 to 50 percent slopes. These steep soils are on the sides of hills and ridges. Areas are long and narrow or irregular in shape and are 5 to 100 acres in size. Stones are 5 to 100 feet apart. These soils have a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with these soils in mapping are small areas of Glover, Vershire, Colrain, and Pomfret soils. Also included are areas of fine sandy loam soils, areas of soils that do not have a fragipan above a depth of 33 inches, outcrops of bedrock, and seep spots on lower slopes.

These soils are used mainly for woodland. They are too stony and too steep for the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. Slope, frost action, large stones, wetness, and permeability limit this soil for most nonfarm uses. Runoff is rapid. The hazard of erosion is severe if the soil has no plant cover. Capability subclass VIIs; woodland suitability subclass 3r.

Cabot series

The Cabot series consists of deep, level to moderately steep, stony and very stony, somewhat poorly drained and poorly drained soils that are underlain by a fragipan. These soils are mostly in depressions and on lower side slopes of bedrock-controlled ridges and hills. These soils formed in glacial till derived mainly from schist, shale, and sandy limestone.

In a representative profile in a hayfield, the surface layer is very dark grayish brown silt loam 8 inches thick. The subsoil is very dark gray loam 6 inches thick and has many distinct dark yellowish brown mottles. The underlying material has distinct brown to dark brown mottles. To a depth of 30 inches it is very firm, very dark gray gravelly loam.

Cabot soils have moderate available water capacity. Natural fertility is high. Permeability is moderate above the fragipan and slow in the fragipan. A seasonal high water table is at or near the surface in spring and during other wet periods. Originally, most areas of these soils were too stony for tillage. Where the surface stones have been removed and piled along the edge of fields, the soil boundary and field boundary in places coincide. Many areas that are drained and that have been cleared of stones are farmed.

Representative profile of Cabot silt loam in an area of Cabot stony silt loam, 0 to 8 percent slopes, in the town of Randolph, about 1.2 miles east of Randolph Center, 1.3 miles south of Vermont Route 66, and 300 feet west of dirt road; 43°56′21″ N. and 72°34′57″ W.:

Ap—0 to 8 inches; very dark grayish brown (2.5Y 3/2) silt loam; moderate fine and medium granular structure; friable, slightly sticky and slightly plastic; many roots; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

Bg—8 to 14 inches; very dark gray (5Y 3/1) loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium granular structure; friable; common fine roots; few fine pores; 5 percent gravel; slightly acid; abrupt smooth boundary.

C1xg—14 to 30 inches; very dark gray (5Y 3/1) loam, common fine and medium distinct brown to dark brown (10YR 4/3) mottles; weak thick platy structure; very firm in place, firm and brittle to crush, slightly sticky and slightly plastic; few fine pores; 10 percent gravel; few incoherent remnants of weathered siliceous limestone pebbles; some mica; neutral; abrupt smooth boundary.

C2g—30 to 60 inches; very dark gray (5Y 3/1) gravelly loam, few fine distinct brown to dark brown (10YR 4/3) mottles; massive; firm in place, friable to crush; 30 percent gravel; common incoherent remnants of weathered siliceous limestone; some mica; neutral.

Bedrock is at a depth of more than 5 feet. The fragipan is at a depth of 12 to 24 inches. Mottles are faint to prominent in the B and C horizons. The A and B horizons are medium acid to neutral and the C horizon is slightly acid to neutral. The profile has 5 to 35 percent coarse fragments. The B and C horizons are fine sandy loam to silt loam or their gravelly analogs. All horizons are less than 18 percent clay.

The A horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 or 2. The Bg horizon matrix has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 1 or 2. The C horizon matrix has the same hue, value, and chroma as the B horizon, but it also has hue of 5GY, value of 4 or 5, and chroma of 1.

Cabot soils are near Glover, Woodstock, Vershire, Tunbridge, Colrain, Pomfret, Buckland, and Peacham soils. Unlike Glover, Woodstock, Vershire and Tunbridge soils, Cabot soils have a fragipan above a depth of 24 inches and are more than 40 inches deep to bedrock. Unlike Colrain and Pomfret soils, Cabot soils have a fragipan and are wetter. Cabot soils are wetter than Buckland soils but are not so wet as Peacham soils.

CaB — Cabot stony silt loam, 0 to 8 percent slopes. This level to gently sloping soil is on the lower parts of hills and ridges and along small streams and drainageways. Areas are long and narrow or irregular in shape and are 3 to 50 acres in sizes. Stones are 30 to 100 feet apart. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Buckland soils on slightly elevated ridges and Peacham soils in depressions. Also included are areas of soils that have a fragipan above a depth of 12 inches and areas of soils that do not have a fragipan above a depth of 40 inches. Also included are spots of sand and gravel along small streams, outcrops of bedrock, and some areas of soils that have a surface layer of fine sandy loam or very fine sandy loam.

This soil is used mainly for hay and pasture. Areas no longer farmed are in woodland or are idle. A seasonal high water table that is at or near the surface and depressions that are ponded delay tillage in spring and after heavy rains. Surface stones hinder tillage and harvesting but do not prevent cultivation. Crops respond well to a good management system that includes artificial drainage and application of lime and fertil-

izer. Wetness, permeability, and frost action limit this soil for many nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIIw; woodland suitability subclass 4w.

CaC—Cabot stony silt loam, 8 to 15 percent slopes. This sloping soil is on the lower parts of hills and ridges and along small streams and drainageways. Areas are long and narrow or irregular in shape and are 3 to 50 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are small areas of Buckland soils on low ridges and Peacham soils in depressions. Also included are areas of soils that have a fragipan above a depth of 12 inches and areas that do not have a fragipan above a depth of 40 inches. Also included are outcrops of bedrock and areas of soils that have a surface layer of fine sandy loam or very fine sandy loam.

This soil is used mainly for hay and pasture. Areas no longer farmed are in woodland or are idle. The seasonal high water at or near the surface delays tillage in spring and after heavy rains. Seep spots and surface stones hinder tillage and harvesting but do not prevent cultivation. Crops respond well to a good management system that includes artificial drainage and application of lime and fertilizer. Wetness, permeability, frost action, and slope limit this soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate if this soil is cultivated. Capability subclass IIIe; woodland suitability subclass 4w.

CaD—Cabot stony silt loam, 15 to 25 percent slopes. This moderately steep soil is along small streams and drainageways. Areas are long and narrow or irregular in shape and are 3 to 30 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are areas of Colrain and Buckland soils on low ridges and Peacham soils in depressions. Also included are areas of soils that have a fragipan above a depth of 12 inches and areas of soils that do not have a fragipan above a depth of 40 inches. Outcrops of bedrock are present in some areas.

This soil is used mainly for hay and pasture. Areas no longer farmed are in woodland or are idle. The seasonal high water table delays tillage and harvesting in spring and after heavy rains. Seep spots, surface stones, and slope limit the use of farm machinery. Wetness, permeability, frost action, and slope limit this soil for many nonfarm uses. Runoff is rapid. The hazard of water erosion is severe if this soil is cultivated. Capability subclass IVe; woodland suitability subclass 4w.

CbB—Cabot very stony silt loam, 3 to 15 percent slopes. This gently sloping to sloping soil is on the lower parts of hills and ridges and along small streams and drainageways. Areas are irregular in shape or elongated and are 5 to 150 acres in size. Stones are 5 to 30 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are small areas of Colrain and Buckland soils on low knolls and ridges and Peacham soils in depressions. Also included are areas of soils that have a fragipan above a depth of 12 inches and areas of soils that have a fragipan at a depth of more than 40 inches. In some areas sand and gravel have been deposited along small streams. Included are outcrops of bedrock, areas of soils that have a surface layer of fine sandy loam or very fine sandy loam, areas of soils that have slopes of less than 3 percent, and areas in which surface stones are absent or the soil is stony only in places.

This soil is mostly in woodland. A few areas have been cleared of trees and are used for unimproved pasture or are idle. Many small ponds have been constructed because this soil has a slowly permeable subsoil. This soil is too stony for the efficient use of modern farm machinery. Excess wetness limits logging. Wetness, permeability, stones, and slope limit this soil for most other uses. Runoff is slow to medium. The hazard of water erosion is slight on the gently sloping areas and moderate on the sloping areas if the areas have no plant cover. Capability subclass VIIs; woodland suitability subclass 4w.

CbD—Cabot very stony silt loam, 15 to 25 percent slopes. This moderately steep soil is on lower side slopes and along small streams and drainageways. It is in irregularly shaped areas that are 5 to 40 acres in size. Stones are 5 to 30 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are small areas of Colrain and Buckland soils on knolls and ridges. Also included are areas of soils that have a fragipan above a depth of 12 inches and areas of soils that have a fragipan at a depth of more than 40 inches. Included are deposits of sand and gravel along small streams, areas of soils that have a surface layer of fine sandy loam or very fine sandy loam, outcrops of bedrock, and areas in which surface stones are absent or the soil is stony only in places.

This soil is mostly in woodland. A few areas have been cleared of trees. These areas are used for unimproved pasture or are idle. Numerous surface stones restrict the efficient use of modern farm machinery. Excess wetness hinders logging. Management is needed to control erosion on logging roads. Wetness, permeability, stones, and slope limit this soil for most other uses. Runoff is rapid. The hazard of water erosion is severe if the soil has no plant cover. Capability subclass VIIs; woodland suitability subclass 4w.

Colrain series

The Colrain series consists of gently sloping to steep, deep, stony to extremely stony, well drained soils. These soils are mainly in convex areas on the sides and tops of hills and ridges where the topography is bedrock controlled. They formed in glacial till derived mainly from siliceous limestone and schistose rocks.

In a representative profile in a cultivated area, the

surface layer is very dark grayish brown fine sandy loam 6 inches thick. The subsoil is fine sandy loam 27 inches thick. The upper part is dark yellowish brown, the middle part is olive brown, and the lower part is light olive brown. The underlying material to a depth of 60 inches is dark grayish brown fine sandy loam.

Colrain soils have moderate available water capacity. Natural fertility is medium. Permeability is moderately rapid. Originally, most areas of the Colrain soils were too stony for tillage, but many areas have been cleared of surface stones and are now being farmed. In many of these cleared areas, the stones and cobbles have been piled along the field boundary to form stone walls. Along these walls the soil boundary in places is a straight line. These cleared areas are used mainly for hay, pasture, and corn for silage. In areas where the surface stones have not been removed and in areas that are no longer being farmed, these soils are forested or are idle.

Representative profile of Colrain fine sandy loam in an area of Colrain very stony fine sandy loam, 25 to 50 percent slopes, about 0.6 mile southwest of Topsham Four Corners, and 200 feet south of the road; 44°5'55" N. and 72°14'10" W.:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; very friable; many roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B21ir—6 to 13 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; slightly acid; clear smooth boundary.

B22—13 to 24 inches; olive brown (2.5Y 4/4) fine sandy loam; weak fine granular structure; very friable; common roots; 5 percent coarse fragments; neutral; clear smooth boundary.

B3—24 to 33 inches; light olive brown (2.5Y 5/4) fine sandy loam; massive; friable; few roots; 10 percent coarse fragments; weathered fragments of limestone; neutral; abrupt smooth boundary.

C—33 to 60 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; massive; friable; few roots; 10 percent coarse fragments; weathered fragments of limestone; neutral.

Bedrock is at a depth of more than 5 feet. The solum is 14 to 34 inches thick. The upper part of the solum is strongly acid to slightly acid, and the lower part is medium acid to neutral. The C horizon is medium acid to neutral. The profile is generally less than 20 percent coarse fragments, but it is as much as 35 percent. The B and C horizons are dominantly fine sandy loam or sandy loam or their gravelly analogs.

The A horizon has hue of 10YR or 2.5Y and value and chroma of 2 or 3. An A2 horizon, 2 to 4 inches thick, is present in undisturbed areas. The B horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 or 4. The upper part of the B horizon is brighter colored than the lower part. The C horizon has hue of 10YR to 5Y, value of 2 to 5, and chroma of 2 or 3.

Colrain soils are near Glover, Woodstock, Tunbridge, Vershire, Pomfret, Buckland, Cabot, and Peacham soils. Colrain soils are deeper than Glover, Woodstock, Tunbridge, and Vershire soils. They contain less mica and are finer textured than Pomfret soils. Colrain soils do not have a fragipan, which is present in Buckland, Cabot, and Peacham soils, and they are better drained than those soils.

CoB—Colrain stony fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is on elongated hills. Areas are irregular in shape and are 3 to 50 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are small areas of Woodstock, Tunbridge, Pomfret, Buckland, and Cabot soils. Also included are areas of level Colrain soils and some areas of soils covered by colluvial material. In some places compact glacial till is at a depth of less than 30 inches. Bedrock is exposed in places.

This soil is used mainly for hay and pasture. Corn is grown for silage in places. Areas no longer farmed are in woodland or are idle. Surface stones hinder tillage and harvesting but do not prevent cultivation. Crops grown on this soil respond well to lime and fertilizer. This soil has few limitations for most nonfarm uses where slope is not a consideration. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIe; woodland suitability subclass 3o.

CoC—Colrain stony fine sandy loam, 8 to 15 percent slopes. This sloping soil is on hills. Areas are irregular in shape and are 3 to 50 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are areas of Woodstock, Tunbridge, Pomfret, Buckland, and Cabot soils. Also included are steeper soils, outcrops of bedrock, and soils that have compact till at a depth of less than 30 inches.

This soil is used mainly for hay and pasture. Corn is grown for silage in a few areas. Areas no longer farmed are idle or are reverting to woodland. Surface stones hinder tillage and harvesting but do not prevent cultivation. A management system is needed that conserves soil moisture and keeps soil losses to a minimum. Crops grown on this soil respond well to lime and fertilizer. This soil has few limitations for most nonfarm uses where slope is not a consideration. Runoff is medium. The hazard of water erosion is moderate when the soil is cultivated. Capability subclass IIIe; woodland suitability subclass 3o.

CoD—Colrain stony fine sandy loam, 15 to 25 percent slopes. This moderately steep soil is on hills and ridges. Areas are irregular in shape and are 5 to 70 acres in size. Stones are 30 to 100 feet apart.

Included with this soil in mapping are areas of Woodstock, Tunbridge, Pomfret, and Buckland soils. Also included are areas of steeper soils, wet spots, outcrops of bedrock, and areas of soils that have compact till at a depth of less than 30 inches.

This soil is used mainly for hay and pasture. Areas that are no longer farmed are idle or are reverting to woodland. Surface stones hinder tillage and harvesting but do not prevent cultivation. A management system is needed that conserves moisture and keeps soil losses to a minimum. Crops grown on this soil respond well to lime and fertilizer. Slope limits this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe when the soil is cultivated. Capability subclass IVe; woodland suitability subclass 3r.

CsD—Colrain very stony fine sandy loam, 8 to 25 percent slopes. This sloping to moderately steep soil is on hills and ridges. Areas are irregular in shape and are 5 to 100 acres in size. Stones are 5 to 30 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, Pomfret, Buckland, and Cabot soils. Also included are areas that have been cleared of stones in the past but are no longer farmed, outcrops of bedrock, wet spots, and areas of soils that have a compact layer above a depth of 30 inches.

Most areas of this soil are forested. Some areas are free of trees and are used for unimproved pasture or are idle. This soil is too stony for cultivation. The numerous surface stones prevent the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. Excessive slope and large stones limit this soil for many nonfarm uses. Runoff is slow to medium. The hazard of water erosion is moderate to severe where the soil has no plant cover. Capability subclass VIs; woodland suitability subclass 3r.

CsE—Colrain very stony fine sandy loam, 25 to 50 percent slopes. This steep soil is on hills and ridges. Areas are irregular in shape or long and narrow and are 5 to 150 acres in size. Stones are 5 to 30 feet apart. This soil has the profile described as representative of the Colrain series. In many areas the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, Pomfret, Vershire, and Buckland soils. Also included are outcrops of bedrock, wet spots, and areas of soils that have a compact layer above a depth of 30 inches. Some areas have been cleared of surface stones.

Most areas of this soil are forested. A few areas have been cleared of trees and are used as unimproved pasture or are idle. The soil is too stony and too steep for cultivation. Sound woodland management that includes control of erosion on logging roads is needed. The steep slopes limit the use of logging equipment. Large stones and steep slopes limit the soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where there is no plant cover. Capability subclass VIIs; woodland suitability subclass 3r.

CxD—Colrain extremely stony fine sandy loam, 8 to 25 percent slopes. This sloping to moderately steep soil is on hills and ridges. Areas are irregular in shape and are 5 to 200 acres in size. Stones are 2½ to 5 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, Buckland, and Cabot soils. Also included are areas that have been cleared of stones in the past but are no longer farmed, outcrops of bedrock, wet spots, and areas of soils that have a compact layer above a depth of 30 inches. In a few areas soils are more than 35 percent coarse fragments.

Most areas of this soil are in woodland. A few areas are free of trees and are used for unimproved pasture or are idle. This soil is too stony for cultivation. The closely spaced surface stones prevent the use of modern farm machinery, and hinder the use of logging equipment. Sound woodland management that includes control of erosion on logging roads is needed. Large stones and excessive slope limit this soil for most nonfarm uses. Runoff is slow to medium. The hazard of water erosion is moderate to severe where the soil has no plant cover. Capability subclass VIIs; woodland suitability subclass 3x.

CxE—Colrain extremely stony fine sandy loam, 25 to 50 percent slopes. This steep soil is on hills and ridges. Areas are irregular in shape or long and narrow and are 5 to 200 acres in size. Stones are 2½ to 5 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, and Buckland soils. Also included are outcrops of bedrock, wet spots, and areas of soils that have a compact layer above a depth of 30 inches. In a few areas are soils that are more than 35 percent coarse fragments.

Most areas of this soil are in woodland. The soil is too steep and too stony for cultivation. Sound woodland management that includes control of erosion on logging roads is needed. The steep slopes and closely spaced surface stones limit use of logging equipment. Steep slopes and large stones limit this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe in areas that have no plant cover. Capability subclass VIIs; woodland suitability subclass 3x.

Glover series

The Glover series consists of gently sloping to steep, shallow, rocky and very rocky, somewhat excessively drained soils. These soils are mainly on upper side slopes and on tops of hills and ridges where the topography is bedrock controlled. They formed in glacial till derived mainly from limestone, schist, and shale. These soils are mapped only in complexes with Vershire soils.

In a representative profile in a plowed area, the surface layer is very dark grayish brown loam 8 inches thick. The subsoil is dominantly olive brown loam. Schistose bedrock is at a depth of 19 inches.

Glover soils have low available water capacity. Natural fertility is medium. Permeability is moderate. Most areas of this soil have closely spaced outcrops of bedrock. Originally, most areas were too stony for tillage. Many areas have been cleared of surface stones and are farmed. Where the stones have been piled along the edge of fields to form stone walls, the soil boundary and field boundary in places coincide.

Representative profile of Glover loam in an area of Vershire-Glover rocky loams, 8 to 15 percent slopes, in the town of Tunbridge about 1¾ miles southeast of East Randolph, 700 feet west of Randolph town line, and 300 feet east of road; 45°54′43″ N. and 72°32′43″ W.:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam; grayish brown (2.5Y 5/2) dry; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21ir—8 to 17 inches; olive brown (2.5Y 4/4) loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.
B22—17 to 19 inches; olive (5Y 4/3) loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid.
R—19 inches; schistose bedrock.

Bedrock is at a depth of 10 to 20 inches. Depth to bedrock typically coincides with the thickness of the solum. Reaction is strongly acid to slightly acid throughout the profile. The solum is 5 to 25 percent coarse fragments, and the C horizon, when present, is 5 to 35 percent. The B and C horizons are typically loam, but in places they are silt loam and channery and gravelly analogs of these textures. Clay content is less than 18 percent in all horizons.

The A horizon has hue of 10YR or 2.5Y, value of 3, and chroma of 2 or 3. A weakly developed A2 horizon is in some profiles. The B horizon has hue of 10YR to 5Y, value of 3, and chroma of 2 to 4. The B horizon is redder in the upper part than in the lower part. The C horizon, where present, has hue of 2.5Y, or 5Y value of 3 or 4, and chroma of 2 or 3.

Glover soils are near Woodstock, Vershire, Tunbridge, Colrain, Pomfret, Buckland, Cabot, and Peacham soils. Glover soils are finer textured than Woodstock soils. They are shallower than Vershire soils. Glover soils are finer textured and shallower than Tunbridge, Colrain, and Pomfret soils. Glover soils do not have the fragipan which is present in Buckland, Cabot, and Peacham soils, and they are better drained than those soils.

Hadley series

The Hadley series consist of deep, well drained level soils on the flood plains of the major streams and their tributaries. These soils formed in very fine sandy loam and silt loam alluvium.

In a representative profile in a cultivated area, the surface layer is very dark grayish brown very fine sandy loam 11 inches thick. The next 17 inches is dark grayish brown very fine sandy loam. Below a depth of 28 inches is olive very fine sandy loam that has very dark grayish brown bands ½ to 1 inch thick.

Hadley soils have high available water capacity. Natural fertility is high. Permeability is moderate. Frequency of flooding ranges from 1 to 2 times a year to once in 10 years or more. These soils are used mainly for farming.

Representative profile of Hadley very fine sandy loam, in the town of Bradford about ½ mile south of Newbury town line and 1,500 feet east of U.S. Route 5; 44°1′33″ N. and 72°5′7″ W.:

Ap—0 to 11 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam, grayish brown (2.5Y 5/2) dry; weak fine granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.
C1—11 to 28 inches; dark grayish brown (2.5Y 4/2) very fine sandy loam; weak fine granular structure; very friable; common roots; slightly acid; gradual smooth boundary.
C2—28 to 64 inches; olive (5Y 4/3) very fine sandy loam; very dark grayish brown (2.5Y 3/2) bands ½ to 1 inch thick; massive; very friable; few roots; slightly acid.

Bedrock is at a depth of more than 5 feet. The reaction is medium acid to slightly acid in all horizons. The profile is 0 to 5 percent coarse fragments throughout. The A horizon is very fine sandy loam or silt loam. The C horizon is loamy very fine sand to silt loam or silt. The clay content is less than 18 percent in all horizons.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 to 4. The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4.

Hadley soils are near Winooski, Limerick, and Saco soils. They have no mottling whereas Winooski and Limerick soils have mottles. Hadley soils do not have the high water table and the very dark gray or black surface layer that is present in Saco soils.

Ha—Hadley very fine sandy loam. This level soil is in areas that are parallel to the nearby stream. These areas are irregular in shape and are 3 to 4 times as long as they are wide. They are 3 to 200 acres in size. This soil has the profile described as representative of the Hadley series.

Included with this soil in mapping are small areas of Winooski and Limerick soils in depressions and along drainageways. Also included are narrow escarpments that have slopes of more than 8 percent, areas of soils that are underlain by sand and gravel, areas that have sand and gravel on the surface, and areas of soils that are fine sandy loam and loamy fine sand below the surface layer. In some places the surface layer is silt loam, fine sandy loam, or loamy fine sand.

This soil is used mainly for corn for silage, hay, and pasture. A few areas are idle, and some inaccessible areas are in woodland. Crops respond well to lime and fertilizer. Spring flooding delays the planting of crops in some years. In a few areas considerable debris is deposited by flood water. Flooding limits the use of this soil for most nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Streambank erosion is a concern along some streams. Capabiilty class I; woodland suitability subclass 3o.

Hartland series

The Hartland series consists of level to steep, deep, well drained soils on dissected stream terraces. They formed in glaciolacustrine silt and very fine sandy loam.

In a representative profile in a cultivated area, the surface layer is dark grayish brown silt loam 6 inches thick. The silt loam subsoil is 13 inches thick. The upper part is olive brown, and the lower part is light olive brown. The underlying material between depths of 19 and 60 inches is varves of dark grayish brown and olive silt and of light olive brown, yellowish brown, and olive very fine sandy loam.

Hartland soils have a high available water capacity. Natural fertility is high. Permeability is moderately slow. These soils are used mainly for hay, pasture, and silage corn. Steep slopes are in woodland or are idle.

Representative profile of Hartland silt loam, 15 to 25 percent slopes, in the town of Bradford, about 1,000 feet north of Bradford Center School, east side of knoll, 25 feet from the top of knoll, and 100 feet west of woods; 44°00′55″ N. and 72°10′08″ W.:

Ap—0 to 6 inches; dark grayish brown (2.5Y 4/2) silt loam; weak fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.
B21—6 to 15 inches; olive brown (2.5Y 4/4) silt loam; weak fine granular structure; very friable; many roots; slightly acid; clear wavy boundary.

B22—15 to 19 inches; light olive brown (2.5Y 5/4) silt loam; weak fine granular structure; very friable; common roots; neutral; abrupt wavy boundary.

C1—19 to 32 inches; dark grayish brown (2.5Y 4/2) silt varves and light olive brown (2.5Y 5/4) very fine sandy loam varves; weak thick platy structure; friable; common roots; neutral; gradual smooth boundary.

C2—32 to 60 inches; olive (5Y 4/3 and 5Y 5/3) silt varves and yellowish brown (10YR 5/6) and olive (5Y 4/3 and 5Y 5/3) very fine sandy loam varves; medium to thick platy structure; friable; few roots; neutral.

Bedrock is at a depth of more than 5 feet. The solum is 16 to 30 inches thick. Reaction is medium acid to neutral in all horizons. Coarse fragments are absent or are less than 1 percent throughout. The profile is very fine sandy loam, silt loam, or silt throughout.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. An A2 horizon, 2 to 4 inches thick, is present in undisturbed areas. The B21 horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 4 to 6. The B22 horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 3 or 4. The C horizon has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 2 to 6.

Hartland soils are near Agawam, Windsor, Merrimac, Ninigret, Belgrade, Walpole, and Raynham Variant soils. Hartland soils have less fine, medium, and coarse sand than the Agawam and Windsor soils. They do not have the high gravel content common to Merrimac soils. Hartland soils have less fine, medium, and coarse sand and are better drained than the Ninigret and Walpole soils. They are better drained than the Raynham Variant soils.

HdB—Hartland silt loam, 0 to 8 percent slopes. This level to gently sloping soil is on terraces. Areas are irregular in shape and are 3 to 30 acres in size.

Included with this soil in mapping are areas of Windsor, Agawam, Belgrade, and Raynham Variant soils. Also included are areas of soils that have up to 10 percent coarse fragments and areas in which surface stones are less than 100 feet apart. Some areas of soils that have a very fine sandy loam surface layer are also included.

This soil is used mainly for hay, pasture, and corn for silage. A small area is in woodland or is idle. Crops respond well to lime and fertilizer. Frost action and the low strength when wet limit this soil for most nonfarm uses. Runoff is slow. The hazard of water erosion is generally slight when the soil is cultivated. Gullies develop readily where concentrated water flows across unprotected areas. Capability subclass IIe; woodland suitability subclass 3o.

HdC—Hartland silt loam, 8 to 15 percent slopes. This sloping soil is on dissected terraces. Areas are irregular in shape and are 3 to 50 acres in size.

Included with this soil in mapping are areas of Windsor, Agawam, and Belgrade soils. Some areas have up to 10 percent coarse fragments and surface stones are less than 100 feet apart and some areas of soils have a surface layer of very fine sandy loam.

This soil is used mainly for hay and pasture. A few areas are in corn for silage. A small area is in woodland or is idle. Crops respond well to lime and fertilizer. Management is needed to prevent excessive soil loss. Slope, frost action, and low strength limit this soil for most nonfarm uses. Runoff is medium. The hazard of water erosion is moderate when the soil is cultivated. Gullies develop readily where concentrated water flows across unprotected areas. Capability subclass IIIe; woodland suitability subclass 3r.

HdD—Hartland silt loam, 15 to 25 percent slopes. This moderately steep soil is on strongly dissected terraces. Areas are irregular in shape and are 3 to 50 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Windsor, Agawam, and Belgrade soils. Some areas have up to 10 percent coarse fragments and surface stones less than 100 feet apart. Also included are areas of soils that have a surface layer of very fine sandy loam, seep spots, outcrops of bedrock, and small eroded spots.

