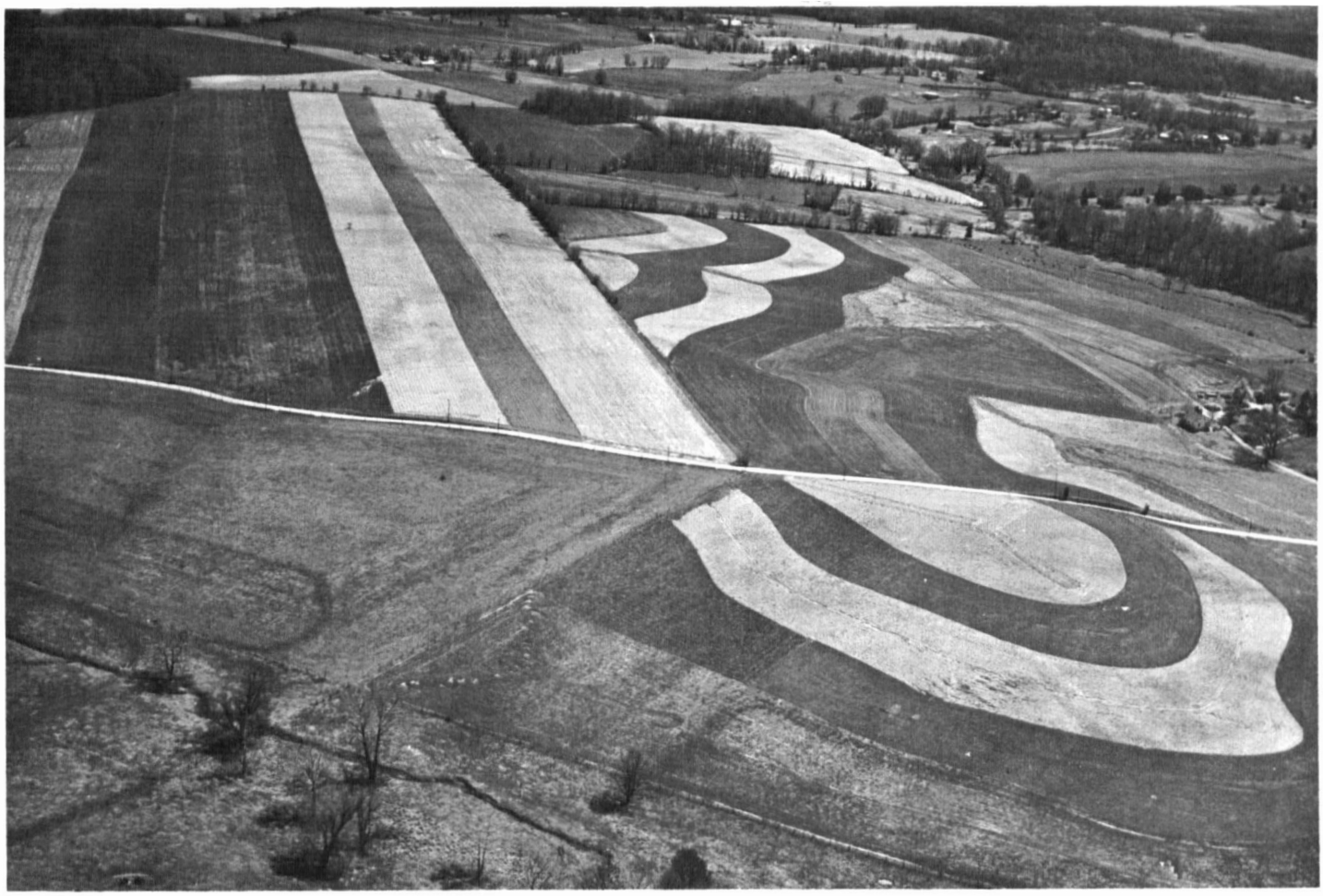
SOIL SURVEY

Howard County, Maryland



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

Major fieldwork for this soil survey was done in the period 1945–62. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the Maryland Agricultural Experiment Station; it is part of the technical assistance furnished to the Howard County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in this survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of soils in the soil descriptions and in the discussions of the interpretative groupings.