This soil is used mainly for hay and pasture. A few areas are idle or in woodland. Crops respond well to a management system that includes application of lime and fertilizer. Management practices are needed to prevent excessive soil loss. Slope, frost action, and low strength limit this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe when the soil is cultivated. Gullies develop readily where water flows through drainageways that have no plant cover. Capability subclass IVe; woodland suitability subclass 3r.

HdE—Hartland silt loam, 25 to 50 percent slopes. This steep soil is on long, narrow terrace breaks and on dissected terraces. Areas are irregular in shape and are 3 to 50 acres in size. This soil is similar to the one described as being representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Windsor and Agawam soils. Some areas have up to 10 percent coarse fragments and stones less than 100 feet apart. Also included are areas of very fine sandy loam soils, outcrops of bedrock, severely eroded spots, and seep spots. A few gullies are also included.

Most areas of this soil are in woodland or unimproved pasture. A few areas are idle. These soils are too steep to operate modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. Slope, frost action, and low strength limit this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where this soil is not protected. Gullies form readily where water flows through drainageways that have no plant cover. Capability subclass VIIe; woodland suitability subclass 3r.

Limerick series

The Limerick series consists of level, deep, poorly drained soils on the flood plains of major streams and their tributaries. These soils formed in very fine sandy loam and silt loam alluvial deposits.

In a representative profile in a hayfield, the surface layer is very dark grayish brown very fine sandy loam 5 inches thick. The underlying material is dark olive gray and olive gray very fine sandy loam that has distinct olive brown mottles and extends to a depth of 60 inches.

Limerick soils have a high available water capacity.

Natural fertility is high. Permeability is moderate. The water table is within 1 foot of the surface in spring and after heavy rains. Most areas are flooded for several days early in spring. These soils are used mainly for hay and pasture.

Representative profile of Limerick very fine sandy loam, in the town of Newbury 1½ miles south of Newbury Village, 600 feet east of the railroad, and 800 feet north of the Connecticut River; 44°3′38″ N. and 72°3′38″ W.:

Ap—0 to 5 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam; moderate fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

C1g—5 to 10 inches; dark olive gray (5Y 3/2) very fine sandy loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak thick platy structure; very friable; common roots; slightly acid; gradual smooth boundary.

C2g—10 to 28 inches; olive gray (5Y 4/2) very fine sandy loam; many medium distinct olive brown (2.5Y 4/4) mottles; massive; friable; few roots; slightly acid; gradual smooth boundary.

C3g—28 to 60 inches; olive gray (5Y 4/2) very fine sandy loam; many medium distinct olive brown (2.5Y 4/4) mottles; massive; friable; neutral.

Bedrock is at a depth of more than 5 feet. Faint to prominent mottles are at a depth of less than 12 inches. The reaction is medium acid to neutral below the A horizon. Coarse fragments are generally not present in the profile or are less than 3 percent. The C horizon is dominantly very fine sandy loam but in places it is silt loam. Clay content is less than 18 percent in all horizons.

The A1 and Ap horizons are very dark grayish brown (10YR 3/2) to olive (5Y 4/3). The C horizon matrix has hue of 2.5Y and 5Y, value of 4 or 5, and chroma of 1 or 2.

Limerick soils are near Hadley, Winooski, and Saco soils. Limerick soils have mottles, whereas Hadley soils do not, and they are grayer than Hadley soils. They have mottles closer to the surface than Winooski soils. Limerick soils are not so wet as Saco soils and do not have the thick very dark gray or black surface layer that Saco soils have.

Le—Limerick very fine sandy loam. This level soil is in long, narrow depressions. Areas are irregular in shape and are 3 to 40 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small convex areas of Winooski soils and areas of Saco soils in depressions. Also included are areas that have fresh deposits of sand, gravel, and cobble on the surface and areas of soils that are underlain by sand and gravel. Some areas of soils that have a surface layer of silt loam or loamy fine sand are also included.

This soil is used mainly for hay and pasture. A few areas are used for corn for silage. Small areas are idle or in woodland. Frequent flooding limits the use of some areas, and flood debris must be removed from the surface. Most areas respond well to artificial drainage, but suitable outlets are difficult to locate. This soil is limited for most nonfarm uses because it is subject to flooding and excess wetness. Runoff is slow. The hazard of water erosion is slight if the soil is cultivated. Capability subclass IIIw; woodland suitability subclass 4w.

Merrimac series

The Merrimac series consists of level to steep, deep, somewhat excessively drained soils on terraces. These soils formed in stratified outwash sand and gravel (fig. 10) derived from granite, schist, quartzite, gneiss, and phyllite.

In a representative profile in a hayfield, the surface layer is very dark grayish brown fine sandy loam 6 inches thick. The upper 10 inches of the subsoil is brown to dark brown grading to yellowish brown fine sandy loam, and the lower 7 inches is brown sandy loam. The underlying material to a depth of 60 inches is olive gray gravelly sand.

Merrimac soils have low available water capacity. Natural fertility is low. Permeability is rapid. When farmed, these soils are used mainly for hay, pasture, or corn for silage. Many gravel pits are in areas of these soils. Steep areas are in forests or are idle.

Representative profile of Merrimac fine sandy loam, 0 to 3 percent slopes, about 2 miles west of Randolph, 200 feet west of Third Branch of White River, and 400 feet south of Riford Brook; 43°56′17″ N. and 72°42′43″ W.:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many roots; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

Figure 10.—**Profile of a Merrimac soil showing the gravelly sand substratum at a depth of about 28 inches.**

B21ir—6 to 10 inches; brown to dark brown (7.5YR 4/4) fine sandy loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; medium acid; abrupt wavy boundary.

B22—10 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; medium acid; clear smooth boundary.

B3—16 to 23 inches; brown (10YR 5/3) sandy loam; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; medium acid; abrupt smooth boundary.

IIC—23 to 60 inches; olive gray (5Y 4/2) gravelly sand; single grained; loose; few roots; 60 percent coarse fragments; medium acid.

Bedrock is at a depth of more than 5 feet. The solum is 18 to 30 inches thick. Reaction is medium acid to strongly acid in all horizons. The A and B horizons generally are less than 20 percent coarse fragments, but can be as much as 30 percent. The C horizon is 30 to 70 percent. The C horizon is 30 to 70 percent coarse fragments. The solum is mainly fine sandy loam, but in places, it is sandy loam and the gravelly analogs.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. An A2 horizon, 2 to 5 inches thick and having grayer colors, is present in places in undisturbed areas. The B horizon has hue of 7.5YR and 10 YR, value of 4 to 6, and chroma of 2 to 4. The upper part of the B horizon is browner than the lower part. The stratified sand and gravel in the IIC horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 or 3.

Merrimac soils are near Windsor, Agawam, Hartland, Ninigret, and Walpole soils. Merrimac soils have a higher content of coarse fragments than Windsor and Agawam soils. Merrimac soils have coarser texture than Hartland soils and are underlain by gravelly material which Hartland soils are not. Merrimac soils are better drained than Ninigret and Walpole soils.

MeA—Merrimac fine sandy loam, 0 to 3 percent slopes. This level soil is on stream terraces. Areas are irregular in shape and are twice as long as they are wide. Areas are 3 to 30 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Hartland, Agawam, and Windsor soils in level areas and on low terraces and areas of Ninigret and Walpole soils in depressions. Also included are areas of freshly deposited gravel along some of the smaller streams and small areas of soils that have more than 30 percent coarse fragments in the surface layer. Soils that have carbonates above a depth of 4 feet and short, sharp terrace breaks are also included.

This soil is used mainly for hay, pasture, and corn for silage. A few areas are idle or in woodland. Part of many of the villages in the county are on this soil. Gravel pits and borrow pits are common. Crops respond well to management that conserves moisture and includes application of lime and fertilizer. This soil has few limitations for most nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Soil blowing is a hazard where there is no plant cover. Capability subclass IIs; woodland suitability subclass 4s.

MeB—Merrimac fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is on stream terraces. Areas are long and narrow or irregular in shape and are 3 to 30 acres in size.

Included with this soil in mapping are areas of Hartland, Agawam, and Windsor soils in level areas and on low terraces and areas of Ninigret and Walpole soils in depressions. Also included are areas of freshly deposited gravel along some of the smaller streams and areas of soils that have more than 30 percent coarse fragments in the surface layer. Soils that have carbonates above a depth of 4 feet and short sharp terrace breaks are also included.

This soil is used mainly for hay, pasture, and corn for silage. A few areas are idle or are in woodland. Part of many of the villages in the county are on this soil. Gravel pits and borrow pits are common. Crops respond well to management that conserves moisture and includes application of lime and fertilizer. This soil has few limitations for most nonfarm uses where slope is not a consideration. Runoff is slow. The hazard of water erosion is slight. Soil blowing is a hazard where there is no plant cover. Capability subclass IIs; woodland suitability subclass 4s.

MeC—Merrimac fine sandy loam, 8 to 15 percent slopes. This sloping soil is on dissected stream terraces. Areas are irregular in shape and are 3 to 40 acres in size.

Included with this soil in mapping are areas of Hartland, Agawam, and Windsor soils on upper side slopes and areas of Ninigret soils in depressions. Also included are areas of soils that have more than 30 percent coarse fragments in the surface layer and that have carbonates above a depth of 4 feet.

This soil is used mainly for hay and pasture. A few areas are in corn grown for silage. A few areas are idle or are in woodland. Part of many of the villages in the county are on this soil. Gravel pits and borrow pits are common. Crops respond well to management practices that conserve moisture, keep soil losses to a minimum, and include application of lime and fertilizer. Slope limits this soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate when the soil is cultivated. Soil blowing is a hazard where there is no plant cover. Capability subclass IIIe; woodland suitability subclass 4s.

MeD—Merrimac fine sandy loam, 15 to 25 percent slopes. This moderately steep soil is on dissected stream terraces. Areas are irregular in shape and are 3 to 40 acres in size.

Included with this soil in mapping are areas of Hartland, Agawam, and Windsor soils on upper side slopes and areas of Ninigret soils along drainageways. Also included are areas of soils that have more than 30 percent coarse fragments in the surface layer and areas of soils that have carbonates above a depth of 4 feet.

This soil is used mainly for hay and pasture. Many areas are in woodland or are idle. Gravel pits and borrow pits are common. Crops respond well to management practices that conserve moisture, reduce soil losses, and include application of lime and fertilizer. Slope limits this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe when the soil is cultivated. Soil blowing is a hazard where there is no plant cover. Capability subclass IVe; woodland suitability subclass 4s.

MeE—Merrimac fine sandy loam, 25 to 50 percent

slopes. This steep soil is on strongly dissected stream terraces and on long, narrow terrace breaks. Areas are irregular in shape and are 3 to 30 acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Hartland, Agawam, and Windsor soils. Also included are severely eroded spots, seep spots on the lower side slopes, and areas of soils that have carbonates above a depth of 4 feet.

This soil is used mainly for woodland. A few areas are idle or are used for unimproved pasture. This soil is too steep for the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. The use of logging equipment is limited. Slope limits this soil for many nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where there is no plant cover. Soil blowing is a hazard in unprotected areas. Capability subclass VIIe; woodland suitability subclass 4s.

Muck

Mu — Muck. These level soils consist of deposits of organic material 18 inches to 14 feet or more deep. They are black or very dark brown, highly decomposed (sapric) organic soils that consist of the remains of reeds, sedges, and woody plants. In places they contain undecomposed pieces of wood. The underlying mineral material is moderately coarse textured to medium textured. In a few areas the muck is underlain by marl 1 foot to 3 feet thick.

Muck has high available water capacity. Natural fertility is low. Permeability is moderate to moderately rapid. These soils are extremely wet. Water stands on the surface early in spring and late in fall. At other times the water table is at or within a few inches of the surface.

These soils are too wet for farm and woodland crops. Wetness and excess humus limit these soils for most other nonfarm uses. The soils are difficult to drain because suitable outlets for drainage ditches are not available in most areas. Surface runoff is slow. The hazard of erosion is slight. Capability subclass VIIw; woodland suitability subclass not assigned.

Ninigret series

The Ninigret series consists of deep, level to sloping, moderately well drained soils on stream terraces. These soils formed in stratified outwash material derived from granite, quartz, gneiss, and schist.

In a representative profile in an idle field, the surface layer is very dark grayish brown fine sandy loam 7 inches thick. The subsoil to a depth of 13 inches is a dark yellowish brown fine sandy loam. It grades to olive brown between the depths of 13 and 29 inches. The underlying material, to a depth of 60 inches, is very dark grayish brown gravelly fine sand with distinct mottles.

Ninigret soils have moderate to low available water capacity. Natural fertility is low. Permeability is moderately rapid to rapid. These soils have a seasonal high water table at a depth of 1½ to 2½ feet. When farmed, these soils are used mainly for hay and pasture. A few areas are in corn for silage. Some areas are idle or are forested.

Representative profile of Ninigret fine sandy loam, 0 to 8 percent slopes, in an idle field that has been previously limed, 3 miles northwest of West Fairlee Village, 1 mile north of Vermont Route 113, 200 feet west of road; 43°56′57″ N. and 72°15′32″ W.:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (2.5Y 5/2) dry; weak fine granular structure; very friable; many roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B21ir—7 to 13 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; medium acid; clear smooth boundary.

B22—13 to 18 inches, olive brown (2.5Y 4/4) fine sandy loam; weak fine granular structure; very friable; few roots; 5 percent coarse fragments; slightly acid; clear smooth boundary.

B3—18 to 29 inches; olive brown (2.5Y 4/4) fine sandy loam; common fine distinct brown to dark brown (10YR 4/3) mottles; massive; very friable; few roots; 15 percent coarse fragments; slightly acid; clear smooth boundary.

IIC—29 to 60 inches; very dark grayish brown (2.5Y 3/2) gravelly fine sand; common fine distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; very few roots; 20 percent coarse fragments; slightly acid.

Bedrock is at a depth of more than 5 feet. The solum is 20 to 30 inches thick. Reaction is strongly acid to slightly acid throughout the profile. Distinct or prominent mottles are at a depth of 14 to 20 inches. The A and B horizons are less than 15 percent coarse fragments. The C horizon is 10 percent coarse fragments. The solum is dominantly fine sandy loam, but in places it is loamy sand and loamy fine sand. The C horizon is loamy fine sand to sand and the gravelly analogs.

The A horizon has hue of 10YR and value and chroma of 2 or 3. The B21ir horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 4 to 6. The B22 horizon has hue of 10YR and 2.5Y, value of 4 or 5, and chroma of 2 to 4. The C horizon has hue of 2.5Y and 5Y, value of 3 to 5, and chroma of 2 to 5.

Ninigret soils are near Windsor, Agawam, Merrimac, Hartland, Walpole, and Belgrade soils. Ninigret soils are wetter than Windsor, Agawam, Merrimac, and Hartland soils. They have a lower content of coarse fragments than Merrimac soils. Ninigret soils have a higher content of fine and medium sand than Hartland soils. They are better drained than Walpole soils. They are coarser textured than Belgrade soils.

NnB—Ninigret fine sandy loam, 0 to 8 percent slopes. This level to gently sloping soil is in depressional areas on stream terraces. Areas are irregular in shape and are 3 to 20 acres in size. This soil has the profile described as representative of the Ninigret series.

Included with this soil in mapping are areas of Windsor, Agawam, and Merrimac soils on low ridges and Walpole soils in depressions. Also included are areas of soils that have a surface layer of loamy sand, soils that are more than 30 percent coarse fragments, soils that have surface stones, and soils that have finer textured underlying material.

This soil is used mainly for hay, pasture, and corn

for silage. A small area is in woodland or is idle. Crops respond well to lime and fertilizer. Sand and borrow pits are common. Wetness and frost action limit this soil for many nonfarm uses. Runoff is slow. The hazard of water erosion is slight. This soil is subject to soil blowing where there is no plant cover. Capability subclass IIw; woodland suitability subclass 3o.

NnC—Ninigret fine sandy loam, 8 to 15 percent slopes. This sloping soil is on stream terraces. Areas are irregular in shape and are 3 to 20 acres in size.

Included with this soil in mapping are areas of Windsor, Agawam, and Merrimac soils on higher positions and Walpole soils in depressions and along drainageways. Also included are some small areas of soils that have a surface layer of loamy sand and few areas of soils that are more than 30 percent coarse fragments in the surface layer. Soils that have finer textured underlying material, soils that have stones on the surface, and soils that slope more than 15 percent are also included.

Where farmed, this soil is used mainly for hay and pasture. A small area is used for corn for silage. Other areas are in woodland or are idle. Crops respond well to lime and fertilizer. Sand and borrow pits are common. Wetness, frost action, and slope limit this soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate where the soil is cultivated. This soil is subject to soil blowing where there is no plant cover. Capability subclass IIIe; woodland suitability subclass 3o.

Peacham series

The Peacham series consists of level, deep, stony and very stony, very poorly drained soils that are underlain by a fragipan. These soils are mainly in depressions and along small streams and drainageways on uplands. They formed in glacial till derived mainly from schist, shale, and sandy limestone.

In a representative profile in a wooded area, the surface layer is black muck 8 inches thick. Beneath the muck layer is 5 inches of distinctly mottled firm, dark gray gravelly silt loam over about 17 inches of distinctly mottled very firm, dark gray very fine sandy loam. The underlying material is mottled, very dark gray loam and olive gray silt loam.

Peacham soils have moderate available water capacity. Natural fertility is high. Permeability is moderate above the fragipan and very slow in the fragipan. The water table is at or near the surface most of the year and many areas are ponded in spring and after heavy rain. These soils are used mainly for trees and unimproved pasture.

Representative profile of Peacham soils in the town of Bradford, 2 miles north of the village of Bradford, 75 feet southwest of the junction of the roads to Goshen and Roger's Hill; 44°2′0″ N. and and 72°7′37″ W.:

O1—8 inches to 0; black (10YR 2/1) muck; weak fine granular structure; slightly sticky; many roots; slightly acid; abrupt smooth boundary.

B2g—0 to 5 inches; dark gray (5Y 4/1) gravelly silt loam; many medium distinct dark yellowish brown 10YR 4/4) mottles; massive; firm; common roots; 20 percent coarse fragments; neutral; clear smooth boundary.

Bxg—5 to 22 inches; dark gray (5Y 4/1) very fine sandy loam; many medium distinct olive brown (2.5Y 4/4) mottles; massive; very firm; few roots; 15 percent coarse fragments; neutral clear smooth boundary.

C1xg—22 to 32 inches; very dark gray (5Y 3/1) loam; many distinct olive brown (2.5Y 4/4) mottles and common fine prominent yellowish red (5YR 4/6) mottles; massive; very firm; 15 percent coarse fragments; neutral; clear wavy boundary.

C2xg—32 to 60 inches; olive gray (5Y 4/2) silt loam; many medium distinct mottles; massive; firm; 15 percent coarse fragments; neutral.

Bedrock is at a depth of 5 to 10 feet or more. The thickness of the solum ranges from 8 to 28 inches and the depth to the fragipan ranges from 4 to 18 inches. Reaction is slightly acid to neutral in all horizons. Distinct or prominent mottles are in the B and C horizons. The mineral material is 5 to 30 percent coarse fragments. The B and C horizons are fine sandy loam to silt loam. The clay content is less than 18 percent in all horizons.

The O horizon has a hue of 10YR, value of 2, and chroma of 1 or 2. Where the A horizon is present it has the same hue, value, and chroma as the O horizon. The B and C horizons have hue of 5Y, value of 4 or 5, and chroma of 1 or 2.

Peacham soils are near Glover, Woodstock, Vershire, Tunbridge, Colrain, Pomfret, Buckland, and Cabot soils. They have a muck layer on the surface, whereas those soils have no muck layer, and they are wetter. Peacham soils have a fragipan, which Glover, Woodstock, Vershire, and Tunbridge soils do not have; and they are deeper to bedrock than those soils. They have a fragipan, which Colrain and Pomfret soils do not. Peacham soils have a fragipan at a shallower depth than Buckland and Cabot soils, and they are wetter than those soils.

Pc—Peacham soils. These level soils are in depressions and along small streams and drainageways. Areas are elliptical or irregular in shape and are 3 to 20 acres in size. Stones are generally 5 to 100 feet apart. These soils include the profile described as representative of the series.

Included with these soils in mapping are small areas of Cabot soils and Muck. Also included are areas of local alluvium that are free of coarse fragments and stones and a few areas of soils that do not have a fragipan.

Peacham soils are used for trees or unimproved pasture. A few areas have been artificially drained and are used for hay and pasture. A small area is idle. Many small ponds have been constructed in these soils. Water commonly ponds on the surface. Drainage outlets are difficult to obtain. Wetness, permeability, stones, and frost action limit these soils for nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Capability subclass Vw; woodland suitability subclass not assigned.

Pomfret series

The Pomfret series consists of sloping to steep, deep, stony to very stony, somewhat excessively drained soils that have a high mica content. These soils are mainly on convex hillsides and rounded hilltops where the topography is bedrock controlled. They formed in glacial

till derived mainly from siliceous limestone and micaceous schist.

In a representative profile in a wooded area, a layer of forest litter 2 inches thick is on the surface. The surface layer is 3 inches of very dark grayish brown loamy fine sand. The subsoil is loamy sand 27 inches thick. The upper part is dark brown and the lower part is dark reddish brown. The underlying material is dark brown loamy sand. Bedrock is at a depth of 58 inches.

Pomfret soils have moderate available water capacity. Natural fertility is medium. Permeability is moderately rapid to rapid. Most Pomfret soils were too stony for tillage, but many areas have been cleared of surface stones and are farmed. Where the stones have been piled up along the edge of fields to form stone walls, the soil boundary and field boundary in places coincide.

Representative profile of Pomfret loamy fine sand in an area of Pomfret very stony loamy fine sand, 8 to 25 percent slopes, 1¾ miles northwest of Chelsea village, ¼ mile south of the old road junction, and 300 feet southwest of the abandoned county road; 44°0′19″ N. and 72°28′40″ W.:

O1—2 inches to 1 inch; loose litter of leaves and twigs.
O2—1 inch to 0; decomposed litter.
A1—0 to 3 inches; very dark grayish brown (10YR 3/2) loamy fine sand; dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; many roots; 5 percent coarse fragments; 78 percent mica; medium acid; abrupt wavy boundary.
B21ir—3 to 11 inches; dark brown (7.5YR 3/2) loamy sand; weak fine granular structure; very friable; common roots; 5 percent coarse fragments; 78 percent mica; slightly acid; gradual wavy boundary.
B22—11 to 30 inches; dark reddish brown (5YR 3/2) loamy sand; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; 67 percent mica; neutral; clear wavy boundary.
C—30 to 58 inches; dark brown (7.5YR 3/2) loamy sand; single grained; dry loose common roots; 15 percent coarse fragments; 63 percent mica; neutral; abrupt wavy boundary.
R—58 inches; bedrock.

Bedrock is at a depth of more than 40 inches but generally less than 8 feet. The solum is 18 to 38 inches thick. Reaction is medium acid to neutral in the A and B horizons and slightly acid to neutral in the C horizon. Coarse fragments range from less than 5 percent to 20 percent throughout the profile, and they may contain carbonates. Mica is prominent in all horizons. The B and C horizons are dominantly loamy sand but range from loamy fine sand to sand and their gravelly analogs. All horizons are less than 10 percent clay.

The A horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. A weak, discontinuous A2 horizon is present in some areas. The upper part of the B horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. The lower part of the B horizon has hue of 5YR to 10YR and value and chroma of 2 and 3. The C horizon has hue of 5YR to 2.5 YR, value of 2 or 3, and chroma of 2.

Pomfret soils are near Glover, Woodstock, Tunbridge, Vershire, Colrain, Buckland, Cabot, and Peacham soils. They are deeper and coarser textured than Glover, Woodstock, Tunbridge, and Vershire soils. Pomfret soils have a higher mica content and are coarser textured than Colrain soils. They do not have a fragipan, which is characteristic of Buckland, Cabot, and Peacham soils; and they are better drained than those soils.

PoC—Pomfret stony loamy fine sand, 8 to 15 percent slopes. This sloping soil is on the sides and tops of hills and ridges. Areas are irregular in shape and are 3 to 50 acres in size. Stones are 30 to 100 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, and Colrain soils on ridges and areas of Buckland and Cabot soils in depressions and along drainageways. Also included are areas of nearly level and gently sloping soils, areas of soils that have compact glacial till at a depth of less than 30 inches, and outcrops of bedrock.

This soil is mainly used for hay and pasture. Some areas are used for corn for silage. Areas that are not farmed are in woodland or are idle. Surface stones limit tillage and harvesting but do not prevent cultivation. A management system is needed that conserves soil moisture and reduces soil losses. Crops respond well to lime and fertilizer. Slope limits this soil for many nonfarm uses. Runoff is medium. The hazard of water erosion is moderate where the soil is cultivated. Capability subclass IIIe; woodland suitability subclass 4s.

PoD—Pomfret stony loamy fine sand, 15 to 25 percent slopes. This moderately steep soil is on the sides and tops of hills and ridges. Areas are irregular in shape and are 3 to 60 acres in size. Stones are 30 to 100 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has been mixed by plowing.

Included with this soil in mapping are areas of Woodstock, Tunbridge, and Colrain soils on ridges and areas of Buckland and Cabot soils in depressions and along drainageways. Also included are areas of soils that have compact glacial till at a depth of less than 30 inches and outcrops of bedrock.

This soil is mainly used for hay and pasture. Areas that are not farmed are idle or are reverting to woodland. Surface stones limit tillage and harvesting but do not prevent tillage. A management system is needed that conserves moisture and reduces soil losses. Crops respond well to lime and fertilizer. Slope limits this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where the soil is cultivated. Capability subclass IVe; woodland suitability subclass 4s.

PsD—Pomfret very stony loamy fine sand, 8 to 25 percent slopes. This sloping to moderately steep soil is on ridges and hills. Areas are irregular in shape and are 5 to 200 acres in size. Stones are 5 to 30 feet apart. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Woodstock, Tunbridge, and Colrain soils on ridges and Buckland and Cabot soils in depressions and along drainageways. Also included are areas that were once cleared of surface stones but are no longer farmed. Areas of soils that have compact glacial till at a depth of less than 30 inches and outcrops of bedrock are also included.

Most areas of this soil are in woodland. A few areas

have been cleared of trees and are used for unimproved pasture, and a few areas are idle. This soil is too stony for cultivation. The numerous surface stones prevent the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. Slope and large stones limit this soil for most nonfarm uses. Runoff is slow to medium. The hazard of water erosion is moderate to severe where there is no plant cover. Capability subclass VIs; woodland suitability subclass 4s.

PtE—Pomfret soils, 25 to 50 percent slopes. These steep soils are on ridges and hills. Areas are irregular in shape and are 5 to 200 acres in size. Stones are 5 to 100 feet apart (fig. 11).

Included with these soils in mapping are steep areas of Woodstock, Tunbridge, and Colrain soils. Also included are areas of Buckland soils along drainageways, areas of soils that have compact glacial till at a depth of less than 30 inches, outcrops of bedrock, and seep spots on lower side slopes.

Most areas of these soils are in woodland. A few areas are idle or have been cleared of trees and are used for unimproved pasture. These soils are too stony and too steep for cultivation. Sound woodland management that includes control of erosion is needed on logging roads. The steep slopes limit the use of logging equipment. Large stones and slope limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where there is no plant cover. Capability subclass VIIs; woodland suitability subclass 4s.

Raynham Variant

Raynham Variant consists of deep, poorly drained, level to gently sloping soils on stream terraces. These soils formed in silt loam and very fine sandy loam glaciolacustrine material.