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

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

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the section "Nonfarm Uses of Soils," and "Recreational Uses of Soils."

Engineers and builders will find under "Engineering Uses of Soils" tables that give engineering properties of the soils in the county and that name soil features that affect engineering practices and structures.

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

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

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

***Cover picture.*—Contour and field stripcropping on a farm near Glenelg. The soil is mostly Chester silt loam.**

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Contents

NOTICE TO LIBRARIANS

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

Issued July 1968

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1963. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

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

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

SOIL SURVEY OF HOWARD COUNTY, MARYLAND

BY EARLE D. MATTHEWS AND MERL F. HERSHBERGER, SOIL CONSERVATION SERVICE

SURVEYED BY H. J. BRYANT, ELVIN Z. W. COMPY, MERL F. HERSHBERGER, RICHARD S. LONG, DAVID G. LONG, ELMER F. SAUER, W. G. SOUDER, AND PHILIP J. WALTER, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE MARYLAND AGRICULTURAL EXPERIMENT STATION

HOWARD COUNTY is in the central part of Maryland (fig. 1). The area is 250 square miles, or 160,000 acres. Ellicott City is the county seat. The county was formed in 1850, from part of Anne Arundel County. The early economy was based mostly on farming and to some extent on lumbering. Although still predominantly rural, the county is being absorbed into the Baltimore and Washington metropolitan areas. In 1960, the population was 35,931, an increase of 55 percent over the 1950 population.

About 65 percent of the acreage consists of soils that are suited to regular cultivation, about 15 percent of soils that are suited to occasional cultivation, and about 19 percent of soils that are not well suited to cultivated crops but can be used for trees and for some forage crops. Rocky areas, gravel pits, and other areas unsuitable for farming constitute about 1 percent of the acreage. Nearly 90 percent of the total acreage is suited to orchards.

The main hazard is erosion. Of the acreage suitable for cultivation, at least 87 percent requires erosion control practices; about 9 percent needs artificial drainage; a little more than 1 percent consists of shallow, sandy, or droughty soils; and about 3 percent consists of deep, well-drained, nearly level soils that hold moisture and plant nutrients very well and present few problems in management.

This county has good potential for wildlife, especially for small birds and small upland animals. There are fairly extensive water impoundments on the Patuxent River and a few on the Patapsco River. These impoundments are well suited to fresh-water fish and to some kinds of migratory waterfowl.

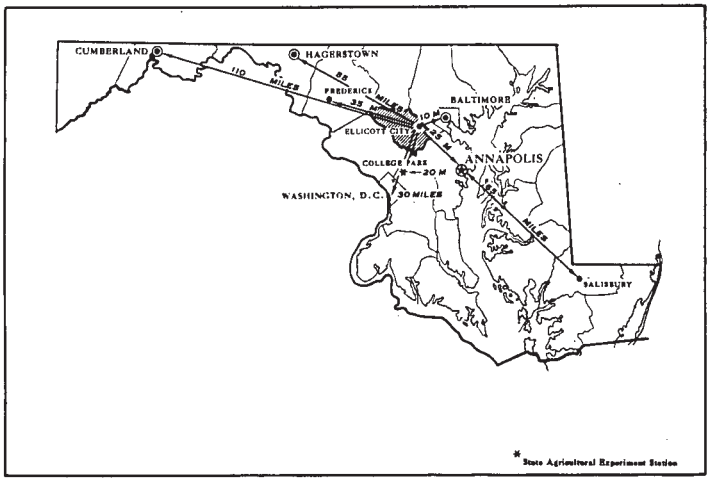

Figure 1.—Location of Howard County in Maryland.

General Nature of the Area

This section provides information for those who want a general idea of the county. The physiography, relief, and drainage are discussed. Also, the climate is described, and information about industries, markets, and farming is given.

Physiography, Relief, and Drainage

A little more than 90 percent of Howard County is in the physiographic province called the Piedmont Plateau, and nearly 10 percent, along the Anne Arundel County line and extending about 4 miles westward from the line, is in the Atlantic Coastal Plain province.

The Piedmont Plateau is a very old upland dissected by many small streams and drainageways. The Atlantic Coastal Plain is not so old as the Piedmont Plateau. It consists of sediments that were deposited chiefly during the Cretaceous period. On the surface in some areas are later deposits of outwash material, largely sand and gravel, which probably came from the glaciated areas of Pennsylvania. In places there is wind-deposited silt, which probably accumulated during late interglacial or early postglacial periods.

The topography of this county is mostly rolling. The elevation ranges from about 20 feet in the extreme southeastern part of the county to about 875 feet in the extreme western part.

Drainage is provided by the Patuxent, Little Patuxent, and Patapsco Rivers and tributaries, all of which drain into the Chesapeake Bay. Howard County has no swamps or marshes. Only about 5 percent of the county consists of poorly drained soils, about 10 percent consists of somewhat poorly drained and moderately well drained soils, and 85 percent of well drained and excessively drained soils.

Records kept at stream-gauging stations on the Patapsco and Patuxent Rivers show a steady increase in the

TABLE 1.— *Temperature and precipitation at Woodstock, Md., 1931–60*

[Elevation, 415 feet]

Month	Temperature					Precipitation						
	Average daily maximum	Average daily minimum	Average monthly	Average number of days with—		Average monthly	Greatest daily	Year of occurrence	Average number of days with 0.1 inch or more	Snowfall		
				Maximum of 90° or higher	Minimum of 32° or lower					Average monthly	Greatest monthly	Year of occurrence
	°F.	°F.	°F.			In.	In.			In.	In.	
January	43	25	34	0	24	3.2	[1] 2.40	1948	7	5	22	1935
February	45	24	34	0	23	2.8	[1] 1.53	1939	6	5	21	1934
March	53	31	42	0	19	3.6	2.65	1958	8	5	25	1942
April	66	40	53	0	7	3.5	3.11	1937	7	(2)	2	1940
May	76	50	63	1	1	4.1	3.53	1952	7	0	0	
June	84	59	71	7	0	3.8	3.16	1946	7	0	0	
July	87	63	75	11	0	4.2	[1] 4.70	1956	7	0	0	
August	85	61	73	9	0	4.2	6.05	1955	6	0	0	
September	79	54	67	3	0	3.9	4.30	1952	6	0	0	
October	68	43	56	0	5	3.3	3.98	1955	5	(2)	2	1940
November	56	33	45	0	16	3.1	3.47	1937	5	1	8	1938
December	44	25	35	0	24	3.0	[1] 1.94	1941	6	4	15	1957
Annual	65	42	54	31	119	42.7	6.05	1955	77	21	25	1942

[1] Exceeded in earlier years. [2] Less than 0.5 inch.

average rate of runoff since the 1930's (*2*)[1]. This increase in runoff is probably the result of suburban expansion, which increases the area of pavements, sidewalks, roofs, and other high-runoff surfaces.

Climate [2]

Howard County has a humid, semicontinental climate. Winters are generally mild, and summers are very warm and moist. Spring and fall are the most pleasant seasons.

Howard County has no long-record weather stations, but records from the Woodstock College weather station in Baltimore County are representative. A summary of temperature and precipitation data from the Woodstock station is given in table 1.

Table 2 gives the average dates of the last occurrences of specified temperatures in spring and the first in fall. These dates were calculated from records kept at the Woodstock weather station, which is on a hill. In valleys, the dates may be 10 days later in spring and 10 days earlier in fall.

Precipitation generally is well distributed through the year, but in any month it may be very heavy or very light. Both drought and excessive precipitation are most likely in summer. Summer precipitation occurs mainly in thunderstorms and is likely to be brief, heavy, and localized. Ordinarily, 1 to 3 inches of rain falls in one of these summer storms, and much more has been recorded. Most winter precipitation occurs in general storms that cover large areas.