In a representative profile in a hayfield, the surface layer is dark grayish brown silt loam 8 inches thick. The upper 7 inches of the subsoil is friable, gray silt loam that has distinct mottles, and the lower 10 inches is firm, olive gray silt loam that has distinct mottles. The underlying material between the depths of 25 and 36 inches is firm, dark grayish brown silt loam that has distinct mottles. Below this to a depth of 68 inches are 1/16- to 1/8-inch thick varves of dark olive gray silt and olive brown very fine sand.

Raynham Variant soils have high available water capacity. Natural fertility is high. Permeability is slow. These soils have a seasonal high water table at or near the surface. They are used mainly for farming.

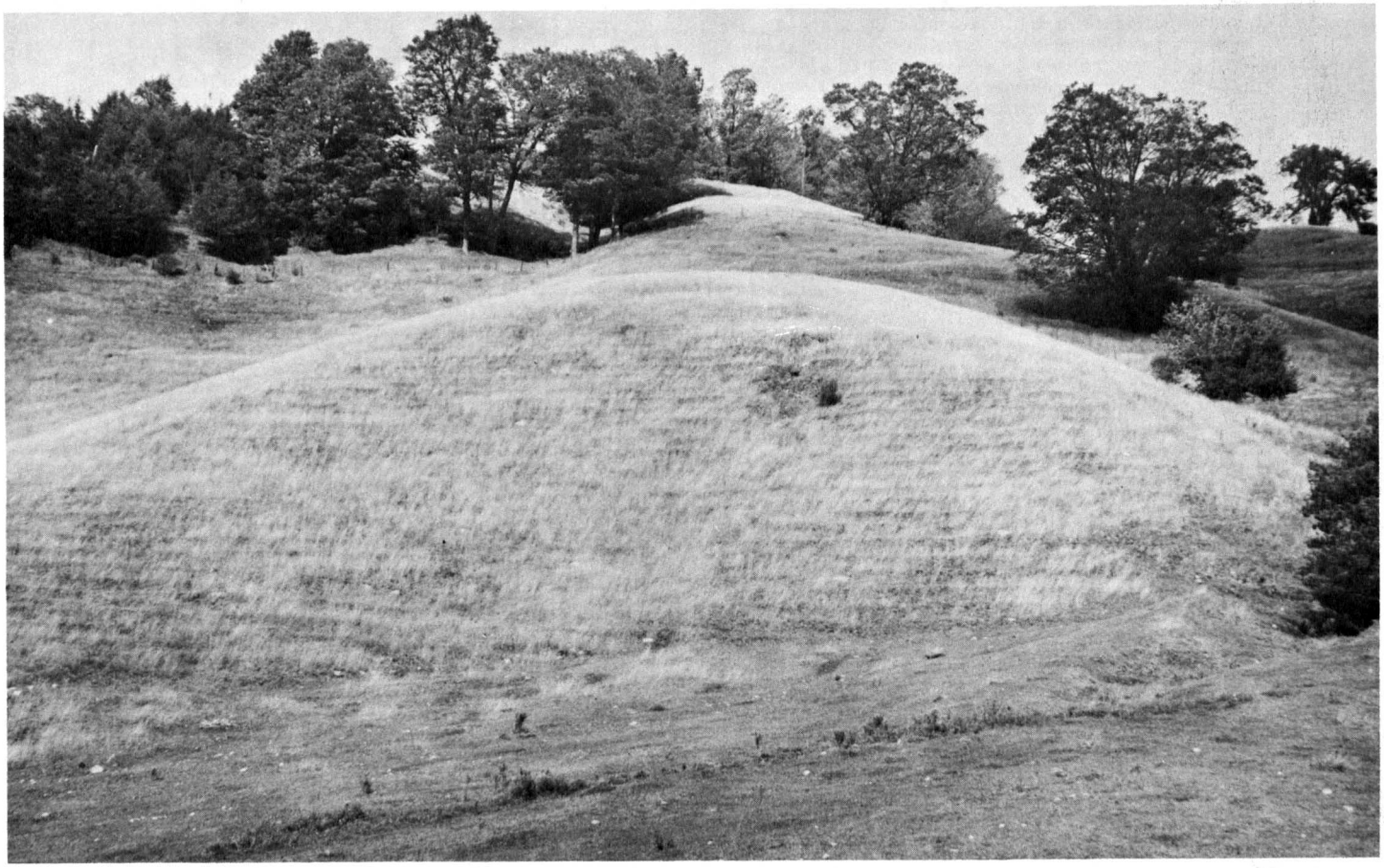

Figure 11.—**Typical landscape and use of steep Pomfret soils, 25 to 50 percent slopes.**

Representative profile of Raynham Variant silt loam in a hayfield, 1 mile south of North Thetford, and 700 feet west of U.S. Route 5; 43°49'47" N. and 72°11'35" W.:

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; weak fine granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

B21g—8 to 15 inches; gray (5Y 5/1) silt loam; many coarse distinct dark grayish brown (2.5Y 4/2) and dark yellowish brown (10YR 4/4) mottles; weak thin platy structure; friable; few roots; slightly acid; clear smooth boundary.

B22g—15 to 25 inches; olive gray (5Y 5/2) silt loam; many coarse distinct olive brown (2.5Y 4/4) and gray (N 5/) mottles; weak thin platy structure; firm; few roots; slightly acid; clear smooth boundary.

C1g—25 to 36 inches; dark grayish brown (2.5Y 4/2) silt loam; many coarse distinct dark gray (N 4/) and brown to dark brown (10YR 4/3) mottles; weak thin and medium platy structure; firm; very few roots; slightly acid; clear smooth boundary.

C2g—36 to 68 inches; 70 percent dark olive gray (5Y 3/2) silt loam and 30 percent olive brown (2.5Y 4/4) very fine sand varves 1/16 to ⅛ inch thick; weak thin and medium platy structure; firm; neutral.

Bedrock is typically at a depth of more than 5 feet. The solum is 16 to 32 inches thick. The A and B horizon ranges from medium acid to slightly acid, and the C horizon ranges from slightly acid to neutral. Distinct or prominent mottles are just below the surface layer. Coarse fragments are absent or are less than 2 percent in all horizons. The B and C horizons are silt loam to very fine sand. The C horizon is strongly varved in places.

The A horizon is dark grayish brown (2.5Y 4/2) or very dark brown (10YR 2/2). The B horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2, or it has neutral hue with value of 4 or 5. The B and C horizons have distinct or prominent yellowish red to olive mottles. The C horizon has hue of 5Y, value of 4 or 5, and chroma of 1 or 2, or it has neutral hue and value of 4 or 5.

Raynham Variant soils are near Belgrade, Hartland, Agawam, Ninigret and Walpole soils. They are wetter than Hartland and Belgrade soils. They are finer textured and wetter than Agawam and Ninigret soils. They are finer textured than Walpole soils.

Ra—Raynham Variant silt loam. This level to gently sloping soil is on stream terraces. Areas are elliptical or irregular in shape and are 3 to 30 acres in size.

Included with this soil in mapping are areas of Belgrade and Ninigret soils on low ridges and areas of Walpole soils on level areas and in depressions. Areas of very poorly drained very fine sandy loams and silt loams, areas that have stones on the surface, and areas of shallow muck are also included.

This soil is used mostly for hay and pasture. A small acreage is used for corn for silage. Some areas are in woodland or are idle. A seasonal high water table at or near the surface and ponded water delay tillage in spring and after heavy rain. Crops respond well to a good management system that includes application of lime and fertilizer and artificial drainage. Wetness, permeability, and frost action limit this soil for many nonfarm uses. Runoff is slow. The hazard of water erosion is slight where the soil is cultivated. Capability subclass IVw; woodland suitability subclass 4w.

Rock outcrop

Ro—Rock outcrop. This unit consists of areas where 50 to 90 percent of the surface is bare rock or has less than 10 inches of soil over bedrock. The bedrock is schist, siliceous limestone, or granite. Rock outcrop is on the tops and steep sides of hills and ridges. The soil ranges from sloping to steep. Vegetation is sparse and consists of moss, lichens, and scrubby brush and trees.

Rock outcrop has no value for farm use. It is poorly suited to timber production. It provides poor cover and some food for wildlife. Some areas have scenic and recreational value. Capability subclass VIIIs; woodland suitability subclass not assigned.

Saco series

The Saco series consists of deep, very poorly drained, level soils on the flood plains of major streams and their tributaries. These soils formed in very fine sandy loam and silt loam alluvium.

In a representative profile in an idle area, the surface layer is black mucky silt loam 11 inches thick. Between the depths of 11 and 66 inches is dark gray and gray silt loam that has dark grayish brown, olive brown, and dark yellowish brown mottles.

Saco soils have high available water capacity. Natural fertility is high. Permeability is moderate. The water table is at a depth of less than 1 foot most of the year. Most areas are flooded for several days each year, generally early in spring. Most areas of this soil are idle or are in woodland.

Representative profile of Saco mucky silt loam in the town of Bradford, at a point off Depot Street approximately 250 feet east of the railroad, and 400 feet north of the railroad bridge; 43°59'55" N. and 72°6'58" W.:

A1—0 to 11 inches; black (10YR 2/1) mucky silt loam; gray (10YR 5/1) dry; weak medium granular structure; slightly sticky and slightly plastic; many roots; slightly acid; abrupt smooth boundary.

C1g—11 to 15 inches; dark gray (5Y 4/1) silt loam; common medium faint dark grayish brown (2.5Y 4/2) mottles; massive; slightly sticky and plastic; common roots; neutral; clear smooth boundary.

C2g—15 to 28 inches; gray (5Y 5/1) silt loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; slightly sticky and slightly plastic; few roots; neutral clear smooth boundary.

C3g—28 to 35 inches; dark gray (5Y 4/1) silt loam; coarse distinct olive brown (2.5Y 4/4) mottles; massive; slightly sticky and slightly plastic; very few roots; neutral; clear smooth boundary.

C4g—35 to 66 inches; dark gray (N 4/) silt loam; few medium distinct olive brown (2.5Y 4/4) mottles; massive; slightly sticky and slightly plastic; neutral.

Bedrock is typically at a depth of more than 5 feet. Reaction is slightly acid to neutral throughout the profile. The C horizon has faint to distinct mottles. In most places the profile is free of coarse fragments, but in some places it has a thin horizon that is gravelly. The C horizon is silt loam to very fine sandy loam.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 to 3. The C horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1, or has neutral hue and value of 3 to 6.

Saco soils are near Hadley, Winooski, and Limerick soils. They have a higher water table and grayer colors than Hadley soils. Saco soils are wetter and have a darker colored surface layer than Winooski and Limerick soils.

Sa—Saco mucky silt loam. This level soil is in depressions. Areas are elliptical or irregular in shape and are 3 to 30 acres in size.

Included with this soil in mapping are small areas of Limerick soils in convex areas and muck in low areas. Also included are areas of soils that have a surface layer of very fine sandy loam and areas of soils that have layers of sand and gravel.

Most areas of this soil are idle or are in woodland. A few areas have been artificially drained and are used for hay and pasture. Most areas are flooded in spring and after heavy rain. Drainage outlets are difficult to locate because the soil surface is at about the same level as the water in the nearby stream. Flooding and wetness limit this soil for most nonfarm uses. This soil provides habitat for wetland wildlife. Runoff is slow. The hazard of erosion is slight. Capability subclass VIw; woodland suitability subclass not assigned.

Stowe series

The Stowe series consists of deep, gently sloping to steep, stony to very stony, well drained and moderately well drained soils that are underlain by a fragipan. These soils formed in glacial till derived mainly from schistose and granitic rocks. Most areas are on convex hillsides and rounded ridgetops where the topography is bedrock controlled.

In a representative profile in a hayfield, the surface layer is very dark grayish brown fine sandy loam 8 inches thick. The subsoil is fine sandy loam 13 inches thick; the upper part is dark yellowish brown, and the lower part is olive. The firm underlying material, to a depth of 60 inches, is olive fine sandy loam.

Stowe soils have moderate available water capacity. Natural fertility is low. Permeability is moderately rapid above the fragipan and slow in the fragipan. Originally, most areas of Stowe soils were too stony for tillage, but many areas have been cleared of stones and are farmed. In many of these cleared areas the stones and cobbles have been piled along the field boundary to form a stone wall. The soil boundaries follow these stone walls.

Representative profile of Stowe fine sandy loam in an area of Stowe stony fine sandy loam, 8 to 15 percent slopes, on Braintree Hill, 600 feet northwest of the corner at Braintree Center, and 300 feet west of the road; 43°58′13″ N. and 72°41′12″ W.:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, olive gray (5Y 5/2) dry; moderate medium granular structure; very friable; many roots; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B21ir—8 to 14 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; medium acid; clear wavy boundary.

B22—14 to 21 inches; olive (5Y 5/4) fine sandy loam; massive; friable; common roots; 10 percent coarse fragments; medium acid; clear smooth boundary.

Cx—21 to 60 inches; olive (5Y 4/3) fine sandy loam; massive; firm; 10 percent coarse fragments; medium acid.

Bedrock is typically at a depth of more than 5 feet. The thickness of the solum and the depth to the fragipan range from 16 to 33 inches. Reaction is strongly acid to medium acid in the A and B horizons and strongly acid to neutral in the C horizon. The C horizon has mottles in places. Coarse fragments range from 5 to 30 percent in all horizons. The B and C horizons are dominantly fine sandy loam but range to loam and the gravelly analogs.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 to 4. A grayish A2 horizon, 2 to 4 inches thick, is present in unplowed areas. The upper part of the B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 4 to 6. The lower part of the B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 2.5Y and 5Y, value of 3 to 5, and chroma of 2 or 3.

Stowe soils are near Woodstock, Glover, Tunbridge, Vershire, Buckland, and Cabot soils. They are deeper than Woodstock, Glover, Tunbridge, and Vershire soils. They are better drained than Buckland and Cabot soils.

SoB—Stowe stony fine sandy loam, 3 to 8 percent slopes. This gently sloping soil is on ridgetops. Areas are irregular in shape and are 3 to 30 acres in size. Surface stones are 30 to 100 feet apart.

Included with this soil in mapping are areas of Woodstock and Tunbridge soils on ridges and Buckland and Cabot soils in depressions and along drainageways. Also included are areas of Stowe soils that are level, areas of soils that are more than 30 percent coarse fragments, and areas of soils that have a surface layer of loam. Outcrops of bedrock are also included.

This soil is mainly used for hay and pasture. A few areas are used for corn for silage (fig. 12). Other areas are in woodland or are idle. The slowly permeable fragipan causes the soil to dry out slowly in spring, thereby delaying tillage. Surface stones limit tillage and harvesting but do not prevent cultivation. Crops grown on this soil respond well to lime and fertilizer. Permeability and frost action limit this soil for many nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIe; woodland suitability subclass 3o.

SoC—Stowe stony fine sandy loam, 8 to 15 percent slopes. This sloping soil is on ridges and hills. Areas are irregular in shape and are 3 to 30 acres in size. Surface stones are 30 to 100 feet apart. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Woodstock and Tunbridge soils in convex areas and Buckland and Cabot soils in depressions and along drainageways. Also included are areas of soils that are more than 30 percent coarse fragments, and areas of soils that have a surface layer of loam. Outcrops of bedrock are also included.

This soil is mainly used for hay and pasture. A few areas are used for corn for silage. Other areas are in woodland or are idle. Surface water moves off this soil faster than it does off the less sloping Stowe soils, so tillage is not delayed so long in spring and after heavy rain. Surface stones limit tillage and harvesting but do not prevent cultivation. Crops grown on this soil respond well to lime and fertilizer. This soil is limited for many nonfarm uses, especially by permeability, frost action, and slope. Runoff is medium. The hazard of water erosion is moderate where the soil is cultivated. Capability subclass IIIe; woodland suitability subclass 3o.

SoD—Stowe stony fine sandy loam, 15 to 25 per-

Figure 12.—**Corn is harvested for silage from this area of gently sloping Stowe soils.**

cent slopes. This moderately steep soil is on ridges and hills. Areas are irregular in shape and are 3 to 50 acres in size. Surface stones are 30 to 100 feet apart.

Included with this soil in mapping are areas of Woodstock and Tunbridge soils in convex areas and Buckland and Cabot soils in small depressions and along narrow drainageways. Also included are areas of soils that are more than 30 percent coarse fragments and areas of soils that have a surface layer of loam. Outcrops of bedrock are also included.

This soil is mainly used for hay and pasture. Other areas are in woodland or are idle. Surface stones limit tillage and harvesting but do not prevent cultivation. Modern farm machinery is difficult to operate on the steeper slopes. Crops grown on this soil respond well to lime and fertilizer. Permeability, frost action, and slope limit this soil for most nonfarm uses. Runoff is rapid. The hazard of water erosion is high where the soil is cultivated. Capability subclass IVe; woodland suitability subclass 3r.

StD—Stowe very stony fine sandy loam, 8 to 25 percent slopes. This sloping to moderately steep soil is on ridges and hills. Areas are irregular in shape and are 5 to 80 acres in size. Stones are 5 to 30 feet apart. This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are areas of Woodstock and Tunbridge soils in convex areas and Buckland and Cabot soils in depressions and along drainageways. Also included are areas that were once cleared of surface stones and are no longer farmed, areas of soils that are more than 30 percent coarse fragments and areas of soils that have a surface layer of loam. Outcrops of bedrock are also included.

This soil is mostly in woodland. Some areas are idle or have been cleared of trees and are used for unimproved pasture. Numerous surface stones prevent cultivation by modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. This soil is limited for most nonfarm uses, especially by permeability, frost action, stones, and slope. Runoff is medium to rapid. The hazard of water erosion is moderate to severe where the soil has no plant cover. Capability subclass VIs; woodland suitability subclass 3r.

SwE—Stowe soils, 25 to 50 percent slopes. These steep soils are on ridges and hills. Areas are irregular in shape and are 5 to 100 acres in size. Stones are 5 to 100 feet apart. These soils have a profile similar to

the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with these soils are areas of Woodstock and Tunbridge soils. Also included are seep spots on the lower slopes, areas of soils that are more than 30 percent coarse fragments, and outcrops of bedrock.

These soils are mostly in woodland. They are too stony and too steep for the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. The operation of logging equipment is hazardous. Permeability, frost action, stones, and slope limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where the soil has no plant cover. Capability subclass VIIs; woodland suitability subclass 3r.

Tunbridge series

The Tunbridge series consists of gently sloping to steep, moderately deep, stony to very stony, well drained soils on the sides and tops of hills and ridges where the topography is bedrock controlled. These soils formed in glacial till derived mainly from siliceous limestone and schistose rocks. They are mapped only in complexes with the Woodstock soils.

In a representative profile in a wooded area, the surface is covered by a 2-inch-thick layer of forest litter. Below the litter the surface layer is very dark grayish brown fine sandy loam 7 inches thick. The subsoil is fine sandy loam 22 inches thick; it is dark brown in the upper part and very dark grayish brown in the lower part. Mica schist bedrock is at a depth of 29 inches.

Tunbridge soils have moderately low available water capacity. Natural fertility is medium. Permeability is moderately rapid. Originally, most areas of Tunbridge soils were too stony for tillage, but many areas have been cleared of surface stones and are farmed. Where the stones have been piled up along the edge of fields to form stone walls, the soil boundary and field boundary in places coincide.

Representative profile of Tunbridge fine sandy loam in an area of Tunbridge-Woodstock-Rock outcrop complex, 8 to 25 percent slopes, about 2 miles east of Chelsea on Route 113, 1.2 miles northeast of Route 113 and 300 feet north of a dirt road; 44°0′8″ N. 72°23′23″ W.:

O1—2 inches to 1 inch; loose litter of leaves and twigs.
O2—1 inch to 0; decomposed litter.
Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.
B21ir—7 to 14 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; medium acid; gradual wavy boundary.
B22—14 to 29 inches; very dark grayish brown (2.5Y 3/2) fine sandy loam; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; medium acid; abrupt wavy boundary.
R—29 inches; mica schist bedrock.

Bedrock is at a depth of 20 to 40 inches. The solum ranges from 20 to 30 inches in thickness. Thickness of the solum coincides with the depth to bedrock in places. Reaction ranges from strongly acid to neutral throughout the profile. The profile is 5 to 30 percent coarse fragments; content of coarse fragments is generally higher in the lower horizons. The B and C horizons are dominantly fine sandy loam but in places are loam. All horizons are less than 10 percent clay.

The A horizon has hue of 10YR or 2.5Y, value of 3, and chroma of 2 or 3. A weakly developed A2 horizon is in some profiles. The B horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2 to 4. This horizon is commonly browner in the upper part than in the lower part. The C horizon, where present, has hue of 2.5Y and 5Y, value of 3 or 4, and chroma of 2.

Tunbridge soils are near Glover, Woodstock, Vershire, Colrain, Pomfret, Buckland, Cabot, and Peacham soils. Tunbridge soils are deeper than Glover and Woodstock soils. They are coarser textured than Vershire soils. Tunbridge soils are not so deep as Colrain and Pomfret soils. They have no fragipan, which Buckland, Cabot, and Peacham soils do have, and they are better drained than those soils.

TbB—Tunbridge-Woodstock rocky fine sandy loams, 3 to 8 percent slopes. This complex is about 45 percent Tunbridge soils and 40 percent Woodstock soils. These gently sloping soils are on the tops of hills and ridges. Areas are irregular in shape and are 3 to 70 acres in size. The surface layer is generally fine sandy loam, but in some places it is loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Tunbridge and Woodstock soils have profiles similar to the ones described as representative of their respective series, but the surface layer has been mixed by plowing.

Included with these soils in mapping are areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Buckland and Cabot soils in depressions and along drainageways. Also included are small areas of rock outcrop, wet spots, and areas of soils that are more than 30 percent coarse fragments. These included areas make up about 15 percent of this complex.

These soils are used mainly for hay and pasture. A small acreage is in corn for silage. Areas that are not being farmed are in woodland or are idle. The surface stones and rock outcrop limit tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer and conservation of moisture. Depth to bedrock limits these soils for most nonfarm uses. Runoff is medium. The hazard of water erosion is slight. Capability subclass IIe; Tunbridge soils in woodland suitability subclass 3o, and Woodstock soils in woodland suitability subclass 4d.

TbC—Tunbridge-Woodstock rocky fine sandy loams, 8 to 15 percent slopes. This complex is about 45 percent Tunbridge soils and 35 percent Woodstock soils. These sloping soils are on hills and ridges. Areas are irregular in shape and are 3 to 100 acres in size. The surface layer is generally fine sandy loam, but in some places it is loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this complex form such an intricate pattern that it

is not practical to map them separately at the scale of the soil map.

The Tunbridge and Woodstock soils have profiles similar to the ones described as representative for their respective series, but the surface layer has been mixed by plowing.

Included with these soils in mapping are areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Buckland and Cabot soils in depressions and along drainageways. Also included are small areas of rock outcrop, wet spots, and areas of soils that are more than 30 percent coarse fragments. These included areas make up about 20 percent of this complex.

These soils are used mainly for hay and pasture. A small acreage is in corn for silage. Areas that are not farmed are in woodland or are idle. The surface stones and rock outcrops hinder tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer, conservation of moisture, and practices that reduce soil losses. Depth to bedrock and slope limit these soils for most nonfarm uses. Runoff is medium. The hazard of water erosion is moderate where the soils are cultivated. Capability subclass IIIe; Tunbridge soils in woodland suitability subclass 3o, and Woodstock soils in woodland suitability subclass 4d.

TbD—Tunbridge-Woodstock rocky fine sandy loams, 15 to 25 percent slopes. This complex is about 45 percent Tunbridge soils and 35 percent Woodstock soils. These moderately steep soils are on hills and ridges. Areas are irregular in shape and are 3 to 100 acres in size. The surface layer is generally fine sandy loam, but in some places it is loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this complex form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Tunbridge and Woodstock soils have profiles similar to the ones described as representative of their series, but the surface layer has been mixed by plowing.

Included with these soils in mapping are areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Buckland and Cabot soils in depressions and along narrow drainageways. Also included are small areas of rock outcrop, wet spots, areas of soils that are more than 30 percent coarse fragments, and seep spots on lower side slopes. These included areas make up about 20 percent of this complex.

Most areas of these soils are used for hay and pasture. The remaining areas are in woodland or are idle. The surface stones, rock outcrop, and slope hinder tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer, conservation of moisture, and practices that reduce soil losses. Depth to bedrock and slope limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where these soils are cultivated. Capability subclass IVe; Tunbridge soils in woodland suitability subclass 3r, and Woodstock soils in woodland suitability subclass 4d.

TrD—Tunbridge-Woodstock-Rock outcrop complex, 8 to 25 percent slopes. This complex is about 45 percent Tunbridge soils, 35 percent Woodstock soils, and 10 percent Rock outcrop. These sloping to moderately steep soils and Rock outcrop are on hills and ridges. Areas are irregular in shape and are 5 to 300 acres in size. Stones are 5 to 100 feet apart, and bedrock exposures are 30 to 100 feet apart. The soils in this complex form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Tunbridge and Woodstock soils have the profiles described as representative of their respective series.

Included with these soils in mapping are areas of Glover, Vershire, Colrain, and Pomfret soils on ridges and Buckland and Cabot soils in depressions and along drainageways. Also included are small bogs, seep spots on lower slopes, areas that were once cleared of surface stones and are presently in woodland or are idle, and areas of soils underlain by granite bedrock. Included areas make up about 10 percent of this complex.

Most areas of these soils are in woodland. A few areas have been cleared of trees and are used for unimproved pasture or are idle. The numerous surface stones and common rock outcrops prevent the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. Depth to bedrock, rock outcrops, stones, and slope limit these soils for most nonfarm uses. Runoff is medium to rapid. The hazard of water erosion is moderate to severe where the soils have no plant cover. Capability subclass VIs; Tunbridge soils in woodland suitability subclass 3r, and Woodstock soils in woodland suitability subclass 4d.

TwE—Tunbridge-Woodstock complex, 25 to 50 percent slopes. This complex is about 45 percent Tunbridge soils and 45 percent Woodstock soils. These steep soils are on hills and ridges. Areas are long and narrow or irregular in shape and are 5 to 300 acres in size. Stones are 5 to 100 feet apart, and bedrock exposures are 30 to 100 feet apart. The soils in this complex form such an intricate pattern that it is not practical to map them separately at scale of the soil map.

Included with these soils in mapping are areas of Glover, Vershire, Colrain, and Pomfret soils. Also included are areas of rock outcrop on ridgetops, seep spots on lower slopes, and areas of soils that are underlain by granite bedrock. Included areas make up about 10 percent of this complex.

Most areas of these soils are in woodland. Some have been cleared of trees and are used for unimproved pasture or are idle. The steep slopes, numerous surface stones, and closely spaced rock outcrop prevent the use of modern farm machinery. Sound woodland management that includes control of erosion on logging roads is needed. The steep slopes limit the use of logging equipment. Steep slopes, depth to bedrock, rock outcrop, and stones limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where the soils have no plant cover. Capability

subclass VIIs; Tunbridge soils in woodland suitability subclass 3r, and Woodstock soils in woodland suitability subclass 4d.

Vershire series

The Vershire series consists of gently sloping to steep, moderately deep, stony to very stony, well drained soils on the sides and tops of hills and ridges where the topography is bedrock controlled. These soils formed in glacial till derived from limestone, schist, and shale (fig. 13). They are mapped only in complexes with Glover soils.

In a representative profile in a wooded area, the surface is covered by a 2-inch-thick layer of forest litter. Below the litter is 2 inches of black loam over 4 inches of dark gray loam. The subsoil is very dark grayish brown; the upper 7 inches is loam, and the lower 17 inches is gravelly loam. Schistose bedrock is at a depth of 30 inches.

Vershire soils have moderately low available water capacity. Natural fertility is high. Permeability is moderate. Originally, most areas of these soils were too stony for tillage, but many areas have been cleared of surface stones and are being farmed. Where the stones have been piled along the edge of fields to form stone walls, the soil boundary and field boundary in places coincide.

Figure 13.—Profile of Vershire soil that has mica schist at a depth of about 27 inches.

Representative profile of Vershire loam in an area of Vershire-Glover-Rock outcrop complex, 8 to 25 percent slopes, in the town of Randolph, 1½ miles north of Route 66, and 200 feet east of Hebard Hill Road; 43°57′38″ N. and 72°37′50″ W.:

O—2 inches to 0; loose litter of leaves and twigs.
A1—0 to 2 inches; black (10YR 2/1) loam, dark gray 10YR 4/1) dry; moderate fine granular structure; very friable; many roots; 10 percent coarse fragments; medium acid; abrupt wavy boundary.
A2—2 to 6 inches; dark gray (10YR 4/1) loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; medium acid; abrupt broken boundary.
B21ir—6 to 13 inches; very dark grayish brown (2.5Y 3/2) loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; medium acid; gradual smooth boundary.
B22—13 to 30 inches; very dark grayish brown (2.5Y 3/2) gravelly loam; weak fine subangular blocky structure; friable; common roots; 20 percent coarse fragments; medium acid; abrupt wavy boundary.
R—30 inches; schistose bedrock.

Bedrock is at a depth of 20 to 40 inches. The solum is 16 to 32 inches thick. Thickness of the solum coincides with the depth to bedrock in places. Reaction ranges from strongly acid to slightly acid in the A horizon and from medium acid to neutral in the B horizon. Content of coarse fragments throughout the soil ranges from 5 to 30 percent. The B and C horizons are loam to silt loam or the gravelly analogs. Clay content is less than 18 percent in all horizons. In some places a compact layer is between the solum and the bedrock.

The A horizon has hue of 10YR to 5Y, value of 2 or 3, and chroma of 1 or 2. In some places an A2 horizon 1 to 4 inches thick is present. The B horizon has hue of 10YR to 5Y, and value and chroma of 2 to 4. Where present, the C horizon is dominantly olive gray (5Y 4/2).

Vershire soils are near Glover, Woodstock, Tunbridge, Colrain, Pomfret, Buckland, Cabot, and Peacham soils. They are deeper than Glover and Woodstock soils and have finer texture than Tunbridge soils. Vershire soils are not so deep and have finer texture than Colrain and Pomfret soils. They have no fragipan, which Buckland, Cabot, and Peacham soils do have, and they are better drained than those soils.

VeB—Vershire-Glover rocky loams, 3 to 8 percent slopes. This complex is about 55 percent Vershire soils and 30 percent Glover soils. These gently sloping soils are on the tops of hills and ridges. Areas are irregular in shape and are 3 to 60 acres in size. The surface layer is generally loam, but in some places it is silt loam or very fine sandy loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Vershire soil has a profile similar to the one described as representative of the Vershire series, but the surface layer has been mixed by plowing.

Included with these soils in mapping are areas of Woodstock, Tunbridge, Colrain, and Pomfret soils in convex areas and Buckland and Cabot soils in the depressions and along drainageways. Also included are small areas of rock outcrop and areas of soils that are more than 30 percent coarse fragments. These included

areas make up about 15 percent of this complex.

These soils are mainly used for hay, pasture, and corn for silage (fig. 14). Areas that are not farmed are in woodland or are idle. The surface stones and rock outcrop limit tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer, and conservation of moisture. Depth to bedrock limits these soils for most nonfarm uses. Runoff is medium. The hazard of water erosion is slight. Capability subclass IIe; Vershire soils in woodland suitability subclass 3o, and Glover soils in woodland suitability subclass 4d.

VeC—Vershire-Glover rocky loams, 8 to 15 percent slopes. This complex is about 50 percent Vershire soils and 30 percent Glover soils. These sloping soils are on hills and ridges. Areas are irregular in shape and are 3 to 100 acres in size. The surface layer is generally loam, but in some places it is silt loam or very fine sandy loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Vershire soil has a profile similar to the one described as representative of the Vershire series, but the surface layer has been mixed by plowing. The Glover soil has the profile described as representative of the Glover series.

Included with these soils in mapping are areas of Woodstock, Tunbridge, Colrain, and Pomfret soils in convex areas and Buckland and Cabot soils in depressions and along drainageways. Also included are small areas of rock outcrop and areas of soils that are more than 30 percent coarse fragments. These included areas make up about 20 percent of this complex.

These soils are mainly used for hay and pasture. A few areas are used for corn for silage. Areas that are not farmed are in woodland or are idle. The surface stones and rock outcrop limit tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer, conservation of moisture, and practices that reduce soil losses. Depth to bedrock and slope limit these soils for most nonfarm uses. Runoff is medium. The hazard of water erosion is moderate where the soil is cultivated. Capability subclass IIIe; Vershire soils in woodland suitability subclass 3o, and Glover soils in woodland suitability subclass 4d.

VeD—Vershire-Glover rocky loams, 15 to 25 percent slopes. This complex is about 50 percent Vershire soils and about 30 percent Glover soils. These moderately

Figure 14.—**Alfalfa on Vershire-Glover rocky loams, 3 to 8 percent slopes.**

steep soils are on hills and ridges. Areas are irregular in shape and are 3 to 100 acres in size. The surface layer is generally loam, but in some places it is silt loam or very fine sandy loam. Stones are 30 to 100 feet apart, and bedrock exposures are 100 to 300 feet apart. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Vershire soil has a profile similar to the one described as representative of the Vershire series, but the surface layer has been mixed by plowing.

Included with these soils in mapping are areas of Woodstock, Tunbridge, Colrain, and Pomfret soils on the sides and tops of hills and ridges and Buckland and Cabot soils in the small depressions and along narrow drainageways. Also included are rock outcrops, areas of soils that are more than 30 percent coarse fragments, and seep spots on the lower side slopes. These included areas make up about 20 percent of this complex.

These soils are mainly used for hay and pasture. The remaining areas are in woodland or are idle. The surface stones, rock outcrop, and slope limit tillage and harvesting but do not prevent cultivation. Crops respond well to a management system that includes application of lime and fertilizer, conservation of moisture and practices that reduce soil losses. Depth to bedrock and slope limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where the soil is cultivated. Capability subclass IVe; Vershire soils in woodland suitability subclass 3r, and Glover soils in woodland suitability subclass 4d.

VgD—Vershire-Glover-Rock outcrop complex, 8 to 25 percent slopes. This complex is about 45 percent Vershire soils, 35 percent Glover soils, and 10 percent Rock outcrop. These sloping to moderately steep soils and Rock outcrop are on ridges and hills. Areas are irregular in shape and are 5 to 300 acres in size. The surface layer is silt loam, loam, or very fine sandy loam. Stones are 5 to 100 feet apart and bedrock exposures are 30 to 100 feet apart. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

The Vershire soil has the profile described as representative of the Vershire series. The Glover soil has a profile similar to the one described as representative of the Glover series, but the surface layer has not been mixed by plowing.

Included with these soils in mapping are areas of Woodstock, Tunbridge, Colrain, and Pomfret soils in convex areas and Buckland and Cabot soils in depressions and along drainageways. Also included are small bogs, seep spots on lower side slopes, and areas that were once cleared of surface stones and are presently in woodland. These included areas make up about 10 percent of this complex.

Most areas of these soils are in woodland. Some areas are idle or have been cleared of trees and are used for unimproved pasture (fig. 15). Numerous surface stones and closely spaced rock outcrop prevent the use of modern farm machinery. Sound woodland management that includes controlling erosion on logging roads is needed. Depth to rock, rock outcrop, stones, and slope limit these soils for most nonfarm uses. Runoff is medium to rapid. The hazard of water erosion is moderate to severe where there is no plant cover. Capability subclass VIs; Vershire soils in woodland suitability subclass 3r, and Glover soils in woodland suitability subclass 4d.

VhE—Vershire-Glover complex, 25 to 50 percent slopes. This complex is about 45 percent Vershire soils and 40 percent Glover soils. These steep soils are on hills and ridges. Areas are long, narrow, and irregular in shape and are 5 to 300 acres in size. Stones are 5 to 100 feet apart, and bedrock exposures are 30 to 100 feet apart. The surface layer is silt loam, loam, or very fine sandy loam. The soils in this mapping unit form such an intricate pattern that it is not practical to map them separately at the scale of the soil map.

Included with these soils in mapping are areas of Woodstock, Tunbridge, Colrain and Pomfret soils. Also included are rock outcrops on ridge tops and seep spots on lower slopes. These included areas make up 15 percent of the complex.

Most areas of these soils are in woodland. Some areas are idle or have been cleared of trees and are used for unimproved pasture. Steep slopes, numerous surface stones, and closely spaced rock outcrop prevent the use of modern farm machinery. Steep slopes prevent the use of logging equipment. Sound woodland management that includes control of erosion on logging roads is needed. Steep slopes, depth to bedrock, rock outcrop, and stones limit these soils for most nonfarm uses. Runoff is rapid. The hazard of water erosion is severe where there is no plant cover. Capability subclass VIIs; Vershire soils in woodland suitability subclass 3r, and Glover soils in woodland suitability subclass 4d.

Walpole series

The Walpole series consists of level to gently sloping, deep, poorly drained soils on stream terraces. These soils formed in stratified outwash sand and gravel derived mainly from granite, quartz, gneiss, and schist.

In a representative profile in a wooded area, a 2-inch-thick layer of leaves, needles, and twigs is on the surface. The surface layer is black fine sandy loam 7 inches thick. The subsoil is 12 inches thick and has distinct mottles; the upper part is dark grayish brown fine sandy loam, and the lower part is grayish brown sandy loam. The underlying material to a depth of 60 inches is olive brown coarse sand that has distinct mottles.

Walpole soils have moderate available water capacity. Natural fertility is low. Permeability is moderately rapid in the upper 2 feet and is rapid below a depth of 2 feet. These soils have a seasonal high water table at or near the surface.

Representative profile of Walpole fine sandy loam in a wooded area, at a point approximately 2½ miles north of Lake Fairlee 600 feet east of road and 300 feet east of Middle Brook; 43°55′32″N. and 72°13′51″W.:

Figure 15.—**Unimproved pasture on Vershire-Glover-Rock outcrop complex, 8 to 25 percent slopes.**

O1—2 inches to 1 inch; fresh litter leaves, needles, and twigs.
O2—1 inch to 0; decomposed litter.
A1—0 to 7 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B21—7 to 11 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; common fine distinct dark yellowish brown (10YR 4/4) and few distinct olive (5Y 4/4) mottles; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; strongly acid; abrupt wavy boundary.
B22—11 to 19 inches; grayish brown (2.5Y 5/2) sandy loam; many coarse distinct dark yellowish brown (10YR 4/4) and common coarse distinct gray to light gray (5Y 6/1) mottles; single grained; loose; few roots; 15 percent coarse fragments; strongly acid; clear smooth boundary.
IIC—19 to 60 inches; olive brown (2.5Y 4/4) coarse sand; few coarse distinct olive (5Y 5/4) mottles; single grained; loose; 15 percent coarse fragments; strongly acid.

Bedrock is at a depth of more than 5 feet. Depth to the coarse textured C horizon is 18 to 28 inches. Reaction throughout the profile is very strongly acid to strongly acid unless it has been changed by liming. Distinct or prominent mottles are just below the A horizon. The profile is generally less than 25 percent coarse fragments but the C horizon contains as much as 40 percent gravel. The B horizon is sandy loam to fine sandy loam and the gravelly analogs. The C horizon ranges from loamy sand to gravelly coarse sand.

The A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). The B horizon has hue of 2.5Y and 5Y, value of 4 or 5, and chroma of 2 or less. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 or 4.

Walpole soils are near Hartland, Windsor, Agawam, Merrimac, Ninigret, and Raynham Variant soils. They are more sandy throughout the profile and are wetter than the Hartland soils. They are the wetter associate of Windsor, Agawam, Merrimac, and Ninigret soils. Walpole soils are not so fine textured as Raynham Variant soils.

Wa—Walpole fine sandy loam. This level to gently sloping soil is on stream terraces. Areas are long and narrow or irregular in shape and are 3 to 20 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Ninigret soils on low ridges and Raynham soils in level areas and in depressions. Areas of very poorly drained sandy and gravelly soils, areas of soils that are silt loam overlying sand, and areas of shallow muck are also included.

Most areas of this soil are in woodland or are idle. A few areas are used for hay, pasture, and corn for silage. A seasonal high water table at or near the surface and depressions that are ponded delay tillage in

spring and after heavy rain. Crops respond well to a management system that includes application of lime and fertilizer and artificial drainage. Sound woodland management that includes not working these areas during wet periods is needed. Wetness and frost action limit this soil for most nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIIw; woodland suitability subclass 4w.

Windsor series

The Windsor series consists of level to steep, deep, excessively drained, sandy soils on stream terraces. These soils formed in water-deposited sand more than 4 feet deep. In most places the sand is underlain by stratified sand and gravel.

In a representative profile in a cultivated, idle field (fig. 16), the surface layer is dark yellowish brown loamy fine sand 7 inches thick. The subsoil is about 22 inches thick; the upper part is strong brown and dark yellowish brown loamy fine sand, and the lower part is light olive brown fine sand. The underlying material to a depth of 60 inches is olive fine sand.

Figure 16.—**Profile of a Windsor loamy fine sand.**

Windsor soils have low available water capacity. Natural fertility is low. Permeability is rapid. These soils are used for hay, pasture, and corn for silage. Some areas are idle or are in woodland. The underlying material is a good source of sand.

Representative profile of Windsor loamy fine sand, 0 to 8 percent slopes, once heavily limed, in an idle field in the town of Randolph, 3 miles south of Route 66, and 200 feet west of the Stock Farm Road. 44°53′45″ N. and 72°38′14″W.:

Ap—0 to 7 inches; dark yellowish brown (10YR 3/4) loamy fine sand; weak fine granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.

B21—7 to 10 inches; strong brown (7.5YR 5/6) loamy fine sand; weak fine granular structure; very friable; common roots; slightly acid; clear wavy boundary.

B22—10 to 22 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak fine granular structure; very friable; few roots; 1 percent coarse fragments; slightly acid; clear smooth boundary.

B3—22 to 29 inches; light olive brown (2.5Y 5/6) fine sand; weak fine granular structure; very friable; 1 percent coarse fragments; neutral; clear smooth boundary.

C—29 to 60 inches; olive (5Y 5/3) fine sand; single grained; loose; very friable; neutral.

Bedrock is typically at a depth of more than 5 feet. The solum is 20 to 32 inches thick. Reaction is strongly acid to neutral throughout the profile. The profile is generally free of coarse fragments but has as much as 10 percent in places. The A and B horizons are mainly loamy fine sand. or loamy sand, but they range to fine sand. The C horizon is medium or fine sand.

The A horizon has hue of 10YR, a value of 3, and chroma of 2 to 4. An A2 horizon, 2 to 4 inches thick, is present in unplowed areas. The B21 horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 4 to 6. The B22 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2 to 4.

Windsor soils are near Hartland, Agawam, Merrimac, Ninigret, and Walpole soils. They have coarser sand throughout the profile than Hartland soils and have coarser sand in the upper part of the profile than Agawam soils. Windsor soils have a lower content of gravel in the underlying material than Merrimac soils and are better drained than Ninigret and Walpole soils.

WnB—Windsor loamy fine sand, 0 to 8 percent slopes. This level to gently sloping soil is on stream terraces. Areas are irregular in shape and are 3 to 40 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Agawam, Merrimac, Hartland, Ninigret, and Walpole soils. Also included are a few small areas that have stones on the surface.

This soil is mainly used for hay, pasture, and corn for silage. A few areas are idle or are in woodland. Many villages are on this soil. Sand and gravel pits are common. Crops respond well to a management system that includes application of lime and fertilizer, conservation of moisture, and reduction of soil losses. This soil has few limitations for most nonfarm uses. Runoff is slow. This soil is subject to soil blowing in areas that have no plant cover. The hazard of water erosion is slight. Capability subclass IIIs; woodland suitability subclass 5s.

WnD—Windsor loamy fine sand, 8 to 25 percent slopes. This sloping to moderately steep soil is on dissected stream terraces. Areas are long and narrow or irregular in shape and are 3 to 40 acres in size.

Included with this soil in mapping are small areas of Agawam, Hartland, Merrimac, and Ninigret soils. Also included are areas of soils that have been severely eroded by wind and areas that have stones on the surface.

This soil is mainly used for hay and pasture. A few areas are used for corn for silage. Many areas are in woodland or are idle. Sand and gravel pits are common. Crops respond well to a management system that includes application of lime and fertilizer, conserves moisture, and reduces soil losses. Slope, sandy texture, and droughtiness limit this soil for many nonfarm uses. Runoff is medium. This soil is subject to soil blowing in areas that have no plant cover. The hazard of water erosion is moderate to severe where the soil is cultivated. Capability subclass VIs; woodland suitability subclass 5s.

WnE—Windsor loamy fine sand, 25 to 50 percent slopes. This steep soil is on terrace breaks and strongly dissected terraces. Areas are long and narrow or irregular in shape and are 3 to 50 acres in size.

This soil has a profile similar to the one described as representative of the series, but the surface layer has not been mixed by plowing.

Included with this soil in mapping are small areas of Agawam, Merrimac, and Hartland soils. Also included are areas of soils that have been severely eroded by wind or water and areas that have stones on the surface. In places seep spots are present on the lower part of the side slopes.

Most areas of this soil are in woodland. A few areas are idle or are used for unimproved pasture. Sand and gravel pits are common. This soil is too steep for the use of modern farm machinery and logging equipment. Sound woodland management that includes controlling erosion on logging roads is needed. Slope limits this soil for most nonfarm uses. Runoff is rapid. This soil is subject to soil blowing and severe water erosion in areas that have no plant cover. Capability subclass VIIs; woodland suitability subclass 5s.

Winooski series

The Winooski series consists of level, deep, moderately well drained soils on flood plains of major streams and their tributaries. These soils formed in very fine sandy loam and silt loam alluvium.

In a representative profile in a hayfield, the surface layer is very dark grayish brown very fine sandy loam 8 inches thick. The underlying material between the depths of 8 and 17 inches is about equal parts of very dark grayish brown and olive very fine sandy loam. Between 17 and 60 inches it is dominantly very dark grayish brown very fine sandy loam that has distinct dark yellowish brown mottles.

Winooski soils have high available water capacity. Natural fertility is high. Permeability is moderate. A seasonal high water table is at a depth of 1½ to 2½ feet in spring and during wet periods. Frequency of flooding varies from 1 time to 3 times a year to once in 10 years or more.

Representative profile of Winooski very fine sandy loam in the town of Thetford, 150 feet south of the West Fairlee town line, and 200 feet east of the Ompompanoosuc River; 43°53′42″N. and 72°15′30″W.:

Ap—0 to 8 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam, light brownish gray (2.5Y 6/2) dry; weak fine granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.

C1—8 to 17 inches; about equal parts of very dark grayish brown (10YR 3/2) and olive (5Y 4/3) very fine sandy loam; weak fine granular structure; very friable; common roots; slightly acid; clear smooth boundary.

C2—17 to 38 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine granular structure; very friable; few roots; slightly acid; abrupt smooth boundary.

IIC3—38 to 42 inches; olive (5Y 4/3) fine sand; single grained; loose; neutral; abrupt smooth boundary.

IIIC4—42 to 60 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; massive; very friable; neutral.

Bedrock is typically at a depth of more than 5 feet. Distinct or prominent mottles are 15 to 24 inches thick. Reaction ranges from medium acid to neutral throughout the soil. Coarse fragments are generally absent but some profiles contain as much as 5 percent. The C horizon is dominantly very fine sandy loam but ranges to fine sand and silt loam. The lower horizons have thin strata of loamy sand or gravelly sand in places. Clay content is less than 18 percent in all horizons.

The A horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2. The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 or 3.

Winooski soils are near Hadley, Limerick, and Saco soils. They have mottles above a depth of 24 inches which Hadley soils do not have. Winooski soils do not have the mottled gray colors in the upper 12 inches that are characteristic of Limerick soils. They do not have so dark a surface layer and are not so wet as Saco soils.

Wo—Winooski very fine sandy loam. This level soil is in areas that are irregular in shape and are 3 to 50 acres in size. These areas are generally 4 to 5 times as long as they are wide.

Included with this soil in mapping are small areas of Hadley soils in convex areas and Limerick soils in depressions. Also included are areas of soils that are underlain by sand and gravel, areas of soils that have recent deposits of sand, gravel, and cobbles on the surface, and some small areas of soils that are fine sandy loam and loamy fine sand throughout the profile. The surface layer is silt loam, fine sandy loam, or loamy fine sand in places.

This soil is mainly used for hay, pasture and corn for silage. Other areas are in woodland or are idle. Frequent flooding limits the use of some of the lower lying areas. Debris from floods delays planting in some years. Crops respond well to a management system that includes application of lime and fertilizer and drainage. Wetness and the hazard of flooding limits this soil for most nonfarm uses. Runoff is slow. The hazard of water erosion is slight. Capability subclass IIw; woodland suitability subclass 3o.

Woodstock series

The Woodstock series consists of gently sloping to steep, rocky and very rocky, somewhat excessively drained soils that are shallow to bedrock. These soils formed in glacial till derived mainly from siliceous limestone and schistose rocks. Most areas of this soil are on the upper side slopes and tops of hills and ridges where the topography is bedrock controlled. These soils are mapped only in complexes with Tunbridge soils.

In a representative profile in an abandoned pasture, the surface layer is dark brown fine sandy loam 6 inches thick. The subsoil is dark yellowish brown fine sandy loam in the upper part and dark brown fine sandy loam in the lower part. Interbedded siliceous limestone and mica schist are at a depth of 18 inches.

Woodstock soils have low or very low available water capacity. Natural fertility is medium. Permeability is moderately rapid. Bedrock outcrops are closely spaced in most areas of this soil. Originally, most areas of these soils were too stony for tillage, but many areas have been cleared of surface stones and are farmed. Where the stones have been piled along the edge of the fields to form stone walls, the soil boundary and field boundary in places coincide.

Representative profile of Woodstock fine sandy loam in an area of Tunbridge-Woodstock-Rock outcrop complex, 8 to 25 percent slopes, 1.5 miles northeast of the village of Waits River, about 1.8 miles north of Vermont Highway 25, and about 0.3 mile north of Fellows Cemetery; 44°6′12″N. and 72°15′30″W.:

Ap—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21ir—6 to 11 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine granular structure; very friable; many roots; 10 percent coarse fragments; slightly acid; gradual wavy boundary.

B22—11 to 18 inches; dark brown (10YR 39/3) fine sandy loam; weak fine granular structure; very friable; common roots; 10 percent coarse fragments; slightly acid; abrupt wavy boundary.

R—18 inches; interbedded siliceous limestone and mica schist.

Depth to bedrock and thickness of the solum are 10 to 20 inches. Reaction throughout the profile ranges from medium acid to slightly acid. Coarse fragments range from 5 to 30 percent throughout. Texture below the A horizon ranges from fine sandy loam to loamy fine sand and the gravelly analogs. The clay content in all horizons is less than 10 percent.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 to 3. A weakly developed A2 horizon is in the profiles in some places. The B horizon has hue of 10YR or 2.5Y, value of 3 or 4, chroma of 2 to 4. The C horizon, where present, has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3.

Woodstock soils are near Glover, Tunbridge, Colrain, Pomfret, Vershire, Buckland, Cabot, and Peacham soils. They are coarser textured than Glover and Vershire soils. They are not so deep as Tunbridge, Colrain, Vershire, and Pomfret soils. Woodstock soils do not have a fragipan, which Buckland, Cabot, and Peacham soils have, and they are better drained than those soils.

Planning the use and management of the soils

The soil survey is a detailed analysis and evaluation of the most basic resource of the survey area—the soil. It may be used to fit the use of the land, including urbanization, to the limitations and potentials of the natural resources and the environment; and to help avoid soil-related failures in uses of the land.

During a soil survey soil scientists, conservationists, engineers, and others keep extensive notes, not only about the nature of the soils but also about unique aspects of behavior of these soils in the field and at construction sites. These notes include observations of erosion; drought damage to specific crops; yield estimates; flooding; the function of septic systems; and other factors relating the kinds of soil and their productivity, potentials and limitations under various uses and management. In this way field experience incorporated with measured data on soil properties and performance is used as a basis for predicting soil behavior.

Information in this section will be useful in applying basic facts about the soils to plans and decisions for use and management of soils for crops, pasture, range, and woodland; and many nonfarm uses, including building sites, highways and other transportation systems, sanitary facilities, parks and other recreational developments, and wildlife habitat. From the data presented, the potential of each soil for specified land use may be determined, soil limitations to these land uses may be identified, and costly failures in homes and other structures, because of unfavorable soil properties, may be avoided. A site can be selected where the soil properties are favorable, or practices can be planned that will overcome the soil limitations.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area, and on the environment. Both of these factors are closely related to the nature of the soil. Plans can be made to maintain or create a land use pattern in harmony with the natural soil.

Contractors can find information useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, trees and shrubs, and most other uses of land are influenced by the nature of the soil.

Crops and pasture

The major management concerns when using the soils for crops and pasture are described in this sec-

tion. In addition, the crops or pasture plants best adapted to the soil, including some that are not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the predicted yields of the main crops, hay, and pasture are presented for each soil.

This section provides information about the overall agricultural potential and needed practices in the survey area for those in the agribusiness sector—equipment dealers, drainage contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Descriptions of the soils." When making plans for management systems for individual fields or farms, check the detailed information given in the description of each soil.

The main crops of Orange County are forage crops and corn grown for silage. Apple orchards and truck crops are of minor importance.

The concerns of use and management vary in different parts of the survey area. In the mountains and on uplands the dominant soils are medium textured, very stony, very rocky, and shallow to deep.These soils make up about 92 percent of the survey area. The major limitations are stoniness, rockiness, and steepness. The main management concerns on the less stony and rocky soils are improving drainage, improving and maintaining fertility, and controlling erosion. The soils are used mainly for hay and pasture. Corn is grown for silage on a small acreage of the less sloping soils.

In the Connecticut River valley and along the many narrow valleys throughout the survey area, the soils are nonstony, nonrocky, medium to moderately coarse textured, and deep. The major management concerns are maintaining fertility, reducing excess wetness, and controlling erosion. These soils are used mainly for hay and pasture and for corn for silage. Corn is grown for grain on a small acreage.

Where the soils are used to grow truck crops, management is needed for controlling erosion, improving drainage, maintaining the content of organic matter, improving or maintaining tilth, and increasing fertility.

Erosion control includes growing a winter cover crop; stripcropping; growing grasses, legumes, or both in a long-term conservation cropping system; farming on the contour; grassing waterways; constructing diversions and ditches to intercept runoff from adjacent higher slopes; regulating grazing to maintain cover; using minimum tillage, particularly on short slopes where contour cultivation is difficult; and applying lime and fertilizer as needed.

Many soils in the survey area need improved drainage for optimum crop growth. Wet soils warm up more slowly in spring than better drained soils. They delay tillage, and they often cause farm machinery to bog down. Drainage can be improved by constructing open ditches, smoothing the land, and installing tile. Land smoothing eliminates small elevated areas and fills small depressions. Tile drains can be used to remove excess water in drainageways, seeps, and depressions. Shallow waterways help to remove surface water from depressions in the field.

The content of organic matter is so low in most soils that management is needed to improve and maintain tilth. Plowing under crop residue reduces crusting and evaporation, incorporates organic matter, increases the amount of water absorbed, and makes the soil easier to till. Growing grasses and legumes to be plowed under as green manure improves tilth and structure and, thus, increases permeability. Soils that are tilled when wet lose their granular structure and become cloddy and hard when dry. Bare soils tend to develop a hard surface crust on drying after heavy rain. This crust limits emergence of new seedlings and may result in sparse stands of plants.

Almost all of the soils in the survey area are acid. Natural fertility is low. Applying lime, livestock manure, and commercial fertilizer improves tilth and crop growth. Lime and fertilizer should be applied according to soil test results. Consideration also should be given to previous use and potential of the soil. Using better plant varieties developed in recent years increases yields.

Hay crops and tame pasture occupy a large area in the survey area. A grass-legume mixture most commonly used consists of alfalfa, ladino clover, bromegrass, and timothy. Red clover, alsike clover, redtop, reed canarygrass, orchardgrass, and birdsfoot trefoil are also grown. Alfalfa grows better on soils that are moderately well drained or well drained than on wet soils. Ladino clover is more tolerant of wet soils. Reed canarygrass and alsike clover grow on some wet soils and in inadequately drained areas.

In managing a good stand of perennial pasture plants, a sound fertilizer program, proper grazing, and necessary brush and weed control insure good growth for a long period.

Yields per acre

The per acre average yields that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated because of seasonal variations in rainfall and other climatic factors. Absence of a yield estimate indicates that the crop is not suited to or not commonly grown on the soil or that irrigation of a given crop is not commonly practiced on the soil.

The predicted yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The latest soil and crop management practices used by many farmers in the survey area are assumed in predicting the yields. Hay and pasture yields are predicted for varieties of grasses and legumes suited to the soil. A few farmers may be using more advanced practices and are obtaining average yields higher than those shown in table 6.

TABLE 6.—*Yields per acre of crops and pasture*

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn silage	Alfalfa hay	Grass-legume hay	Pasture
	Tons	*Tons*	*Tons*	*AUM*[1]
Agawam:				
AgA, AgB	24	5.0	4.5	8.5
AgC	22	4.5	4.0	7.7
AgD	18			6.6
AgE				
Belgrade:				
BeB	22	4.5	4.0	8.0
BeC	20	4.5	3.5	8.0
BeD	18	4.0	3.5	7.5
Buckland:				
BuB	22	4.0	3.5	7.5
BuC	20	3.5	3.0	7.0
BuD	18	3.0	2.5	6.0
BvC				
BwE				
Cabot:				
CaB	16	4.0	4.0	7.5
CaC	15	4.0	4.0	7.5
CaD				7.0
CbB, CbD				
Colrain:				
CoB	22	5.0	4.5	8.0
CoC	20	5.0	4.0	8.0
CoD	18	4.5	3.5	7.5
CsD				
CsE				
CxD, CxE				
Hadley: Ha	28	4.5	4.5	
Hartland:				
HdB	28	5.0	4.5	9.5
HdC	26	4.5	4.0	8.5
HdD	22	4.0	3.5	8.0
HdE				
Limerick: Le	20	3.5	3.5	6.5
Merrimac:				
MeA, MeB	18	4.0	3.0	
MeC	16	4.0	3.0	
MeD	14	3.5	2.5	
MeE				
Muck: Mu[2]				
Ninigret:				
NnB	22	4.0	3.5	7.7
NnC	20	3.5	3.0	7.0
Peacham: Pc				
Pomfret:				
PoC	18	3.5	3.5	7.0
PoD	16	3.0		7.0
PsD				
PtE				
Raynham Variant:				
Ra	18	3.5	3.5	6.5
Rock outcrop: Ro.				
Saco: Sa				
Stowe:				
SoB	20	4.0	3.5	8.0
SoC	18	4.0	3.5	8.0
SoD	16	3.5	3.0	7.0
StD				
SwE				
Tunbridge:				
TbB[2]	18	4.0	3.5	6.3
TbC[2]	16	4.0	3.5	6.3
TbD[2]	14			5.8
TrD[2]				
TwE[2]				
Vershire:				
VeB[2]	18	4.0	3.5	7.6
VeC[2]	17	4.0	3.5	7.7
VeD[2]	15			6.8
VgD[2]				
VhE[2]				
Walpole: Wa	18	3.5	3.0	5.5
Windsor:				
WnB	14	3.0	2.5	5.5
WnD		2.5	2.0	5.0
WnE				
Winooski: Wo	26	4.5	4.0	8.5

[1] Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

[2] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit descripton for the composition and behavior of the whole mapping unit.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation, and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; harvesting of crops with the smallest possible loss; and timeliness of all fieldwork.

The predicted yields reflect the relative productive capacity of the soils for each of the principal crops. Yields are likely to increase in the future as new production technology is developed. The relative productivity of a given soil compared to other soils, however, is not likely to change.

Crops other than those shown in table 6 are also grown in the survey area, but because their acreage is small, predicted yields for these crops are not included. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the productivity and management concerns of the soils for these crops.

Capability classes and subclasses

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. This classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering purposes.

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

Class I soils have a few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial plants.

CAPABILITY SUBCLASSES are soil groups within one class. They are designated by adding a small letter *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c*, because the soils in Class V are subject to little or no erosion. However, they do have other limitations that restrict their use to pasture, range, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 7. All land in the survey area except borrow pits, gravel pits, urban land, and other miscellaneous areas are included. Some of the soils that are well suited to crops and pasture, for example those in capability classes I and II, are now used for woodland or other low intensity uses. Data in this table can be used to determine the farming potential of the area. The capability subclass is identified in the description of each soil mapping unit in the section "Descriptions of the soils."

Woodland management and productivity[4]

Most woodland in Orange County has been used either intensively as cropland and cleared pasture or extensively as woodland and pasture. In the 1800's much of the acreage that is now in forest was used for sheep pasture and subsistence farming. In the 1900's dairy herds replaced the sheep. Since World War I the acreage used for farming has steadily decreased, and the abandoned hill fields have reverted to forest. The family dairy farm has survived in the more fertile valleys and on the less severely sloping soils. Forests now occupy four-fifths of the county, but dairy farming is still the largest commercial activity.

Timber growing and processing make up a large part of the county's economy. Wood crops and timber production are included in most farm operations. A growing vacation home industry exists side by side with the farm and timber industry, and the competition for land ownership is severe.

Almost 80 percent of the survey area is now in forest. The standing sawtimber includes 400 million board feet of hardwood and 300 million board feet of softwood. The leading tree species in order of total saw-

[4] MYRON E. SMITH, Orange County forester, assisted in preparing this section.

TABLE 7.—*Capability classes and subclasses*

[Miscellaneous areas excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
	Acres	*Acres*	*Acres*	*Acres*
I	5,088	.....	.....	.....
II	31,495	7,428	20,626	3,441
III	41,194	28,755	10,996	1,443
IV	21,179	20,470	709	.....
V	3,816	.....	3,816	.....
VI	173,795	2,547	1,319	169,929
VII	163,469	1,662	3,139	158,668
VIII	1,564	.....	.....	1,564

timber volume are sugar maple, hemlock, white pine, spruce, and yellow birch.

In 1938 a hurricane hit all of Orange County very hard, particularly the area near the Connecticut River. Virtually every large tree on slopes openly exposed to the southeast was destroyed. Those slopes have been naturally restocked, but the hurricane effects are still evident.

Tree planting programs of the Vermont Department of Forests and Parks and the Soil Conservation Service and other federal agencies are in effect in the survey area. Three plants for processing forest products are established in the area because of the increased material supply in the planted stands. In addition, planted forest stands provide thousands of board feet annually to conventional sawmills.

A four-year period of exceptionally dry growing seasons during the early 1960's severely hurt forest growth. Yellow birch and spruce were especially vulnerable, and mortality in these species continues. The weakened trees never fully recovered from the lack of soil moisture and the effects of disease and insects which attacked them.

The demand for good quality hardwood timber was high during the mid-1960's. The greater removal of quality hardwood in 1972 and 1973 lowered the average quality of the remaining timber stands.

Table 8 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Those soils suitable for wood crops are listed alphabetically by soil name, and the ordination symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the symbol, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *s*, sandy texture; and *r*, steep slopes. The letter *o* indicates no significant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the order in which the letters are listed above—x, w, d, s, and r.

In table 8 the soils are also rated for a number of factors to be considered in management. The ratings of slight, moderate, and severe are used to indicate the degree of major soil limitations.

Ratings of the hazard of erosion indicate the risk of soils in well managed woodland. The risk is *slight* if the expected soil loss is small; *moderate*, if some measures are needed to control erosion during logging and road construction; and *severe*, if intensive management or special equipment and methods are needed to prevent soil loss.

Ratings of equipment limitation reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings when plant competition is not a limiting factor. The ratings are for seedlings from good planting stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of windthrow hazard are characteristics of the soil that affect the development of tree roots and the ability of soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The potential productivity of merchantable trees on a soil is expressed as a site index (*4, 5, 6, 7*). This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Field plot data for site index were measured for some of the soils listed in table 8. Where data was lacking on soils, judgement and experience were used to supply site index and species information.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Engineering[5]

This section provides information about the use of soils for building sites, sanitary facilities, construction materials, and water management. Among those who can benefit from this section are engineers, landowners, community decision makers and planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in tables in this section are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by the soil survey and used in determining the ratings in this section are grain-size distribution, liquid limit, plasticity index, soil reaction, depth to and

[5] RICHARD A. GALLO, State conservation engineer, Soil Conservation Service, assisted in preparing this section.

TABLE 8.—*Woodland management and productivity*

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Agawam:								
AgA, AgB, AgC	4o	Slight	Slight	Slight	Slight	Eastern white pine	70	Eastern white pine, red pine, white spruce, Norway spruce.
						Red pine	70	
						Northern red oak	65	
						Sugar maple	60	
						Eastern hemlock	56	
AgD, AgE	4r	Slight	Moderate	Slight	Slight	Eastern white pine	70	Eastern white pine, red pine.
						Red pine	70	
						Northern red oak	65	
						Sugar maple	60	
						Eastern hemlock	56	
Belgrade:								
BeB	3o	Slight	Slight	Slight	Slight	Eastern white pine	75	Eastern white pine, red pine, white spruce.
						Red pine	75	
						White spruce	65	
						Eastern hemlock	62	
BeC	3r	Moderate	Slight	Slight	Slight	Eastern white pine	75	Eastern white pine, red pine, white spruce.
						Red pine	75	
						White spruce	65	
						Eastern hemlock	62	
BeD	3r	Moderate	Slight	Slight	Slight	Eastern white pine	75	Eastern white pine, red pine, white spruce.
						Red pine	75	
						White spruce	65	
						Eastern hemlock	62	
Buckland:								
BuB, BuC	3o	Slight	Slight	Slight	Slight	Eastern white pine	71	Eastern white pine.
						Sugar maple	57	
						White spruce	64	
						Balsam fir	62	
						Eastern hemlock	56	
						Yellow birch	60	
BuD	3r	Slight	Moderate	Slight	Slight	Eastern white pine	71	Eastern white pine.
						Sugar maple	57	
						White spruce	64	
						Balsam fir	62	
						Eastern hemlock	56	
						Yellow birch	60	
BvC	3r	Slight	Moderate	Slight	Slight	Eastern white pine	71	Eastern white pine, red pine, white spruce, red spruce.
						Sugar maple	57	
						White spruce	64	
						Balsam fir	62	
						Eastern hemlock	56	
						Yellow birch	60	
BwE	3r	Moderate	Severe	Slight	Slight	Eastern white pine	71	Eastern white pine, red pine, white spruce, red spruce.
						Sugar maple	57	
						White spruce	64	
						Balsam fir	62	
						Eastern hemlock	56	
						Yellow birch	60	
Cabot: CaB, CaC, CaD, CbB, CbD.	4w	Slight	Severe	Severe	Severe	Sugar maple	56	Eastern white pine, white spruce, northern white-cedar.
						White spruce	60	
						Balsam fir	56	
						Red spruce	47	
						Eastern hemlock	50	
						Yellow birch	56	

TABLE 8.—*Woodland management and productivity*—Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Colrain:								
CoB, CoC	3o	Slight	Slight	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce, white spruce, balsam fir.
						Eastern white pine	75	
						Red pine	67	
						Red spruce	45	
						Eastern hemlock	50	
						Yellow birch	56	
CoD	3r	Slight	Moderate	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce, white spruce, balsam fir.
						Eastern white pine	75	
						Red pine	67	
						Red spruce	45	
						Eastern hemlock	50	
						Yellow birch	56	
CsD	3r	Slight	Moderate	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce.
						Northern red oak	66	
						Eastern white pine	75	
						Red pine	67	
						Eastern hemlock	50	
						Yellow birch	56	
CsE	3r	Moderate	Severe	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce.
						Northern red oak	66	
						Eastern white pine	75	
						Red pine	67	
						Eastern hemlock	50	
						Yellow birch	56	
CxD	3x	Slight	Moderate	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce.
						Northern red oak	66	
						Eastern white pine	75	
						Red pine	67	
						Eastern hemlock	50	
						Yellow birch	56	
CxE	3x	Moderate	Severe	Slight	Slight	Sugar maple	65	Eastern white pine, red pine, Norway spruce.
						Northern red oak	66	
						Eastern white pine	75	
						Red pine	67	
						Eastern hemlock	50	
						Yellow birch	56	
Hadley: Ha	3o	Slight	Slight	Slight	Slight	Eastern white pine	70	Eastern white pine, red pine, black walnut, European larch.
Hartland:								
HdB	3o	Slight	Slight	Slight	Slight	Sugar maple	60	Eastern white pine, red pine, white spruce, Norway spruce.
						Eastern white pine	70	
						Eastern hemlock	60	
HdC	3r	Moderate	Slight	Slight	Slight	Sugar maple	60	Eastern white pine, red pine, white spruce, Norway spruce.
						Eastern white pine	70	
HdD	3r	Severe	Moderate	Slight	Slight	Sugar maple	60	Eastern white pine, red pine, white spruce, Norway spruce.
						Eastern white pine	70	
						Eastern hemlock	60	
HdE	3r	Severe	Severe	Slight	Slight	Sugar maple	60	Eastern white pine, red pine, white spruce, Norway spruce.
						Eastern white pine	70	
						Eastern hemlock	60	

TABLE 8.—*Woodland management and productivity*—Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Limerick: Le	4w	Slight	Severe	Severe	Severe	Eastern white pine	65	Eastern white pine, white spruce, northern white-cedar.
Merrimac:								
MeA, MeB, MeC	4s	Slight	Slight	Moderate	Slight	Northern red oak Eastern white pine Sugar maple Eastern hemlock	51 64 58 58	Eastern white pine, red pine.
MeD	4s	Slight	Moderate	Moderate	Slight	Northern red oak Eastern white pine Sugar maple Eastern hemlock	51 64 58 58	Eastern white pine, red pine.
MeE	4s	Moderate	Severe	Moderate	Slight	Northern red oak Eastern white pine Sugar maple Eastern hemlock	51 64 58 58	Eastern white pine, red pine.
Muck: Mu.								
Ninigret: NnB, NnC	3o	Slight	Slight	Slight	Slight	Red pine Eastern white pine Balsam fir Eastern hemlock	71 75 51 60	Eastern white pine, white spruce.
Peacham: Pc.								
Pomfret:								
PoC	4s	Slight	Slight	Moderate	Slight	Sugar maple Northern red oak Eastern white pine Red pine	62 58 69 65	Red pine, eastern white pine, Norway spruce.
PoD, PsD	4s	Slight	Moderate	Moderate	Slight	Sugar maple Northern red oak Eastern white pine Red pine	62 58 69 65	Red pine, eastern white pine, Norway spruce.
PtE	4s	Moderate	Severe	Moderate	Slight	Sugar maple Northern red oak Eastern white pine Red pine	62 58 69 65	Red pine, eastern white pine, Norway spruce.
Raynham Variant: Ra	4w	Slight	Severe	Severe	Severe	Eastern white pine White spruce Red spruce Eastern hemlock	65 55 45 52	Eastern white pine, white spruce, northern white-cedar.
Rock outcrop: Ro.								
Saco: Sa.								
Stowe:								
SoB, SoC	3o	Slight	Slight	Slight	Slight	Red pine Eastern white pine Sugar maple	67 66 75	Red pine, eastern white pine, Norway spruce.
SoD, StD	3r	Slight	Moderate	Slight	Slight	Red pine Eastern white pine Sugar maple	67 66 75	Red pine, eastern white pine, Norway spruce.
SwE	3r	Moderate	Severe	Slight	Slight	Red pine Eastern white pine Sugar maple	67 66 75	Red pine, eastern white pine, Norway spruce.

TABLE 8.—*Woodland management and productivity*—Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Tunbridge:								
TbB:[1]								
Tunbridge part	3o	Slight	Slight	Slight	Slight	Northern red oak Eastern white pine Red spruce	70 75 55	Eastern white pine, white spruce, red spruce.
Woodstock part	4d	Slight	Slight	Severe	Moderate	Red pine White spruce Balsam fir Red spruce	60 58 58 41	Eastern white pine, white spruce, balsam fir.
TbC:[1]								
Tunbridge part	3o	Slight	Slight	Slight	Slight	Northern red oak Eastern white pine Red spruce	70 75 55	Eastern white pine, white spruce, red spruce.
Woodstock part	4d	Slight	Slight	Severe	Moderate	Red pine White spruce Balsam fir Red spruce	60 58 58 41	Eastern white pine, white spruce, balsam fir.
TbD:[1]								
Tunbridge part	3r	Slight	Moderate	Slight	Slight	Northern red oak Eastern white pine Red spruce	70 75 55	Eastern white pine, white spruce, red spruce.
Woodstock part	4d	Slight	Moderate	Severe	Moderate	Red pine White spruce Balsam fir Red spruce	60 58 58 41	Eastern white pine, white spruce, balsam fir.
TrD:[1]								
Tunbridge part	3r	Slight	Moderate	Slight	Slight	Northern red oak Eastern white pine Red spruce	70 75 55	Eastern white pine, white spruce, red spruce.
Woodstock part	4d	Slight	Moderate	Severe	Moderate	Red pine White spruce Balsam fir Red spruce	60 58 58 41	Eastern white pine, white spruce, balsam fir.
Rock outcrop part.								
TwE:[1]								
Tunbridge part	3r	Moderate	Severe	Slight	Slight	Northern red oak Eastern white pine Red spruce	70 75 55	Eastern white pine, white spruce, red spruce.
Woodstock part	4d	Moderate	Severe	Severe	Moderate	Red pine White spruce Balsam fir Red spruce	60 58 58 41	Eastern white pine, white spruce, balsam fir.
Vershire:								
VeB:[1]								
Vershire part	3o	Slight	Slight	Slight	Slight	Sugar maple Eastern white pine Red spruce Eastern hemlock	70 75 55 52	Eastern white pine, white spruce, red spruce.
Glover part	4d	Slight	Slight	Severe	Moderate	White spruce Red spruce Sugar maple	57 44 61	Eastern white pine, white spruce, balsam fir, tamarack.
VeC:[1]								
Vershire part	3o	Slight	Slight	Slight	Slight	Sugar maple Eastern white pine Red spruce Eastern hemlock	70 75 55 52	Eastern white pine, white spruce, red spruce.

TABLE 8.—*Woodland management and productivity*—Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
VeC:[1]—Continued								
Glover part	4d	Slight	Slight	Severe	Moderate	White spruce Red spruce Sugar maple	57 44 61	Eastern white pine, white spruce, balsam fir, tamarack.
VeD:[1]								
Vershire part	3r	Slight	Moderate	Slight	Slight	Sugar maple Eastern white pine Red spruce Eastern hemlock	70 75 55 52	Eastern white pine, white spruce, red spruce.
Glover part	4d	Slight	Moderate	Severe	Moderate	White spruce Red spruce Sugar maple	57 44 61	Eastern white pine, white spruce, balsam fir, tamarack.
VgD:[1]								
Vershire part	3r	Slight	Moderate	Slight	Slight	Sugar maple Eastern white pine Red spruce Eastern hemlock	70 75 55 52	Eastern white pine, white spruce, red spruce.
Glover part	4d	Slight	Moderate	Severe	Moderate	White spruce Red spruce Sugar maple	57 44 61	Eastern white pine, white spruce, balsam fir, tamarack.
Rock outcrop part.								
VhE:[1]								
Vershire part	3r	Moderate	Severe	Slight	Slight	Sugar maple Eastern white pine Red spruce Eastern hemlock	70 75 55 52	Eastern white pine, white spruce, red spruce.
Glover part	4d	Moderate	Severe	Severe	Moderate	White spruce Red spruce Sugar maple	57 44 61	Eastern white pine, white spruce, balsam fir, tamarack.
Walpole: Wa	4w	Slight	Severe	Severe	Severe	Eastern white pine Red spruce Red maple	68 43 75	Eastern white pine, white spruce, northern white-cedar, Norway spruce.
Windsor:								
WnB	5s	Slight	Slight	Severe	Slight	Eastern white pine Northern red oak Red pine Sugar maple	57 52 61 55	Eastern white pine, red pine.
WnD	5s	Slight	Moderate	Severe	Slight	Eastern white pine Northern red oak Red pine Sugar maple	57 52 61 55	Eastern white pine, red pine.
WnE	5s	Moderate	Severe	Severe	Slight	Eastern white pine Northern red oak Red pine Sugar maple	57 52 61 55	Eastern white pine, red pine.
Winooski: Wo	3o	Slight	Slight	Slight	Slight	Northern red oak Eastern white pine White spruce Sugar maple	70 75 70 65	Eastern white pine, red pine, European larch.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for composition and behavior of whole mapping unit.

hardness of bedrock above a depth of 5 or 6 feet, soil wetness characteristics, depth to a seasonal water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

Based on the information assembled about soil properties, ranges of values may be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values may be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to—(1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternate routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternate sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-county movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations and testing.

The information is presented mainly in tables. Table 9 shows, for each kind of soil, ratings of the degree and kind of limitations for building site development; table 10, for sanitary facilities; and table 12 for water management. Table 11 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, with the soil map, soil descriptions, and other data provided in this survey can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have different meanings in soil science than in engineering; the Glossary defines many of these terms.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 9. A *slight* limitation indicates that soil properties are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by the soil wetness of a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined; and the presence of very firm or extremely firm horizons, generally difficult to excavate, is indicated.

Dwellings and small commercial buildings referred to in table 9 are built on undisturbed soils and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence from settling or shear failure of the foundation do not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and the large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets referred to in table 9 have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock frag-

TABLE 9.—*Building site development*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Agawam:					
AgA	Slight	Slight	Slight	Slight	Slight.
AgB	Slight	Slight	Slight	Moderate: slope	Slight.
AgC	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.
AgD, AgE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Belgrade:					
BeB	Severe: wetness	Severe: frost action	Severe: wetness	Severe: frost action, wetness.	Severe: frost action, low strength.
BeC	Severe: wetness	Severe: frost action	Severe: wetness	Severe: slope, frost action, wetness.	Severe: frost action, low strength.
BeD	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, wetness.	Severe: slope, frost action, wetness.	Severe: slope, frost action, low strength.
Buckland:					
BuB	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: wetness, frost action.	Severe: frost action.
BuC	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: slope, wetness, frost action.	Severe: frost action.
BuD, BvC, BwE	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, frost action.
Cabot:					
CaB	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: wetness, frost action.	Severe: wetness, frost action.
CaC, CbB	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: slope, wetness, frost action.	Severe: wetness, frost action.
CaD, CbD	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, wetness, frost action.
Colrain:					
CoB	Slight	Slight	Slight	Moderate: slope	Slight.
CoC	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.
CoD, CsD, CsE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
CxD, CxE	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope	Severe: slope.
Hadley: Ha	Severe: floods	Severe: floods, frost action.	Severe: floods, frost action.	Severe: floods, frost action.	Severe: floods.
Hartland:					
HdB	Slight	Severe: frost action	Moderate: low strength.	Severe: frost action	Severe: frost action.
HdC	Moderate: slope	Severe: frost action	Moderate: slope, low strength.	Severe: slope, low strength.	Severe: frost action.
HdD, HdE	Severe: slope	Severe: slope, frost action.	Severe: slope	Severe: slope, low strength.	Severe: slope, frost action.
Limerick: Le	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Merrimac:					
MeA	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
MeB	Severe: cutbanks cave.	Slight	Slight	Moderate: slope	Slight.
MeC	Severe: cutbanks cave.	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.
MeD, MeE	Severe: slope, cutbanks cave.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Muck: Mu	Severe: wetness, excess humus.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.
Ninigret:					
NnB	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: slope, wetness, corrosive.	Moderate: frost action.
NnC	Severe: wetness	Moderate: slope, wetness.	Severe: wetness	Severe: slope	Moderate: slope, frost action.

TABLE 9.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Peacham: Pc	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: wetness, frost action.	Severe: wetness, frost action.
Pomfret:					
PoC	Moderate: slope, cutbanks cave.	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.
PoD	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
PsD, PtE	Severe: slope, cutbanks cave.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Raynham: Ra	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: wetness, frost action.	Severe: wetness, frost action.
Rock outcrop: Ro.					
Saco: Sa	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, frost action.
Stowe:					
SoB	Severe: wetness	Moderate: frost action.	Severe: wetness	Moderate: slope, frost action.	Moderate: frost action.
SoC	Severe: wetness	Moderate: slope, frost action.	Severe: wetness	Severe: slope	Moderate: slope, frost action.
SoD, StD, SwE	Severe: slope, wetness.	Severe: slope	Severe: slope, wetness.	Severe: slope	Severe: slope.
Tunbridge:					
TbB:[1]					
Tunbridge part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: frost action, depth to rock.
Woodstock part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
TbC:[1]					
Tunbridge part	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Moderate: slope, depth to rock, frost action.
Woodstock part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
TbD:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
TrD:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.					
TwE:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Vershire:					
VeB:[1]					
Vershire part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: frost action.
Glover part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
VeC:[1]					
Vershire part	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Severe: frost action.
Glover part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
VeD:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope, frost action.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.

TABLE 9.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Vershire: (Continued)					
VgD:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope, frost action.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.					
VhE:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope, frost action.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Walpole: Wa	Severe: wetness	Severe: wetness, frost action.	Severe: wetness	Severe: wetness, frost action.	Severe: wetness, frost action.
Windsor:					
WnB	Severe: cutbanks cave.	Slight	Slight	Moderate: slope	Slight.
WnD, WnE	Severe: slope, cutbanks cave.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Winooski: Wo	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

ments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of available fill material are important in design and construction of roads and streets. The AASHTO and Unified classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones, all of which affect stability and ease of excavation, were considered.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that deal with the ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 10 shows the degree and kind of limitations of each soil for these uses and for use of the soil as daily cover for landfills.

If the degree of soil limitation is indicated by the rating *slight,* soils are favorable for the specified use and limitations are minor and easily overcome; if *moderate,* soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe,* soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance are required.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect the absorption of the effluent are permeability, depth to a seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion and soil slippage are hazards where absorption fields are installed in sloping soils.

In some soils that have loose sand and gravel or fractured bedrock less than 4 feet below the tile lines, the absorption field does not adequately filter the effluent and ground water may be contaminated. Such inadequately filtered soils are AgA, AgB, and AgC in the Agawam series; MeA, MeB, and MeC in the Merrimac series; NnB and NnC in the Ninigret series; and WnB and WnC in the Windsor series.

Percolation tests are performed to determine the absorptive capacity of the soil and its suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity.

TABLE 10.—*Sanitary facilities*

["Percs slowly" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Agawam:					
AgA, AgB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
AgC	Moderate: slope	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Fair: slope.
AgD, AgE	Severe: slope	Severe: seepage, slope.	Severe: slope	Severe: slope	Poor: slope.
Belgrade:					
BeB	Severe: percs slowly, wetness.	Moderate: slope	Severe: wetness	Severe: wetness	Good.
BeC	Severe: percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: wetness	Fair: slope.
BeD	Severe: slope, percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: slope, wetness.	Poor: slope.
Buckland:					
BuB	Severe: percs slowly, wetness.	Moderate: slope	Severe: wetness	Severe: wetness	Fair: small stones.
BuC	Severe: percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: wetness	Fair: slope, small stones.
BuD, BvC	Severe: slope, percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: slope, wetness.	Poor: slope.
BwE	Severe: slope, percs slowly, wetness.	Severe: slope	Severe: slope, wetness.	Severe: slope, wetness.	Poor: slope.
Cabot:					
CaB	Severe: percs slowly, wetness.	Moderate: slope, small stones.	Severe: wetness	Severe: wetness	Poor: wetness, thin layer, area reclaim.
CaC	Severe: percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: wetness	Poor: wetness, thin layer, area reclaim.
CaD	Severe: slope, percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: slope, wetness.	Poor: slope, wetness, area reclaim.
CbB	Severe: percs slowly, wetness.	Severe: slope	Severe: wetness	Severe: wetness	Poor: wetness, area reclaim.
CbD	Severe: slope, percs slowly, wetness.	Severe: slope	Severe: slope, wetness.	Severe: slope, wetness.	Poor: slope, wetness, area reclaim.
Colrain:					
CoB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
CoC	Moderate: slope	Severe: slope, seepage.	Severe: seepage	Severe: seepage	Fair: slope.
CoD, CsD	Severe: slope	Severe: slope, seepage.	Severe: seepage	Severe: slope, seepage.	Poor: slope.
CsE	Severe: slope	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
CxD	Severe: slope, large stones.	Severe: slope, seepage.	Severe: seepage, large stones.	Severe: slope, seepage.	Poor: slope, large stones.
CxE	Severe: slope, large stones.	Severe: slope, seepage.	Severe: slope, seepage, large stones.	Severe: slope, seepage.	Poor: slope, large stones.
Hadley: Ha	Severe: floods	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Hartland:					
HdB	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
HdC	Moderate: slope, percs slowly.	Severe: slope	Slight	Moderate: slope	Fair: slope.
HdD	Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Poor: slope.
HdE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope.
Limerick: Le	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: floods, wetness.
Merrimac:					
MeA, MeB	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Poor: thin layer, area reclaim.
MeC	Moderate: slope	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage	Poor: thin layer, area reclaim.

TABLE 10.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Merrimac—(Continued)					
MeD	Severe: slope	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
MeE	Severe: slope	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Muck: Mu[1]	Severe: wetness	Severe: excess humus.	Severe: wetness, excess humus.	Severe: wetness	Poor: wetness, excess humus.
Ninigret:					
NnB	Severe: wetness	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: thin layer, area reclaim.
NnC	Severe: wetness	Severe: slope, wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: slope, thin layer, area reclaim.
Peacham: Pc	Severe: wetness, percs slowly.	Moderate: small stones.	Severe: wetness	Severe: wetness	Poor: wetness, area reclaim.
Pomfret:					
PoC	Moderate: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage	Fair: slope, too sandy.
PoD, PsD	Severe: slope	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
PtE	Severe: slope	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
Raynham: Ra	Severe: wetness, percs slowly.	Severe: slope	Severe: wetness	Severe: wetness	Poor: wetness.
Rock outcrop: Ro.					
Saco: Sa	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Stowe:					
SoB	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: wetness	Slight	Good.
SoC	Severe: percs slowly.	Severe: slope	Moderate: wetness	Moderate: slope	Fair: slope.
SoD	Severe: slope, percs slowly.	Severe: slope	Moderate: slope, wetness.	Severe: slope	Poor: slope.
StD	Severe: slope, percs slowly.	Severe: slope	Severe: wetness	Severe: slope, wetness.	Poor: slope.
SwE	Severe: slope, percs slowly.	Severe: slope	Severe: slope, wetness.	Severe: slope, wetness.	Poor: slope.
Tunbridge:					
TbB:[1]					
Tunbridge part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Fair: thin layer.
Woodstock part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Poor: thin layer, area reclaim.
TbC:[1]					
Tunbridge part	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Fair: slope, thin layer.
Woodstock part	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Poor: thin layer, area reclaim.
TbD:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
TrD:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, large stones.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Rock outcrop part.					

TABLE 10.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Tunbridge—(Continued)					
TwE:[1]					
Tunbridge part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, large stones.
Woodstock part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Vershire:					
VeB:[1]					
Vershire part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: seepage.	Fair: thin layer.
Glover part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.
VeC:[1]					
Vershire part	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope, seepage.	Fair: slope, thin layer.
Glover part	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope	Poor: thin layer, area reclaim.
VeD:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope, seepage.	Poor: slope.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Poor: slope, thin layer, area reclaim.
VgD:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope, depth to rock.		Severe: slope, seepage.	Poor: slope.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Poor: slope, thin layer, area reclaim.
Rock outcrop part.					
VhE:[1]					
Vershire part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, seepage.	Poor: slope.
Glover part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope	Poor: slope, thin layer, area reclaim.
Walpole: Wa	Severe: wetness	Severe: percs rapidly, wetness.	Severe: percs rapidly, wetness.	Severe: percs rapidly, wetness.	Poor: wetness.
Windsor:					
WnB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Poor: too sandy.
WnD	Severe: slope	Severe: slope, seepage.	Severe: seepage	Severe: slope, seepage.	Poor: slope, too sandy.
WnE	Severe: slope	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, too sandy.
Winooski: Wo	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods	Good.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved.

Sewage lagoons are shallow ponds constructed to hold sewage while bacteria decompose the solid and liquid wastes. Lagoons have a nearly level flow area surrounded by cut slopes or embankments of compacted, nearly impervious soil material. They generally are designed so that depth of the sewage is 2 to 5 feet. Impervious soil, at least 4 feet thick for the lagoon floor and sides, is required to minimize seepage and contamination of local ground water. Soils that are very high in organic matter content and those that have stones and boulders are undesirable. Unless the soil has very slow permeability, contamination of local ground water is a hazard in areas where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce its capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing of solid

TABLE 11.—*Construction materials*

["Frost action" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Agawam:				
AgA, AgB	Good	Good	Good	Fair: thin layer.
AgC	Good	Good	Good	Fair: thin layer, slope.
AgD	Fair: slope	Good	Good	Poor: slope, thin layer.
AgE	Poor: slope	Good	Good	Poor: slope, thin layer.
Belgrade:				
BeB	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Good.
BeC	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
BeD	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
Buckland:				
BuB	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: small stones.
BuC	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: slope, small stones.
BuD	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
BvC	Poor: frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, large stones.
BwE	Poor: slope, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, large stones.
Cabot:				
CaB, CaC	Poor: wetness, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: wetness, small stones area reclaim.
CaD	Poor: wetness, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, wetness, small stones.
CbB	Poor: wetness, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: large stones, wetness, area reclaim.
CbD	Poor: slope, wetness, frost action.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, large stones, wetness.
Colrain:				
CoB	Good	Poor: excess fines	Unsuited: excess fines	Fair: small stones.
CoC	Good	Poor: excess fines	Unsuited: excess fines	Fair: slope, small stones.
CoD	Fair: slope	Poor: excess fines	Unsuited: excess fines	Poor: slope.
CsD	Fair: slope	Poor: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
CsE, CxE	Poor: slope	Poor: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
CxD	Fair: slope, large stones	Poor: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
Hadley: Ha	Poor: frost action	Poor: excess fines	Unsuited: excess fines	Good.
Hartland:				
HdB	Poor: frost action, low strength.	Unsuited: excess fines	Unsuited: excess fines	Good.
HdC	Poor: frost action, low strength.	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
HdD	Poor: frost action, low strength.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
HdE	Poor: slope, frost action, low strength.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
Limerick: Le	Poor: wetness, frost action	Unsuited	Unsuited	Poor: wetness.
Merrimac:				
MeA, MeB	Good	Good	Good	Fair: thin layer, area reclaim.
MeC	Good	Good	Good	Fair: slope, thin layer, area reclaim.
MeD	Fair: slope	Good	Good	Poor: slope.
MeE	Poor: slope	Good	Good	Poor: slope.
Muck: Mu	Poor: wetness, low strength, excess humus.	Unsuited: excess fines, excess humus.	Unsuited: excess fines, excess humus.	Poor: wetness.
Ninigret:				
NnB	Fair: frost action	Good	Fair: excess fines	Good.
NnC	Fair: frost action	Good	Fair: excess fines	Fair: slope.
Peacham: Pc	Poor: wetness, frost action, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: wetness, small stones.

TABLE 11.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pomfret:				
PoC	Good	Poor: excess fines	Unsuited: excess fines	Poor: too sandy.
PoD	Fair: slope	Poor: excess fines	Unsuited: excess fines	Poor: slope, too sandy.
PsD	Fair: slope	Poor: excess fines	Unsuited: excess fines	Poor: too sandy.
PtE	Poor: slope	Poor: excess fines	Unsuited: excess fines	Poor: too sandy.
Raynham: Ra	Poor: wetness, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: wetness.
Rock outcrop: Ro.				
Saco: Sa	Poor: wetness, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: wetness.
Stowe:				
SoB	Fair: frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: small stones.
SoC	Fair: frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: slope, small stones.
SoD	Fair: slope, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
StD	Fair: slope, frost action	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope.
SwE	Poor: slope	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope.
Tunbridge:				
TbB:[1]				
Tunbridge part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Good.
Woodstock part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: area reclaim.
TbC:[1]				
Tunbridge part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
Woodstock part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: area reclaim.
TbD:[1]				
Tunbridge part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
Woodstock part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, area reclaim.
TrD:[1]				
Tunbridge part	Poor: thin layer, area reclaim.	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
Woodstock part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, area reclaim.
Rock outcrop part.				
TwE:[1]				
Tunbridge part	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
Woodstock part	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, area reclaim.
Vershire:				
VeB:[1]				
Vershire part	Poor: thin layer, frost action	Unsuited: excess fines	Unsuited: excess fines	Good.
Glover part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: small stones, thin layer, area reclaim.
VeC:[1]				
Vershire part	Poor: thin layer, frost action	Unsuited: excess fines	Unsuited: excess fines	Fair: slope.
Glover part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: small stones, thin layer, area reclaim.
VeD:[1]				
Vershire part	Poor: thin layer, frost action	Unsuited: excess fines	Unsuited: excess fines	Poor: slope.
Glover part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, small stones, thin layer.
VgD:[1]				
Vershire part	Poor: frost action	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
Glover part	Poor: thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, small stones, thin layer.
Rock outcrop part.				
VhE:[1]				
Vershire part	Poor: slope, frost action	Unsuited: excess fines, large stones.	Unsuited: excess fines, large stones.	Poor: slope, large stones.
Glover part	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines	Unsuited: excess fines	Poor: slope, small stones, thin layer.
Walpole: Wa	Poor: frost action, wetness	Poor: excess fines	Poor: excess fines	Poor: wetness.
Windsor:				
WnB	Good	Good	Poor: excess fines	Poor: too sandy.
WnD	Fair: slope	Good	Poor: excess fines	Poor: slope, too sandy.
WnE	Poor: slope	Good	Poor: excess fines	Poor: slope, too sandy.
Winooski: Wo	Poor: frost action	Poor: excess fines	Unsuited: excess fines	Good.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 12.—*Water management*

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Agawam: AgA, AgB, AgC, AgD, AgE.	Seepage, slope	Seepage, piping	No water	Not needed	Slope, erodes easily.	Slope, erodes easily.
Belgrade: BeB, BeC, BeD	Slope	Piping, erodes easily.	Slope, slow refill	Percs slowly	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Buckland:						
BuB, BuC, BuD	Slope	Piping	Deep to water	Percs slowly, slope.	Slope, rooting depth, percs slowly.	Slope, rooting depth, percs slowly.
BvC, BwE	Slope	Piping, large stones.	Deep to water, large stones.	Slope	Slope, rooting depth, large stones.	Slope, large stones, rooting depth.
Cabot:						
CaB, CaC, CaD	Slope	Favorable	Slope	Slope, percs slowly, poor outlets.	Slope, wetness, rooting depth.	Slope, wetness, rooting depth.
CbB, CbD	Slope	Large stones, piping.	Slope, large stones.	Slope, percs slowly, poor outlets.	Wetness, large stones, rooting depth.	Slope, wetness, large stones.
Colrain:						
CoB, CoC, CoD	Slope, seepage	Seepage, piping	No water	Not needed	Slope	Slope.
CsD, CsE, CxD, CxE	Slope, seepage	Seepage, large stones, piping.	No water	Not needed	Slope, large stones.	Slope, large stones.
Hadley: Ha	Seepage	Piping, seepage	No water	Not needed	Not needed	Not needed.
Hartland: HdB, HdC, HdD, HdE.	Slope	Piping, low strength, erodes easily.	Deep to water	Not needed	Slope, erodes easily.	Slope, erodes easily.
Limerick: Le	Seepage	Piping, low strength.	Favorable	Wetness, floods	Not needed	Wetness.
Merrimac: MeA, MeB, MeC, MeD, MeE.	Slope, seepage	Seepage	No water	Not needed	Slope, too sandy.	Slope, droughty.
Muck: Mu	Excess humus	Excess humus, low strength, unstable fill.	Cutbanks cave	Cutbanks cave, excess humus, poor outlets.	Not needed	Not needed.
Ninigret: NnB, NnC	Slope, seepage	Seepage, piping	Deep to water	Wetness, slope	Slope, wetness	Slope, wetness.
Peacham: Pc	Favorable	Piping	Favorable	Poor outlets, percs slowly, wetness.	Wetness, rooting depth, poor outlets.	Wetness, rooting depth, percs slowly.
Pomfret:						
PoC, PoD	Slope, seepage	Seepage, piping	No water	Not needed	Slope, too sandy	Slope.
PsD, PtE	Slope, seepage	Seepage, large stones, piping.	No water	Not needed	Slope, large stones, too sandy.	Slope, large stones.
Raynham: Ra	Favorable	Erodes easily, piping, low strength.	Favorable	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.	Wetness, erodes easily, percs slowly.
Rock outcrop: Ro.						
Saco: Sa	Wetness	Low strength	Favorable	Wetness, floods	Not needed	Wetness.
Stowe:						
SoB, SoC, SoD	Slope	Low strength, piping.	No water	Not needed	Erodes easily, percs slowly.	Slope, percs slowly, erodes easily.
StD, SwE	Slope	Large stones, piping.	No water	Not needed	Large stones, percs slowly, erodes easily.	Large stones, percs slowly, erodes easily.

TABLE 12.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Tunbridge:						
TbB:[1]						
Tunbridge part	Slope, depth to rock, seepage.	Thin layer, piping.	No water	Not needed	Slope, depth to rock.	Slope.
Woodstock part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Depth to rock, no water.	Not needed	Slope, depth to rock, rooting depth.	Slope, depth to rock, rooting depth.
TbC:[1]						
Tunbridge part	Slope, depth to rock, seepage.	Thin layer, piping.	No water	Not needed	Slope, depth to rock.	Slope.
Woodstock part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Depth to rock, no water.	Not needed	Slope, depth to rock, rooting depth.	Slope, depth to rock, rooting depth.
TbD:[1]						
Tunbridge part	Slope, depth to rock, seepage.	Thin layer, piping.	No water	Not needed	Slope, depth to rock.	Slope.
Woodstock part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Depth to rock, no water.	Not needed	Slope, depth to rock, rooting depth.	Slope, depth to rock, rooting depth.
TrD:[1]						
Tunbridge part	Slope, depth to rock, seepage.	Thin layer, large stones, piping.	No water	Not needed	Slope, depth to rock, large stones.	Slope, large stones.
Woodstock part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Depth to rock, no water.	Not needed	Slope, depth to rock, rooting depth.	Slope, depth to rock, rooting depth.
Rock outcrop part.						
TwE:[1]						
Tunbridge part	Slope, depth to rock, seepage.	Thin layer, large stones, piping.	No water	Not needed	Slope, depth to rock, large stones.	Slope, large stones.
Woodstock part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Depth to rock, no water.	Not needed	Slope, depth to rock, rooting depth.	Slope, depth to rock, rooting depth.
Vershire:						
VeB:[1]						
Vershire part	Depth to rock, slope, seepage.	Thin layer, low strength.	No water	Not needed	Depth to rock, slope.	Slope.
Glover part	Depth to rock, seepage, slope.	Piping, thin layer.	No water, depth to rock.	Not needed	Depth to rock, slope, rooting depth.	Slope, depth to rock, rooting depth.
VeC:[1]						
Vershire part	Depth to rock, slope, seepage.	Thin layer, low strength.	No water	Not needed	Depth to rock, slope.	Slope.
Glover part	Depth to rock, seepage, slope.	Piping, thin layer.	No water, depth to rock.	Not needed	Depth to rock, slope, rooting depth.	Slope, depth to rock, rooting depth.
VeD:[1]						
Vershire part	Depth to rock, slope, seepage.	Thin layer, low strength.	No water	Not needed	Depth to rock, slope.	Slope.
Glover part	Depth to rock, seepage, slope.	Piping, thin layer.	No water, depth to rock.	Not needed	Depth to rock, slope, rooting depth.	Slope, depth to rock, rooting depth.
VgD:[1]						
Vershire part	Slope, depth to rock, seepage.	Thin layer, large stones.	No water	Not needed	Slope, depth to rock, large stones.	Slope, large stones.
Glover part	Depth to rock, seepage, slope.	Piping, thin layer.	No water, depth to rock.	Not needed	Depth to rock, slope, rooting depth.	Slope, depth to rock, rooting depth.
Rock outcrop part.						
VhE:[1]						
Vershire part	Slope, depth to rock, seepage.	Thin layer, large stones.	No water	Not needed	Slope, depth to rock, large stones.	Slope, large stones.
Glover part	Depth to rock, seepage, slope.	Piping, thin layer.	No water, depth to rock.	Not needed	Depth to rock, slope, rooting depth.	Slope, depth to rock, rooting depth.

TABLE 12.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Walpole: Wa	Percs rapidly	Favorable	Favorable	Wetness	Wetness, piping	Wetness.
Windsor: WnB, WnD, WnE	Seepage, slope	Seepage, piping	No water	Not needed	Piping, slope, too sandy.	Droughty, slope.
Winooski: Wo	Percs slowly	Piping	Deep to water	Floods, poor outlets.	Not needed	Not needed.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

waste, either in excavated trenches or on the surface of the soil. The waste is spread, compacted in layers, and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this purpose. The best soils have a loamy or silty texture, have moderate or slow permeability, are deep to bedrock and a seasonal water table, are free of large stones and boulders, and are not subject to flooding. In areas where the seasonal water table is high, water seeps into the trenches and causes problems in excavating and filling the trenches. Also, seepage into the refuse increases the risk of pollution of ground water. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability that allow noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 10 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the area type of sanitary landfill, refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, may be a limitation because of the difficulty in operating equipment.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfill should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either area or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of available suitable soil material and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 11 by ratings of good, fair, or poor. The texture, thickness, and organic matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed and described as the survey is made, generally about 6 feet.

Roadfill is soil material used in embankments for roads. The ratings reflect the ease of excavating and working the material and the expected performance of the material after it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about soil properties that determine such performance is given in the descriptions of soil series.

The ratings apply to the soil profile between the A horizon and a depth of 5 or 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within the profile. The estimated engineering properties in table 15 provide more specific information about the nature of each horizon that can help determine its suitability for roadfill.

Soils rated *good* have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as high shrink-swell potential, high potential frost action, steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor,* regardless of the quality of the suitable material.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 11 provide guidance as to where to look for probable sources and

are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to sustain the growth of plants. Also considered is the damage that would result to the area from which the topsoil is taken.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones, are low in content of gravel and other coarse fragments, and are gently sloping. They are low in soluble salts, which can limit plant growth; and they are naturally fertile or respond well to fertilization. These soils are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy, firm loamy, or clayey soils in which the suitable material is only 8 to 16 inches thick; or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils; very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is much preferred for topsoil because of its organic matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter. Consequently, careful preservation and use of material from these horizons is desirable.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 12 site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or an embankment. Soils suitable for this use have low seepage potential, which is determined by the permeability and depth over fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and is of favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

An *aquifer-fed excavated pond* is a body of water created by excavating a pit or dugout into a groundwater aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 12 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability, texture, structure, depth to claypan or other layers that influence rate of water movement, depth to the water table, slope, stability of ditchbanks, susceptibility to flooding, salinity and alkalinity, and availability of outlets for drainage.

Terraces and diversions are embankments, or a combination of channels and ridges, constructed across a slope to intercept runoff and allow the water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity of slope and steepness; depth to bedrock or other unfavorable material; permeability; establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff at nonerosive velocities to outlets. Features that affect the use of soils for waterways are slope, permeability, erodibility, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreational use by the duration of flooding and the season in which it occurs. Onsite asessment of height, duration, and frequency of flooding is essential in planning recreational facilities.

In table 13 the limitations of soils are rated as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome; *moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance; and *severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, spec-

TABLE 13.—*Recreational development*

["Percs Slowly" and some of the other terms that describe restrictive features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Agawam:				
AgA	Slight	Slight	Slight	Slight.
AgB	Slight	Slight	Moderate: slope	Slight.
AgC	Moderate: slope	Moderate: slope	Severe: slope	Slight.
AgD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
AgE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Belgrade:				
BeB	Moderate: percs slowly, wetness.	Moderate: wetness	Moderate: slope, percs slowly, wetness.	Slight.
BeC	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope	Slight.
BeD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Buckland:				
BuB	Moderate: percs slowly	Slight	Moderate: slope, percs slowly	Slight.
BuC	Moderate: slope, percs slowly	Moderate: slope	Severe: slope	Slight.
BuD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
BvC	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
BwE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Cabot:				
CaB	Severe: wetness, percs slowly	Severe: wetness	Severe: wetness, percs slowly, small stones.	Severe: wetness.
CaC	Severe: wetness, percs slowly	Severe: wetness	Severe: slope, wetness, percs slowly.	Severe: wetness.
CaD	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: slope, wetness, percs slowly.	Severe: wetness.
CbB	Severe: wetness, percs slowly	Severe: wetness	Severe: slope, wetness, small stones.	Severe: wetness.
CbD	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: slope, wetness, small stones.	Severe: slope, wetness.
Colrain:				
CoB	Slight	Slight	Moderate: slope, small stones	Slight.
CoC	Moderate: slope	Moderate: slope	Severe: slope	Slight.
CoD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
CsD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
CsE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
CxD	Severe: slope, large stones	Severe: slope	Severe: slope, large stones	Severe: large stones.
CxE	Severe: slope, large stones	Severe: slope	Severe: slope, large stones	Severe: slope, large stones.
Hadley: Ha	Severe: floods	Moderate: floods	Moderate: floods	Slight.
Hartland:				
HdB	Slight	Slight	Moderate: slope	Slight.
HdC	Moderate: slope	Moderate: slope	Severe: slope	Slight.
HdD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
HdE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Limerick: Le	Severe: floods, wetness	Severe: wetness	Severe: wetness, floods	Severe: wetness.
Merrimac:				
MeA	Slight	Slight	Slight	Slight.
MeB	Slight	Slight	Moderate: slope	Slight.
MeC	Moderate: slope	Moderate: slope	Severe: slope	Slight.
MeD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
MeE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Muck: Mu	Severe: excess humus, wetness	Severe: excess humus, wetness.	Severe: excess humus, wetness	Severe: excess humus, wetness.
Ninigret:				
NnB	Slight	Slight	Moderate: slope, wetness	Slight.
NnC	Moderate: slope	Moderate: slope	Severe: slope	Slight.
Peacham: Pc	Severe: wetness, percs slowly	Severe: wetness	Severe: wetness, small stones	Severe: wetness.
Pomfret:				
PoC	Moderate: slope, too sandy	Moderate: slope, too sandy.	Severe: slope	Moderate: too sandy.

TABLE 13.—*Recreation development*—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Promfret—(Continued)				
PoD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, too sandy.
PsD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
PtE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Raynham: Ra	Severe: wetness	Severe: wetness	Severe: slope, wetness, percs slowly.	Severe: wetness.
Rock outcrop: Ro.				
Saco: Sa	Severe: floods, wetness	Severe: wetness	Severe: floods, wetness	Severe: wetness.
Stowe:				
SoB	Moderate: percs slowly	Slight	Moderate: slope, percs slowly	Slight.
SoC	Moderate: slope, percs slowly	Moderate: slope	Severe: slope	Slight.
SoD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
StD	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
SwE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Tunbridge:				
TbB:[1]				
Tunbridge part	Slight	Slight	Moderate: slope, depth to rock	Slight.
Woodstock part	Slight	Slight	Severe: depth to rock	Slight.
TbC:[1]				
Tunbridge part	Moderate: slope	Moderate: slope	Severe: slope	Slight.
Woodstock part	Moderate: slope	Moderate: slope	Severe: slope, depth to rock	Slight.
TbD:[1]				
Tunbridge part	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Woodstock part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Moderate: slope.
TrD:[1]				
Tunbridge part	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
Woodstock part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Moderate: slope.
Rock outcrop part.				
TwE:[1]				
Tunbridge part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Woodstock part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
Vershire:				
VeB:[1]				
Vershire part	Slight	Slight	Moderate	Slight.
Glover part	Slight	Slight	Severe: depth to rock	Slight.
VeC:[1]				
Vershire part	Moderate: slope	Moderate: slope	Severe: slope	Slight.
Glover part	Moderate: slope	Moderate: slope	Severe: slope, depth to rock	Slight.
VeD:[1]				
Vershire part	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, depth to rock.
Glover part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Moderate: slope.
VgD:[1]				
Vershire part	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, large stones.
Glover part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Moderate: slope.
Rock outcrop part.				
VhE:[1]				
Vershire part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Glover part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
Walpole: Wa	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Windsor:				
WnB	Moderate: too sandy	Moderate: too sandy.	Severe: too sandy	Moderate: too sandy.
WnD	Severe: slope	Moderate: slope, too sandy.	Severe: slope, too sandy	Moderate: too sandy.
WnE	Severe: slope	Severe: slope	Severe: slope, too sandy	Severe: slope, too sandy.
Winooski: Wo	Severe: floods	Moderate: floods	Moderate: floods	Slight.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

ial design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 13 can be supplemented by additional information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 10, and interpretations for dwellings without basements and for local roads and streets, given in table 9.

Camp areas require such site preparation as shaping and leveling tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines (fig. 17). These areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes, and they are not wet and are not subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strongly sloping soils and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, and are not subject to flooding during the period of use. Also, they are not sloping, and do not have stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level, and they are not wet and are not subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rain, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over rock should be sufficient to allow necessary grading.

The design and layout of paths and trails for walking, horseback riding, and bicycling should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rain, are not dusty when dry, and are not subject to flooding more than once during the period of use. They should be moderately sloping and have few or no stones or boulders on the surface.

Wildlife

Wildlife is an abundant and important natural resource in Orange County. Deer, in particular, have an important economic impact during the hunting season.

The mountains and large inaccessible woodland areas on uplands are covered by hardwood trees. Stands of coniferous trees are restricted largely to areas of shallow, rocky soils on hilltops or to poorly drained soils in the valleys and in depressions. Wildlife inhabiting these large wooded areas are deer, bear, bobcat, fishercat, snowshoe hare, coyote, porcupine, beaver, ruffed grouse, small mammals, and songbirds.

Much of the uplands and valleys are in dairy farms that are interspersed with wooded areas. Principal crops on these farms are grasses and legumes and some corn grown for silage. Abandoned farmland is

Figure 17.—A camping and recreational development on Buckland soils. Pond is on Cabot soils.

invaded by herbaceous plants and shrubs. Coniferous trees are on the shallow soils on ridges and on the wet soils in depressions. Wildlife inhabiting these areas are deer, snowshoe hare, racoon, red fox, woodchuck, beaver, muskrat, gray squirrel, ruffed grouse, woodcock, small mammals, and songbirds.

The slow-moving streams, potholes, beaver ponds, and man-made ponds furnish limited habitat for waterfowl.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the development of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, inadequate, or inaccessible, wildlife will either be scarce or will not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by properly managing the existing plant cover, and by fostering the natural establishment of desirable plants.

In table 14 the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area (*1*). This information can be used in planning the use of parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; determining the intensity of management needed for each element of the habitat; and determining areas that are suitable for acquisition to manage for wildlife.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, sorghum, wheat, oats, barley, millet, buckwheat, cowpeas, soybeans, and sunflowers. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are fescue, bluegrass, bromegrass, timothy, orchardgrass, clover, alfalfa, trefoil, and crownvetch. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established herbaceous grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiangrass, goldenrod, beggarweed, pokeweed, partridgepea, and wheatgrass. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Examples of native plants are oak, poplar, cherry, apple, hawthorn, dogwood, sumac, hazelnut, blackberry, grape, viburnum, blueberry, bayberry, and briers. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated good are Russian-olive, autumn-olive, and crabapple. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Examples are pine, spruce, hemlock, fir, yew, cedar, and juniper. Major soil properties that affect the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, rushes, sedges, reeds, wildrice, saltgrass, cordgrass, and cattail. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope and surface stoniness.

Shallow water areas are bodies of surface water that have an average depth of less than 5 feet and are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control devices in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds. Major soil properties affecting shallow

water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of croplands, pastures, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include meadowlark, field sparrow, killdeer, cottontail rabbit, red fox, and woodchuck.

Woodland habitat consists of hardwoods or conifers or a mixture of both, with associated grasses, legumes, and wild herbaceous plants. Examples of wildlife attracted to this habitat are wild turkey, ruffed grouse, woodcock, thrushes, vireos, woodpeckers, tree squirrels, grey fox, racoon, deer, and black bear.

Wetland habitat consists of water-tolerant plants in open, marshy, or swampy shallow water areas. Examples of wildlife attracted to this habitat are ducks, geese, herons, shore birds, rails, kingfishers, muskrats, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of samples selected from representative soil profiles in the field.

When he makes soil borings during field mapping, the scientist can identify several important soil properties. He notes the seasonal soil moisture condition, or the presence of free water and its depth in the profile. For each horizon, he notes the thickness of the soil and its color; the texture, or the amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or natural pattern of cracks and pores in the undisturbed soil; and the consistence of soil inplace under the existing soil moisture conditions. He records the root depth of existing plants; determines soil pH, or reaction; and identifies any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to characterize key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many of the soil series are available from nearby areas.

Based on summaries of available field and laboratory data, and listed in tables in this section, are estimated ranges in engineering properties and classifications and in physical and chemical properties for each major horizon of each soil in the survey area. Also, pertinent soil and water features are presented.

Engineering properties

Table 15 (page 75) gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area. These estimates are presented as ranges in values most likely to exist in areas where the soil is mapped.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Information is presented for each of these contrasting horizons. Depth to the upper and lower boundaries of each horizon in a typical profile of each soil is indicated. More information about the range in depth and in properties of each horizon is given for each soil series in "Descriptions of the soils."

Texture is described in table 15 in standard terms used by the United States Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms used by USDA are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified soil classification system (*3*) and the American Association of State Highway and Transportation Officials system (AASHTO) (*2*). In table 15 soils in the survey area are classified according to both systems.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic matter content. Soils are grouped into 15 classes — eight classes of coarse grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example CL-ML.

The AASHTO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified as one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine grained soils. Highly organic soils are classified as A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or more for the poorest. The estimated classification, without group index numbers, is given in table 15.

Also in table 15 the percentage, by weight, of cobbles, or the rock fragments more than 3 inches in di-

TABLE 14.—*Wildlife habitat potentials*

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements—							Potential as habitat for—		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Agawam:										
AgA	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
AgB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
AgC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
AgD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
AgE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Belgrade:										
BeB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
BeC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
BeD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Buckland:										
BuB, BuC	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
BuD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
BvC, BwE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Cabot:										
CaB	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor.
CaC, CaD	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
CbB, CbD	Very poor	Very poor	Fair	Fair	Fair	Good	Fair	Poor	Fair	Fair.
Colrain:										
CoB	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
CoC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
CoD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
CsD, CsE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
CxD, CxE	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Hadley: Ha	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Hartland:										
HdB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
HdC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
HdD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
HdE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Limerick: Le	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Merrimac:										
MeA, MeB, MeC	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MeD	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
MeE	Very poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Muck: Mu	Very poor	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor	Good.
Ninigret:										
NnB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
NnC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Peacham: Pc	Very poor	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Fair.

Pomfret:										
PoC	Fair	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
PoD	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
PsD	Very poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
PtE	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Raynham: Ra	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor.
Rock outcrop: Ro.										
Saco: Sa	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Stowe:										
SoB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
SoC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
SoD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
StD	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
SwE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Tunbridge:										
TbB:[1]										
Tunbridge part	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
Woodstock part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
TbC:[1]										
Tunbridge part	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
Woodstock part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
TbD:[1]										
Tunbridge part	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Woodstock part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
TrD:[1]										
Tunbridge part	Poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Woodstock part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Rock outcrop part.										
TwE:[1]										
Tunbridge part	Poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Woodstock part	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Vershire:										
VeB:[1]										
Vershire part	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Glover part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
VeC:[1]										
Vershire part	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Glover part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
VeD:[1]										
Vershire part	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Glover part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
VgD:[1]										
Vershire part	Poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Glover part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Rock outcrop part.										
VhE:[1]										
Vershire part	Poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Glover part	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Walpole: Wa	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Windsor:										
WnB, WnD	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
WnE	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Winooski: Wo	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

ameter, are estimated for each major horizon. These estimates are determined largely by observing volume percentage in the field and then converting it, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four standard sieves is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby field estimates from many borings made during the survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistency of soil. These indexes are used in both the Unified and the AASHTO systems. They are also used as indicators in making general predictions of soil behavior.

Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

Physical and chemical properties

Table 16 (page 80) shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the representative profile of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships between the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for water movement in a vertical direction when the soil is saturated. Not considered in the estimates are lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in the planning and design of drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops and ornamental or other plants to be grown, in evaluating soil amendments for fertility and stabilization, and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others it was estimated on the basis of the kind of clay and on measurements of similar soils. Size of imposed loadings and the magnitude of changes in soil moisture content are also important factors that influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A *high* shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion, as used in table 16, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rating of soils for corrosivity to concrete is based mainly on the sulfate content, soil texture, and acidity. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Installations of steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Features that relate to runoff or infiltration of water, to flooding, to grading and excavation, and to subsidence and frost action of each soil are indicated in table 17 (page 84). This information is helpful in planning land uses and engineering projects that are likely to be affected by the amount of runoff from watersheds, by flooding and a seasonal high water table, by the presence of bedrock in the upper 5 to 6 feet of the soil, by subsidence, or by frost action.

Hydrologic groups are used to estimate runoff after rainfall. Soil properties that influence the minimum rate of infiltration into the bare soil after prolonged wetting are depth to a water table, water intake rate and permeability after prolonged wetting, and depth to layers of slowly or very slowly permeable soil.

The four hydrologic soil groups are —

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessive-

TABLE 15.—*Engineering properties and classifications*

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				*Pct*					*Pct*	
Agawam: AgA, AgB, AgC, AgD, AgE.	0–9	Fine sandy loam	SM	A–4	0	95–100	90–100	85–100	40–50		
	9–23	Fine sandy loam, very fine sandy loam.	SM	A–4	0	95–100	85–100	80–100	40–65		
	23–60	Fine sand, loamy fine sand, gravelly sand.	SP, SM	A–1, A–2, A–3	0	65–100	55–100	30–90	3–35		
Belgrade: BeB, BeC, BeD.	0–9	Silt loam	ML	A–4	0	100	100	85–100	65–95	<25	[1]NP–20
	9–24	Silt loam, very fine sandy loam	ML	A–4	0	100	100	85–100	65–95	<25	NP–20
	24–60	Silt loam, very fine sandy loam	ML	A–4	0	100	100	85–100	65–95	<25	NP–20
Buckland:											
BuB, BuC, BuD	0–7	Loam	ML, SM	A–4	0–10	85–100	75–100	55–95	35–85	<47	NP–8
	7–22	Loam, silt loam, gravelly very fine sandy loam.	ML, SM	A–4	0–20	65–100	55–95	50–90	35–70	<37	NP–6
	22–60	Loam, silt loam, gravelly very fine sandy loam.	ML, SM	A–4	65–100	55–95	75–95	50–90	35–70	<27	NP–6
BvC, BwE	0–7	Very stony loam	ML, SM	A–4	2–10	80–100	75–90	60–90	35–75	<47	NP–8
	7–22	Loam, silt loam, gravelly very fine sandy loam.	ML, SM	A–4	0–20	65–100	55–90	50–90	35–70	<37	NP–6
	22–60	Loam, silt loam, gravelly very fine sandy loam.	ML, SM	A–4	5–20	65–100	55–85	50–85	35–70	<27	NP–6
Cabot:											
CaB, CaC, CaD	0–8	Silt loam	ML, SM	A–4, A–2	5–20	80–100	75–95	50–90	30–75	<30	NP
	8–14	Loam, silt loam, gravelly fine sandy loam.	ML, SM	A–4, A–2	5–20	80–95	65–95	50–85	30–70	<30	NP
	14–60	Loam, gravelly loam, silt loam	ML, SM	A–4	5–20	80–95	65–95	55–85	40–70	<30	NP
CbB, CbD	0–8	Very stony silt loam	ML, SM	A–4, A–2	15–30	80–95	75–95	50–90	30–75	<30	NP
	8–14	Loam, silt loam, gravelly fine sandy loam.	ML, SM	A–4, A–2	5–35	80–95	65–95	50–85	30–70	<30	NP
	14–60	Loam, gravelly loam, silt loam	ML, SM	A–4, A–2	5–35	80–95	65–95	45–85	25–70	<30	NP
Colrain:											
CoB, CoC, CoD	0–6	Fine sandy loam	SM	A–2, A–4	0–20	85–100	80–95	55–80	30–45		NP
	6–33	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–20	70–100	60–95	40–80	20–45		NP
	33–60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–25	70–95	60–90	40–75	20–45		NP
CsD, CsE	0–6	Very stony fine sandy loam	SM	A–2, A–4	5–25	85–100	75–95	50–80	30–45		NP
	6–33	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–20	70–100	60–95	40–80	20–45		NP
	33–60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–25	70–95	60–90	40–75	20–45		NP
CxD, CxE	0–6	Extremely stony fine sandy loam.	SM	A–2, A–4	5–30	85–100	75–95	50–80	30–45		NP
	6–33	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–20	70–100	60–95	40–80	20–45		NP
	33–60	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2, A–4	5–25	70–95	60–90	40–75	20–45		NP

TABLE 15.—*Engineering properties and classifications*—Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				*Pct*					*Pct*	
Hadley: Ha	0–11	Very fine sandy loam	ML, CL–ML	A–4	0	100	95–100	95–100	70–95	<30	NP–9
	11–28	Silt loam, very fine sandy loam	ML, CL–ML	A–4	0	100	95–100	90–100	60–95	<39	NP–13
	28–64	Silt loam, very fine sandy loam, silt.	ML, CL–ML	A–4	0	100	95–100	85–100	60–95	<30	NP–13
Hartland: HdB, HdC, HdD, HdE.	0–6	Silt loam	ML, CL	A–4, A–6	0	100	100	85–100	65–90	<25	NP–20
	6–19	Silt loam, very fine sandy loam, silt.	ML, CL	A–4, A–6	0	100	100	85–100	65–90	<25	NP–20
	19–60	Silt loam, very fine sandy loam, silt.	ML, CL	A–4, A–6	0	100	100	85–100	65–95	<25	NP–20
Limerick: Le	0–5	Very fine sandy loam	ML	A–4	0	100	100	95–100	85–95	<20	NP
	5–28	Very fine sandy loam, silt loam	ML	A–4	0	100	100	95–100	85–95	<20	NP
	28–60	Very fine sandy loam, silt loam	ML	A–4	0	100	100	95–100	85–95	<20	NP
Merrimac: MeA, MeB, MeC, MeD, MeE.	0–6	Fine sandy loam	SM, ML	A–2, A–4	0	85–95	70–90	50–85	30–55	<20	NP
	6–23	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A–1, A–2	0	65–95	55–90	40–60	20–35	<25	NP
	23–60	Stratified gravelly sand, and very gravelly sand.	GP, SP	A–1	5–25	40–65	30–60	15–40	0–10		NP
Muck: Mu	0–10	Muck	Pt	A–8	0						NP
	10–45	Muck	Pt	A–8	0						NP
Ninigret: NnB, NnC	0–7	Fine sandy loam	SM, ML	A–4	0	95–100	90–100	70–85	40–55	<25	NP–3
	7–29	Fine sandy loam, loamy fine sand, loamy sand.	SM	A–1, A–2, A–4	0	85–100	75–100	45–85	20–50		NP
	29–60	Gravelly fine sand, loamy fine sand, gravelly sand.	SP, SM	A–1, A–2	0–10	60–100	45–100	25–75	0–30		NP
Peacham: Pc	8–0	Muck	Pt	A–8							
	0–5	Gravelly silt loam, fine sandy loam.	SM, ML	A–2, A–4	0–5	65–100	55–95	40–95	25–85	<30	NP
	5–22	Loam, silt loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	5–15	75–100	65–95	50–95	30–85	<30	NP
	22–60	Loam, silt loam, gravelly loam	SM ML	A–4	5–15	80–100	70–95	60–90	40–70	<30	NP
Pomfret: PoC, PoD	0–3	Loamy fine sand	SM	A–2	0–5	85–100	85–95	50–80	15–30		NP
	3–30	Loamy sand, loamy fine sand, fine sand.	SM	A–2	0–10	85–100	75–90	50–75	15–35		NP
	30–58	Loamy sand, gravelly sand, fine sand.	SM, SP–SM	A–2	0–15	85–100	70–95	45–75	10–30		NP
	58	Weathered bedrock.									
PsD, PtE	0–3	Very stony loamy fine sand	SM	A–2	0–10	85–100	85–95	50–80	15–30		NP
	3–30	Loamy sand, loamy fine sand, fine sand.	SM	A–2	0–10	85–100	80–95	50–75	10–35		NP
	30–58	Loamy sand, sand, fine sand	SM, SP–SM	A–2	0–15	85–100	70–95	45–75	10–30		NP
	58	Weathered bedrock.									
Raynham: Ra	0–8	Silt loam	ML	A–4	0	100	95–100	90–95	70–90		NP
	8–25	Silt loam, very fine sandy loam	ML	A–4	0	100	95–100	90–95	70–90		NP
	25–68	Stratified silt loam to very fine sand.	ML	A–4	0	100	95–100	75–95	40–90		NP

Soil name and map symbol	Depth	Soil description	Unified	AASHTO	Frag. > 3 inches	Pct. passing sieve No. 4	Pct. passing sieve No. 10	Pct. passing sieve No. 40	Pct. passing sieve No. 200	Liquid limit	Plasticity index
	In				*Pct.*						
Rock outcrop: Ro.											
Saco: Sa	0–11	Mucky silt loam	ML, OL	A–4	0	100	100	95–100	70–95	<40	NP–10
	11–28	Silt loam, very fine sandy loam	ML	A–4	0	100	100	95–100	55–95	<40	NP–10
	28–66	Silt loam, very fine sandy loam	ML	A–4	0	100	100	90–100	50–95	<25	NP–5
Stowe:											
SoB, SoC, SoD	0–8	Fine sandy loam	SM, ML	A–2, A–4	5–20	75–95	65–95	50–85	30–60	<40	NP
	8–21	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	5–20	75–95	65–95	50–85	25–55	<30	NP
	21–60	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	5–25	65–95	70–95	50–85	30–65	<25	NP
StD, SwE	0–8	Very stony fine sandy loam	SM, ML	A–2, A–4	10–30	75–95	65–95	50–85	30–60	<40	NP
	8–21	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	5–25	75–95	65–95	50–85	25–55	<30	NP
	21–60	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	5–30	65–95	70–95	50–85	30–65	<25	NP
Tunbridge:											
TbB:[2]											
Tunbridge part	0–7	Fine sandy loam	SM, ML	A–2, A–4	0–10	85–95	80–90	60–80	30–65	<20	NP
	7–29	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	0–15	85–95	70–85	60–80	30–65	<20	NP
	29	Unweathered bedrock.									
Woodstock part	0–6	Fine sandy loam	SM	A–2, A–4	0–5	85–95	80–95	60–75	30–45		NP
	6–18	Fine sandy loam, loamy fine sand, gravelly loamy fine sand.	SM	A–1, A–2, A–4	0–15	75–95	65–95	45–75	20–45		NP
	18	Unweathered bedrock.									
TbC:[2]											
Tunbridge part	0–7	Fine sandy loam	SM, ML	A–2, A–4	0–10	85–95	80–90	60–80	30–65	<20	NP
	7–29	Fine sandy loam, loam, gravelly fine sandy loam.	SM ,ML	A–2, A–4	0–15	85–95	70–85	60–80	30–65	<20	NP
	29	Unweathered bedrock.									
Woodstock part	0–6	Fine sandy loam	SM	A–2, A–4	5–25	85–95	80–95	60–75	25–45		NP
	6–18	Fine sandy loam, loamy fine sand, gravelly loamy fine sand.	SM	A–1, A–2, A–4	0–15	75–95	65–95	45–75	20–45		NP
	18	Unweathered bedrock.									
TbD:[2]											
Tunbridge part	0–7	Fine sandy loam	SM, ML	A–2, A–4	0–10	85–95	80–90	60–80	30–65	<20	NP
	7–29	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	0–15	85–95	70–85	60–80	30–65	<20	NP
	29	Unweathered bedrock.									
Woodstock part	0–6	Fine sandy loam	SM	A–2, A–4	5–25	85–95	80–95	60–75	30–45		NP
	6–18	Fine sandy loam, loamy fine sand, gravelly loamy fine sand.	SM	A–1, A–2, A–4	0–15	75–95	65–95	45–75	20–45		NP
	18	Unweathered bedrock.									
TrD:[2]											
Tunbridge part	0–7	Very stony fine sandy loam	SM, ML	A–2, A–4	0–15	80–90	70–85	50–70	20–55	<20	NP
	7–29	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	0–20	80–90	70–85	60–80	30–65	<20	NP
	29	Unweathered bedrock.									
Woodstock part	0–6	Fine sandy loam	SM	A–2, A–4	5–25	85–95	80–95	60–75	30–45		NP
	6–18	Fine sandy loam, loamy fine sand, gravelly loamy fine sand.	SM	A–1, A–2, A–4	0–15	75–95	65–95	45–75	20–45		NP
	18	Unweathered bedrock.									

TABLE 15.—*Engineering properties and classifications*—Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				*Pct*					*Pct*	
Rock outcrop part.											
TwE:[2]											
Tunbridge part	0–7	Very stony fine sandy loam	SM, ML	A–2, A–4	0–15	80–90	70–85	50–70	20–55	<20	NP
	7–29	Fine sandy loam, loam, gravelly fine sandy loam.	SM, ML	A–2, A–4	0–20	80–90	70–85	60–80	30–65	<20	NP
	29	Unweathered bedrock.									
Woodstock part	0–6	Fine sandy loam	SM	A–2, A–4	5–25	85–95	80–95	60–75	30–45	.....	NP
	6–18	Fine sandy loam, loamy fine sand, gravelly loamy fine sand.	SM	A–1, A–2, A–4	0–15	75–95	65–95	45–75	20–45	.....	NP
	18	Unweathered bedrock.									
Vershire:											
VeB:[2]											
Vershire part	0–6	Loam	ML	A–4	0–10	90–100	85–95	75–90	60–85	20–40	NP
	6–30	Silt loam, loam, gravelly loam	ML, SM	A–4	0–10	70–100	60–90	55–80	40–70	20–40	NP
	30	Unweathered bedrock.									
Glover part	0–8	Loam	ML	A–4	5–15	85–95	80–90	70–85	50–70	20–40	NP–10
	8–19	Loam, channery loam, channery silt loam.	ML	A–4	5–30	85–95	80–95	70–95	50–75	20–40	NP–10
	19	Unweathered bedrock.									
VeC:[2]											
Vershire part	0–6	Loam	ML	A–4	0–10	90–100	85–95	75–90	60–85	20–40	NP
	6–30	Silt loam, loam, gravelly loam	ML, SM	A–4	0–10	70–100	60–90	55–80	40–70	20–40	NP
	30	Unweathered bedrock.									
Glover part	0–8	Loam	ML	A–4	5–15	85–95	80–90	70–85	50–70	20–40	NP–10
	8–19	Loam, channery loam, channery silt loam.	ML	A–4	5–30	85–95	80–95	70–95	50–75	20–40	NP–10
	19	Unweathered bedrock.									
VeD:[2]											
Vershire part	0–6	Loam	ML	A–4	0–10	90–100	85–95	75–90	60–85	20–40	NP
	6–30	Silt loam, loam, gravelly loam	ML, SM	A–4	0–10	70–100	60–90	55–80	40–70	20–40	NP
	30	Unweathered bedrock.									
Glover part	0–8	Loam	ML	A–4	5–15	85–95	80–90	70–85	50–70	20–40	NP–10
	8–19	Loam, channery loam, channery silt loam.	ML	A–4	5–30	85–95	80–95	70–95	50–75	20–40	NP–10
	19	Unweathered bedrock.									
VgD:[2]											
Vershire part	0–6	Very stony loam	ML, SM	A–4	0–20	85–100	75–90	65–80	45–70	20–40	NP
	6–30	Silt loam, loam, gravelly loam	ML, SM	A–4	0–15	75–100	65–90	60–80	45–70	20–40	NP
	30	Unweathered bedrock.									
Glover part	0–8	Loam	ML	A–4	5–15	85–95	80–90	70–85	50–70	20–40	NP–10
	8–19	Loam, channery loam, channery silt loam.	ML	A–4	5–30	85–95	80–95	70–95	50–75	20–40	NP–10
	19	Unweathered bedrock.									
Rock outcrop part.											

VhE:[2]											
Vershire part	0-6	Very stony loam	ML, SM	A-4	0-20	85-100	75-90	65-80	45-70	20-40	NP
	6-30	Silt loam, loam, gravelly loam	ML, SM	A-4	0-15	75-100	65-90	60-80	45-70	20-40	NP
	30	Unweathered bedrock.									
Glover part	0-8	Loam	ML	A-4	5-15	85-95	80-90	70-85	50-70	20-40	NP-10
	8-19	Loam, channery loam, channery silt loam.	ML	A-4	5-35	85-95	80-95	70-95	50-75	20-40	NP-10
	19	Unweathered bedrock.									
Walpole: Wa	0-7	Fine sandy loam	SM, OL	A-2, A-4	0-5	90-100	85-100	70-100	30-50	<25	NP-3
	7-19	Fine sandy loam, sandy loam, gravelly sandy loam.	SM	A-2, A-4	0-5	85-100	60-100	40-95	25-50		NP
	19-60	Coarse sand, loamy sand, gravelly coarse sand.	SP, SM	A-1, A-2, A-3	0-20	55-100	50-100	25-75	0-25		NP
Windsor: WnB, WnD, WnE.	0-7	Loamy fine sand	SM	A-2	0	95-100	85-100	35-85	20-35		NP
	7-29	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	95-100	85-100	55-95	20-30		NP
	29-60	Sand, fine sand	SP-SM, SM	A-2, A-3	0	90-100	85-100	40-80	5-20		NP
Winooski: Wo	0-8	Very fine sandy loam	ML	A-4	0	100	100	95-100	75-95	<33	NP
	8-38	Very fine sandy loam, silt loam, fine sand.	ML	A-4	0	100	100	95-100	65-95	<34	NP
	38-60	Stratified silt loam and fine sand.	ML, SM	A-2, A-4	0	100	100	65-100	20-90		NP

[1]NP means nonplastic.
[2]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

ly drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very low infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is rated in general terms that describe the frequency, duration, and period of the year when flooding is most likely. The ratings are based on evidences in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic matter content as depth increases; absence of distinctive soil horizons that form in soils of the area that are not subject to flooding; local information about the depth of floodwater and the extent of flooding; and local knowledge that relates the unique landscape position of each soil to historic floods.

The generalized description of flood hazards is valuable in land use planning and provides a valid basis for land use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

A *high water table* is the highest level of a saturated zone, more than 6 inches thick, in soils for a continuous period of more than 2 weeks during most years. The depth to a high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed during the course of the soil survey. Indicated are the depth to the high water table; the kind of water table, whether perched, artesian, or the upper part of the ground water table; and the months of the year that the high water commonly is present. Only those saturated zones above a depth of 5 or 6 feet are indicated.

Information about the high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not to construct basements and to determine how septic tank absorption fields and other underground instal-

TABLE 16.—*Physical and chemical properties of the soils*

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	*In/hr*	*In/in*	*pH*					
Agawam: AgA, AgB, AgC, AgD, AgE.	0–9	2.0–6.0	0.13–0.25	5.6–6.5	Low	Low	High	0.28	3
	9–23	2.0–6.0	0.11–0.21	5.6–6.5	Low	Low		0.43	
	23–60	6.0–20	0.01–0.09	5.6–6.5	Low	Low		0.17	
Belgrade: BeB, BeC, BeD	0–9	0.6–2.0	0.18–0.25	5.6–7.3	Low	Low	Low	0.49	3
	9–24	0.2–2.0	0.18–0.25	5.6–7.3	Low	Low	Low	0.49	
	24–60	0.06–0.2	0.16–0.22	5.6–7.3	Low	Low	Low	0.49	
Buckland:									
BuB, BuC, BuD	0–7	0.6–2.0	0.16–0.21	6.1–7.3	Low	Low	Moderate	0.24	3
	7–22	0.6–2.0	0.14–0.20	6.1–7.3	Low	Low	Moderate	0.24	
	22–60	0.06–0.2	0.06–0.12	6.1–7.3	Low	Low	Moderate	0.24	
BvC, BwE	0–7	0.6–2.0	0.16–0.21	6.1–7.3	Low	Low	Moderate	0.24	3
	7–22	0.6–2.0	0.14–0.20	6.1–7.3	Low	Low	Moderate	0.24	
	22–60	0.06–0.2	0.06–0.12	6.1–7.3	Low	Low	Moderate		
Cabot:									
CaB, CaC, CaD	0–8	0.6–2.0	0.18–0.22	5.6–7.3	Low	High	Low	0.28	3
	8–14	0.6–2.0	0.16–0.20	5.6–7.3	Low	High	Low	0.28	
	14–60	0.06–0.2	0.05–0.12	6.1–7.3	Low	High	Low	0.28	
CbB, CbD	0–8	0.6–2.0	0.14–0.20	5.6–7.3	Low	High	Low	0.28	3
	8–14	0.6–2.0	0.16–0.20	5.6–7.3	Low	High	Low	0.28	
	14–60	0.06–0.2	0.05–0.12	6.1–7.3	Low	High	Low	0.28	
Colrain:									
CoB, CoC, CoD	0–6	2.0–6.0	0.12–0.16	5.1–6.5	Low	Low	Moderate	0.20	3
	6–33	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	33–60	2.0–6.0	0.08–0.14	5.6–7.3	Low	Low	Moderate	0.20	
CsD, CsE	0–6	2.0–6.0	0.10–0.15	5.1–6.5	Low	Low	Moderate	0.20	3
	6–33	2.0–6.0	0.08–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	33–60	2.0–6.0	0.06–0.14	5.6–7.3	Low	Low	Moderate	0.20	
CxD, CxE	0–6	2.0–6.0	0.09–0.14	5.1–6.5	Low	Low	Moderate	0.20	3
	6–33	2.0–6.0	0.08–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	33–60	2.0–6.0	0.06–0.14	5.6–7.3	Low	Low	Moderate	0.20	
Hadley: Ha	0–11	0.6–2.0	0.15–0.25	5.6–6.5	Low	Low	Moderate	0.49	3
	11–28	0.6–2.0	0.13–0.20	5.6–6.5	Low	Low	Moderate	0.49	
	28–64	0.6–2.0	0.10–0.20	5.6–6.5	Low	Low	Moderate	0.49	
Hartland: HdB, HdC, HdD, HdE.	0–6	0.6–2.0	0.18–0.22	5.6–7.3	Low	Low	Low	0.49	3
	6–19	0.6–2.0	0.18–0.21	5.6–7.3	Low	Low	Low	0.49	
	19–60	0.2–2.0	0.16–0.21	5.6–7.3	Low	Low	Low	0.49	
Limerick: Le	0–5	0.6–2.0	0.18–0.25	5.6–7.3	Low	High	Low	0.20	3
	5–28	0.6–2.0	0.18–0.25	5.6–7.3	Low	High	Low	0.20	
	28–60	0.6–2.0	0.18–0.25	5.6–7.3	Low	High	Low	0.20	
Merrimac: MeA, MeB, MeC, MeD, MeE.	0–6	2.0–6.0	0.18–0.19	5.1–6.0	Low	Low	High	0.17	3
	6–23	2.0–6.0	0.15–0.17	5.1–6.0	Low	Low	High	0.24	
	23–60	6.0–20	0.01–0.06	5.1–6.0	Low	Low	High	0.17	
Muck: Mu	0–10	2.0–6.0	0.20–0.40	5.6–7.3	Low	High	Low	0.28	3
	10–45	0.6–6.0	0.20–0.40	5.6–6.5	Low	High	Low	0.28	
Ninigret: NnB, NnC	0–7	2.0–6.0	0.13–0.25	5.1–6.0	Low	Low	High	0.28	3
	7–29	2.0–6.0	0.06–0.18	5.1–6.0	Low	Low	High	0.43	
	29–60	6.0–20	0.01–0.13	5.1–6.0	Low	Low	High	0.17	
Peacham: Pc	8–0	0.6–2.0	0.25–0.40	6.1–7.3	Low	High	Low		
	0–5	0.6–2.0	0.08–0.18	6.1–7.3	Low	High	Low		
	5–22	<0.06	0.08–0.12	6.1–7.3	Low	High	Low		
	22–60	<0.06	0.05–0.12	6.1–7.3	Low	High	Low		

TABLE 16.—*Physical and chemical properties of the soils*—Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	*In/hr*	*In/in*	*pH*					
Pomfret: PoC, PoD, PsD, PtE	0–3	2.0–20	0.12–0.16	5.6–7.3	Low	Low	Moderate	0.17	5
	3–30	2.0–20	0.08–0.12	5.6–7.3	Low	Low	Moderate	0.17	
	30–58	6.0–20	0.06–0.10	6.1–7.3	Low	Low	Moderate	0.17	
	58								
Raynham: Ra	0–8	0.6–2.0	0.20–0.25	5.6–6.5	Low	High	Low	0.49	3
	8–25	0.2–2.0	0.18–0.22	5.6–6.5	Low	High	Low	0.49	
	25–68	0.06–0.2	0.18–0.22	6.1–7.3	Low	High	Low	0.49	
Rock outcrop: Ro.									
Saco: Sa	0–11	0.6–2.0	0.17–0.30	6.1–7.3	Low	Low	Moderate		
	11–28	0.6–2.0	0.15–0.26	6.1–7.3	Low	Low	Moderate	0.64	
	28–66	0.6–2.0	0.10–0.26	6.1–7.3	Low	Low	Low	0.64	
Stowe:									
SoB, SoC, SoD	0–8	2.0–6.0	0.10–0.22	5.1–6.0	Low	Low	Moderate	0.24	3
	8–21	2.0–6.0	0.10–0.20	5.1–6.0	Low	Low	Moderate	0.43	
	21–60	0.06–0.2	0.08–0.12	5.1–7.3	Low	Low	Moderate	0.17	
StD, SwE	0–8	2.0–6.0	0.10–0.18	5.1–6.0	Low	Low	Moderate	0.24	3
	8–21	2.0–6.0	0.10–0.18	5.1–6.0	Low	Low	Moderate	0.43	
	21–60	0.06–0.2	0.08–0.12	5.1–7.3	Low	Low	Moderate	0.17	
Tunbridge:									
TbB:[1]									
Tunbridge part	0–7	2.0–6.0	0.12–0.16	5.1–7.3	Low	Low	Moderate	0.20	2
	7–29	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	29								
Woodstock part	0–6	2.0–6.0	0.14–0.16	5.6–6.5	Low	Low	Moderate	0.20	2
	6–18	2.0–6.0	0.06–0.15	5.6–6.5	Low	Low	Moderate		
	18								
TbC:[1]									
Tunbridge part	0–7	2.0–6.0	0.12–0.16	5.1–7.3	Low	Low	Moderate	0.20	2
	7–29	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	29								
Woodstock part	0–6	2.0–6.0	0.14–0.16	5.6–6.5	Low	Low	Moderate	0.20	2
	6–18	2.0–6.0	0.06–0.15	5.6–6.5	Low	Low	Moderate		
	18								
TbD:[1]									
Tunbridge part	0–7	2.0–6.0	0.12–0.16	5.1–7.3	Low	Low	Moderate	0.20	2
	7–29	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	29								
Woodstock part	0–6	2.0–6.0	0.14–0.16	5.6–6.5	Low	Low	Moderate	0.20	2
	6–18	2.0–6.0	0.06–0.15	5.6–6.5	Low	Low	Moderate		
	18								
TrD:[1]									
Tunbridge part	0–7	2.0–6.0	0.12–0.16	5.1–7.3	Low	Low	Moderate	0.20	2
	7–29	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	29								
Woodstock part	0–6	2.0–6.0	0.14–0.16	5.6–6.5	Low	Low	Moderate	0.20	2
	6–18	2.0–6.0	0.06–0.15	5.6–6.5	Low	Low	Moderate		
	18								
Rock outcrop part.									
TwE:[1]									
Tunbridge part	0–7	2.0–6.0	0.12–0.16	5.1–7.3	Low	Low	Moderate	0.20	2
	7–29	2.0–6.0	0.10–0.14	5.1–7.3	Low	Low	Moderate	0.20	
	29								

TABLE 16.—*Physical and chemical properties of the soils*—Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	*In/hr*	*In/in*	*pH*					
Woodstock part.	0–6	2.0–6.0	0.14–0.16	5.6–6.5	Low	Low	Moderate	0.20	2
	6–18	2.0–6.0	0.06–0.15	5.6–6.5	Low	Low	Moderate		
	18								
Vershire:									
VeB:[1]									
Vershire part.	0–6	0.6–2.0	0.12–0.21	5.1–6.5	Low	Low	Moderate	0.20	2
	6–30	0.6–2.0	0.10–0.20	5.6–7.3	Low	Low	Moderate	0.20	
	30								
Glover part.	0–8	0.6–2.0	0.14–0.20	5.1–6.5	Low	Low	Low	0.20	2
	8–19	0.6–2.0	0.10–0.20	5.1–6.5	Low	Low	Low	0.20	
	19								
VeC:[1]									
Vershire part.	0–6	0.6–2.0	0.12–0.21	5.1–6.5	Low	Low	Moderate	0.20	2
	6–30	0.6–2.0	0.10–0.20	5.6–7.3	Low	Low	Moderate	0.20	
	30								
Glover part.	0–8	0.6–2.0	0.14–0.20	5.1–6.5	Low	Low	Low	0.20	2
	8–19	0.6–2.0	0.10–0.20	5.1–6.5	Low	Low	Low	0.20	
	19								
VeD:[1]									
Vershire part.	0–6	0.6–2.0	0.12–0.21	5.1–6.5	Low	Low	Moderate	0.20	2
	6–30	0.6–2.0	0.10–0.20	5.6–7.3	Low	Low	Moderate	0.20	
	30								
Glover part.	0–8	0.6–2.0	0.14–0.20	5.1–6.5	Low	Low	Low	0.20	2
	8–19	0.6–2.0	0.10–0.20	5.1–6.5	Low	Low	Low	0.20	
	19								
VgD:[1]									
Vershire part.	0–6	0.6–2.0	0.12–0.21	5.1–6.5	Low	Low	Moderate	0.20	2
	6–30	0.6–2.0	0.10–0.20	5.6–7.3	Low	Low	Moderate	0.20	
	30								
Glover part.	0–8	0.6–2.0	0.14–0.20	5.1–6.5	Low	Low	Low	0.20	2
	8–19	0.6–2.0	0.10–0.20	5.1–6.5	Low	Low	Low	0.20	
	19								
Rock outcrop part.									
VhE:[1]									
Vershire part.	0–6	0.6–2.0	0.12–0.21	5.1–6.5	Low	Low	Moderate	0.20	2
	6–30	0.6–2.0	0.10–0.20	5.6–7.3	Low	Low	Moderate	0.20	
	30								
Glover part.	0–8	0.6–2.0	0.14–0.20	5.1–6.5	Low	Low	Low	0.20	2
	8–19	0.6–2.0	0.10–0.20	5.1–6.5	Low	Low	Low	0.20	
	19								
Walpole: Wa	0–7	2.0–6.0	0.10–0.23	4.5–6.0	Low	Low	High	0.20	3
	7–19	2.0–6.0	0.07–0.18	4.5–6.0	Low	Low	High	0.28	
	19–60	6.0–20	0.01–0.13	4.5–6.0	Low	Low	High	0.17	
Windsor: WnB, WnD, WnE	0–7	6.0–20	0.08–0.12	5.1–7.3	Low	Low	High	0.17	5
	7–29	6.0–20	0.02–0.12	5.1–7.3	Low	Low	High	0.17	
	29–60	6.0–20	0.01–0.08	5.1–7.3	Low	Low	High	0.17	
Winooski: Wo	0–8	0.6–2.0	0.15–0.30	5.6–7.3	Low	Moderate	Moderate		
	8–45	0.6–2.0	0.13–0.26	5.6–7.3	Low	Moderate	Moderate		
	40–60	0.6–2.0	0.05–0.22	5.6–7.3	Low	Moderate	Moderate		

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

lations will function. Also, a high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at depths of 5 to 6 feet or less. For many soils, limited ranges in depth to bedrock are a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and other observations during the soil mapping. The kind of bedrock and its relative hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200 horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action is defined as freezing temperatures in the soil and movement of soil moisture into the freezing zone, which causes the formation of ice lenses. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly or sandy soils are the least susceptible.

Formation and classification of the soils

This section consists of three main parts. The first part discusses the factors of soil formation, the second part discusses the processes of soil formation, and the third part discusses the classification system.

Factors of soil formation

The characteristics of a soil at a given point are determined by the interaction of: (1) the physical, mineralogical, and chemical composition of the parent material; (2) the climate under which the soil profile has developed; (3) the plant and animal life in and on the soil; (4) the relief, or relative elevation of the land, and drainage; and (5) the length of time the soil material has been in place. One or more of the factors may dominate the kind of soil formed in a particular area. Commonly, however, the effect of any one factor is difficult to isolate, and the combined effects of all are evident. The differences in parent material, drainage, and age are of primary importance in causing differences among the soils in the survey area.

The most important morphological characteristics of the soils of the survey area are discussed in relation to the factors of soil formation.

Parent material

The parent material of the soils in the survey area consists of alluvial and organic deposits and deposits of glacial origin. The texture and mineralogical composition of the soils are directly related to the nature of the parent material; and to a lesser degree, other soil features such as drainage, depth to rock, and degree of horizonation also are related to the parent material.

An important group of soils formed in glacial till that was low in lime and had medium texture. Examples of these soils are Vershire, Glover, Buckland, Cabot, and Peacham soils. Another group of soils formed in glacial till that had moderately coarse texture. Tunbridge, Woodstock, Colrain, and Pomfret soils are in this group.

A feature of glacial till that has affected soil characteristics is the compact till in the substratum. The grayish compact layer, called a fragipan, in Stowe, Buckland, Cabot, and Peacham soils is considered to be inherited, at least in part, from the parent material. This layer has greatly influenced such soil characteristics as drainage, organic matter content, and amount of translocation.

A small but important group of soils formed in glaciofluvial, deltaic, and beach deposits of sand and gravel. Windsor, Merrimac, Ninigret, and Walpole soils are examples of soils that formed in glaciofluvial deposits. They are high in sand content and low in silt and clay content. Some of them contain gravel and cobbles. Belgrade, Hartland, and Raynham soils formed in water-laid deposits and in glaciolacustrine silt loam and very fine sandy loam.

Hadley, Winooski, and Limerick soils formed in flood plain sediment. Water-deposited sediment similar to that in which these soils formed is still being deposited on the surface. These materials contain a high proportion of very fine sand; have lesser amounts of silt, gravel, and stone fragments; and generally have very little clay.

The organic soils of the survey area formed in deposits of decomposed reeds, sedges, and woody plants. In undrained areas the parent material still collects on the surface when plants die.

The unconsolidated deposits that cover the survey area vary in thickness. Where bedrock is at a depth of less than 40 inches, the soil-forming processes are affected. Generally, little weathering of bedrock takes place during soil formation, so the bedrock contributes little parent material. The kind of bedrock at this depth, however, influences the nutrient uptake of plants and the recycling of nutrients in the soil.

The dominant texture of soil in the survey area and practically all coarse fragments in the soil are derived from the parent material. In affecting volume of the soil, the weathering of bedrock to coarse fragments and the reduction of large stone fragments into smaller ones was of minor importance. During soil formation the gross volume increase of the soil mass was the result of such processes as development of structure and loosening by root penetration. Therefore, the proportion of volume occupied by the coarse fragments in the solum is generally less than the proportion in the substratum.

Coarse fragments make up as much as 35 percent, by volume, of the soils that formed in glacial till. Buck-

TABLE 17.—*Soil and water features*

[Absence of an entry indicates the feature is not a concern. See text for descriptions of hydrologic groups. The symbol < means less than; >means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			*In*		
Agawam: AgA, AgB, AgC, AgD, AgE	B	None			3.0–10	Apparent	Jan.–Mar.	>60		Low.
Belgrade: BeB, BeC, BeD	B	None			1.5–2.5	Perched	Jan.–June	>60		High.
Buckland: BuB, BuC, BuD, BvC, BwE	C	None			1.0–2.0	Perched	Jan.–May	>60		High.
Cabot: CaB, CaC, CaD, CbB, CbD	D	None			0.5–2.0	Perched	Nov.–May	>60		High.
Colrain: CoB, CoC, CoD, CsD, CsE, CxD, CxE	B	None			>6.0			>60		Low.
Hadley: Ha	B	Common	Brief	Oct.–April	3.0–6.0	Apparent	Nov.–May	>60		High.
Hartland: HdB, HdC, HdD, HdE	B	None			>6.0			>60		High.
Limerick: Le	C	Frequent	Brief	Apr.–June	0.5–1.5	Apparent	Jan.–June	>60		High.
Merrimac: MeA, MeB, MeC, MeD, MeE	A	None			>6.0			>60		Low.
Muck: Mu	D	None			0–0.5	Apparent	Sept.–July	>60		Low.
Ninigret: NnB, NnC	B	None			1.5–2.5	Apparent	Nov.–April	>60		Moderate.
Peacham: Pc	D	None			0–1.5	Perched	Oct.–June	>60		High.
Pomfret: PoC, PoD, PsD, PtE	A	None			>6.0			>40	Rippable	Low.
Raynham: Ra	D	None			0.5–1.5	Apparent	Nov.–June	>60		High.
Rock outcrop: Ro.										
Saco: Sa	D	Common			0–0.5	Apparent	Nov.–June	>60		High.
Stowe: SoB, SoC, SoD, StD, SwE	C	None			1.5–2.5	Perched	Nov.–May	>60		Moderate.
Tunbridge:										
TbB:[1]										
Tunbridge part	C	None			>6.0			20–40	Hard	Moderate.
Woodstock part	C/D	None			>6.0			10–20	Hard	Low.
TbC:[1]										
Tunbridge part	C	None			>6.0			20–40	Hard	Moderate.
Woodstock part	C/D	None			>6.0			10–20	Hard	Low.
TbD:[1]										
Tunbridge part	C	None			>6.0			20–40	Hard	Moderate.
Woodstock part	C/D	None			>6.0			10–20	Hard	Low.
TrD:[1]										
Tunbridge part	C	None			>6.0			20–40	Hard	Moderate.
Woodstock part	C/D	None			>6.0			10–20	Hard	Low.
Rock outcrop part.										
TwE:[1]										
Tunbridge part	C	None			>6.0			20–40	Hard	Moderate.
Woodstock part	C/D	None			>6.0			10–20	Hard	Low.

Vershire:										
VeB:[1]										
Vershire part	C	None			>6.0			20–40	Hard	High.
Glover part	C/D	None			>6.0			10–20	Hard	Moderate.
VeC:[1]										
Vershire part	C	None			>6.0			20–40	Hard	High.
Glover part	C/D	None			>6.0			10–20	Hard	Moderate.
VeD:[1]										
Vershire part	C	None			>6.0			20–40	Hard	High.
Glover part	C/D	None			>6.0			10–20	Hard	Moderate.
VgD:[1]										
Vershire part	C	None			>6.0			20–40	Hard	High.
Glover part	C/D	None			>6.0			10–20	Hard	Moderate.
Rock outcrop part.										
VhE:[1]										
Vershire part	C	None			>6.0			20–40	Hard	High.
Glover part	C/D	None			>6.0			10–20	Hard	Moderate.
Walpole: Wa	C	None			0–1.0	Apparent	Nov.–April	>60		High.
Windsor: WnB, WnD, WnE	A	None			>6.0			>60		Low.
Winooski: Wo	B	Common			1.5–2.5	Apparent	Dec.–April	>60		High.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

land, Colrain, and Stowe soils are examples. Merrimac soils that formed in glaciofluvial materials have inherited from their parent material not only the texture of the fine-earth fraction but a high gravel and cobblestone content.

Climate

Orange County has a cool, humid, continental climate that is marked by extreme seasonal temperature changes. The annual precipitation is about 35 inches in the valleys and 40 to 50 inches at higher elevations. The mean annual air temperature is about 42° F in the valleys and is lower at higher elevations. The rainfall is fairly uniform during the growing season from May through September. The growing season (length of freeze-free season) in most of the survey area ranges from 110 to 130 days. For more detailed information on climate, see the section "General nature of the county."

The survey area was covered with ice thousands of years ago. It was during that time and immediately afterwards that most of the parent material was deposited. From the end of the period when ice covered the area to the present, there probably have been periods when the climate was slightly different than it is today. However, all of the climate-related features in the soils can be attributed to the effects of a climate similar to the present climate.

Cool summers, well distributed rainfall, and a cover of vigorously growing plants have interacted to supply large amounts of organic material to the soil. The organic matter on the surface has not decayed completely because of the relatively short, cool summer and because the ground is frozen for several months each year. Consequently, a large amount of organic matter has accumulated on the surface and in the upper part of many soils.

Frozen conditions during much of the year have held leaching to a moderate level. Because of this, the concentration of bases and the pH in the C horizon are thought to be very similar to those of the original parent material. Nutrients and bases from the annual fall of leaves and other vegetation are not readily lost from the surface layer because the soil freezes.

Cool summers and cold winters have limited the rate of biological activity, chemical reaction, and the rate of mechanical breakdown of parent material. Consequently, the weathering of the parent material into secondary minerals has not progressed so far as in soils that formed in similar parent material in warmer climates.

Plant and animal life

In the survey area the effects of plants and animals on soil formation are evident. The native vegetation was mixed hardwoods and conifers. Generally the cover was stands of maple, birch, beech, hemlock, spruce, and pine. Wet soils and soils that are shallow to bedrock probably had the most conifers. Wet areas also had sphagnum and other mosses that contributed substantially to the accumulation of organic deposits. Local differences in drainage and changes in parent material,

elevation, and other features contribute to differences in the density of forests, the composition of species, and the kinds of associated ground cover.

Insects, such as ants and cicada, earthworms, and burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose the vegetation, thus releasing nutrients for plants.

Man has had great influence on the surface layer of soils where he has cleared the forest and plowed the soils. He has added fertilizer and lime to the soils and made grassland of most of the survey area. Many areas originally cleared or harvested for timber now support excellent stands of northern hardwoods. Other areas have been planted to coniferous trees or are allowed to reseed naturally. Presumably the soil-forming processes in the reforested areas are proceeding as they did before these areas were cleared.

Relief and drainage

The survey area is a plateau that has been dissected by streams and subdued by glaciation. Generally, slopes are moderately steep. Elevation is dominantly between 1,000 and 2,000 feet. The difference in elevation between the lowest and highest points is approximately 2,760 feet.

The eastern half of the county is drained by Peach Brook and the Wells, Waits, and Ompompanoosuc Rivers, all of which flow into the Connecticut River; the southwestern part is drained by the tributaries of the White River, which eventually flows into the Connecticut River; and the northwestern part is drained by the tributaries of the Winooski River.

The shape of the land surface, the slope, and the position in relation to the water table considerably influence formation of soils in the survey area. Soils that formed in sloping to steep areas where runoff is medium to rapid generally are well drained; have a bright-colored, unmottled subsoil; and are more deeply leached than other soils. Examples are Colrain and Stowe soils. Soils that formed in less sloping areas where runoff is slower generally are mottled in the subsoil or show some other evidence of saturation by water for brief periods. An example is Buckland soils. Soils that formed in nearly level areas or slight depressions where the water table is at or near the surface for long periods show evidence of wetness to a marked degree. They have a dark colored surface layer and a strongly mottled or grayish subsoil. An example is Cabot soils. In addition, permeability of the soil material, as well as the length, steepness, and shape of the slopes, influences the kind of soil that formed in an area. Local soil differences are generally the result of differences in parent material and topography.

Time

The degree of soil development is related to the length of time that the soil-forming processes have acted on the parent material. The soils in the survey area developed since the last glaciation period.

Distinctive horizons have had time to form in many of the soils on uplands in the survey area. Stowe and Colrain soils are examples. Hadley soils are forming in alluvial sediment on flood plains; these soils are immature because the continuous deposition of fresh alluvium prevents the formation of distinct horizons.

Genesis of the soils

This section explains major processes that have contributed to the differentiation of horizons in the soils of the survey area and to the development of distinctive morphology of each kind of soil.

The most important soil-forming processes that have caused horizon differentiation in the soils are accumulation and distribution of organic matter; leaching of salts and carbonates; chemical weathering of primary minerals into silicate clay minerals, and their transfer to deeper layers; chemical changes, such as oxidation, reduction, and hydration, and the transfer or loss of the products of these changes; and mechanical breakdown of rock fragments into finer fragments and soil material.

Certain processes tend to modify, retard, or reverse the effects of these soil-forming processes. The most important are mixing of the soil by windthrow, and animal activity, or frost action; the deposition of fresh soil material; and interception and recycling by plants of leached bases.

Organic matter has accumulated to some degree in all of the soils of the survey area. Muck soils formed in accumulated vegetation in which the rate of decomposition has been retarded by saturation with water and by the climate. The color of the surface layer of mineral soils is a rough guide to the relative amount of organic matter. The surface layer of Peacham soils is black because of its high content of organic matter. Most soils in the survey area have sharply reduced organic matter content below the A horizon. The exceptions are (1) soils that formed in recent alluvium and have enough organic matter to appreciably affect their color to a depth of 24 inches or more and (2) soils in which the oxides of iron and aluminum have been moved from the surface and subsurface layers and have been precipitated in the subsoil. In the second kind of exception, the subsoil, especially the upper part, is higher in organic matter content than the subsurface layer; Buckland, Colrain, Stowe, and Vershire soils are examples.

Some parent material contained appreciable amounts of salts and carbonates. At least partial removal of the salts and carbonates occurred in soils that formed in this material. As a result, most of these soils are acid in the upper part, and removal of soluble salts has been complete. However, removal of carbonates has proceeded at different rates, depending on the amount originally present and on the drainage and texture of the soil. Cabot and Raynham soils formed from slightly acidic to calcareous parent material. In all of these soils, the reaction of the surface layer is relatively high and acidity decreases as the depth increases.

The parent material of the soils in this survey area contains only small amounts of clay, and soil formation

apparently has produced only small amounts. Therefore, the soils show little evidence of clay accumulation in the subsoil.

Chemical changes have been an important part of horizon differentiation in many of the soils. In some soils the subsurface horizon has lost sesquioxides, which moved to lower horizons and formed metal-organic complexes. The complexes are precipitated as iron oxides in the subsoil and give the subsoil a reddish or brownish color.

The horizons of many soils in the survey area have a characteristic morphology as the result of being saturated with water for extended periods. Mottling results when iron is reduced and segregated, as in the lower horizons of Ninigret and Belgrade soils. Gleying results when a horizon is subjected to intense reduction during soil development. Horizons were intensively reduced during formation of Cabot, Peacham, and Raynham soils.

The principal agents of mechanical breakdown of rock fragments in the survey area have been freezing and thawing. The glacial till in which many of the soils formed contains many coarse fragments.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*9*).

The system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the bases for classification are the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18 the soils of the survey area are classified according to the current system. Classes of this sytem are briefly discussed in the following paragraphs.

ORDER. Ten soils order are recognized. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have occurred. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and that are important to plant growth, or that were selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. The name of a great group ends with the name of a suborder. A prefix added to the name suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

TABLE 18.—*Classification of the soils*

Soil name	Family or higher taxonomic class
Agawam	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Dystrochrepts.
Belgrade	Coarse-silty, mixed, mesic Aquic Dystric Eutrochrepts.
Buckland	Coarse-loamy, mixed, frigid Entic Fragiorthods.
Cabot	Coarse-loamy, mixed, frigid Typic Fragiaquepts.
Colrain	Coarse-loamy, mixed, frigid Entic Haplorthods.
Glover	Loamy, mixed, frigid Entic Lithic Haplorthods.
Hadley	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents.
Hartland	Coarse-silty, mixed, mesic Dystric Euthrochrepts.
Limerick	Coarse-silty, mixed, nonacid, mesic, Typic Fluvaquents.
Merrimac	Sandy, mixed, mesic Typic Dystrochrepts.
Muck	Histosols.
Ninigret	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Dystrochrepts.
Peacham	Coarse-loamy, mixed, frigid Humic Fragiaquepts.
Pomfret	Sandy, micaceous, frigid Entic Haplorthods.
Raynham Variant	Coarse-silty, mixed, nonacid, mesic Typic Haplaquepts.
Saco	Coarse-silty, mixed, nonacid, mesic Fluvaquentic Humaquepts.
Stowe	Coarse-loamy, mixed, frigid Entic Fragiorthods.
Tunbridge	Coarse-loamy, mixed, frigid Entic Haplorthods.
Vershire	Coarse-loamy, mixed, frigid Entic Haplorthods.
Walpole	Sandy, mixed, mesic Aeric Haplaquepts.
Windsor	Mixed, mesic Typic Udipsamments.
Winooski	Coarse-silty, mixed, mesic Aquic Udifluvents.
Woodstock	Loamy, mixed, frigid Entic Lithic Haplorthods.

SUBGROUP. Each great group is divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades that have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. The adjective *Typic* is used for the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the bases of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distributions, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-silty, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of a group of soils that formed from a particular kind of parent material and have horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the soil profile. Among these charac-

teristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	Less than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) **soil.** Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation of partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the

soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. — Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. — Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly previous layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained. — Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly previous layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. — Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. — Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfal is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial: those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; occasional that it occurs on an average of once or less in 2 years; and frequent that it occurs on an average of more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many are interbeded or lamnated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery

and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon. — An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon. — The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon. — A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon. — The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. — The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer. — Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables — hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A land form of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, hardpan, fragipan, claypan, plowpan, and traffic pan.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.20 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for exemple, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as —

Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A resignation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: very coarse sand (2.0 millimeters to 1.0 millimeter); coarse sand (1.0 to 0.5 millimeter); silt (0.05 to 0.002 millimeter); and clay (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetable barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles

adhering without and regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embarkment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil areas does not justify creation of a new series.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within 1 year; specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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