[1] Italic numbers in parentheses refer to Literature Cited, p. 101.

[2] By A. DELBERT PETERSON, State climatologist, U. S. Weather Bureau.

TABLE 2.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from records at Woodstock College in Baltimore County]

Probability	Dates for given probability and temperature		
	16° F. or lower	24° F. or lower	32° F. or lower
Spring:			
1 year in 10 later than	Mar. 21	Apr. 17	May 12
1 year in 4 later than	Mar. 12	Apr. 8	May 5
1 year in 3 later than	Mar. 9	Apr. 5	May 3
1 year in 2 later than	Mar. 3	Mar. 30	Apr. 28
2 years in 3 later than	Feb. 25	Mar. 24	Apr. 23
3 years in 4 later than	Feb. 22	Mar. 21	Apr. 21
9 years in 10 later than	Feb. 13	Mar. 12	Apr. 14
Fall:			
1 year in 10 earlier than	Nov. 16	Oct. 22	Sept. 30
1 year in 4 earlier than	Nov. 24	Oct. 29	Oct. 5
1 year in 3 earlier than	Nov. 27	Oct. 31	Oct. 6
1 year in 2 earlier than	Dec. 3	Nov. 5	Oct. 10
2 years in 3 earlier than	Dec. 9	Nov. 10	Oct. 14
3 years in 4 earlier than	Dec. 12	Nov. 12	Oct. 15
9 years in 10 earlier than	Dec. 20	Nov. 19	Oct. 20

A measurable amount of precipitation falls on about one-third of the days in each year. On the average, there is one-tenth of an inch on 75 days, half an inch on between 25 and 30 days, and an inch on about 10 days. Two inches or more of rain in a day is likely only twice during an average year.

Evaporation is rapid in summer. In the latter part of July, the rate is nearly 1.5 inches per week, which is

nearly half an inch more than the average rate of precipitation for that period.

The annual snowfall averages about 20 inches, but the amount varies considerably from year to year. In the winter of 1949–50, less than 0.5 of an inch fell, but in the winter of 1957-58, more than 53 inches was recorded.

Thunderstorms occur on an average of 30 to 35 days each year. Three-fourths of these storms occur in summer. Hail falls during these storms only once or twice a year.

Tornadoes are infrequent and have caused little damage. The effects of hurricanes are felt in the county about once in a year, usually in August or September.

From the first of May till the end of September, the prevailing winds are from the south or southwest; the rest of the year, they are from the northwest. The average annual velocity is between 8 and 10 miles per hour, but winds of 50 miles per hour or more sometimes accompany severe thunderstorms or hurricanes in summer and general storms in winter.

The relative humidity is lowest in winter and spring and highest in summer. The relative humidity in the afternoon is 50 to 55 percent in winter and spring and nearly 60 percent in summer. Normally, the humidity is highest near sunrise; it is about 90 percent in summer and 70 to 75 percent in winter and spring.

Water Supply

The rate of runoff in Howard County is about 873,500 gallons per square mile per day, which is over 1,200 gallons per acre per day. This amount of runoff indicates that the supply of water would be ample for all domestic and commercial uses if the water could be stored until needed. The combined capacity of Triadelphia Reservoir and Rocky Gorge Reservoir is 27,050 acre-feet, the equivalent of 6¼ days runoff for the whole county. Obviously, only a small proportion of the water available is being stored for future use.

The amount of water that can be stored underground depends upon the porosity of the underlying rocks or sediments. Most of Howard County is underlain by hard, unweathered crystalline rocks of low porosity. Because of this, the water table may fall so low in dry periods that the yield from wells and springs decreases. Yields from wells range from very low to fairly high. The highest yield recorded, which is from a well in schistose rock, is 60 gallons per minute. Generally, wells in schistose rock yield about 20 gallons per minute. Wells in harder or more dense crystalline rocks yield about 11 gallons per minute. Wells in unconsolidated sediments in the eastern part of the county yield about 14 gallons per minute.

A detailed summary of well records in Howard County has been published by the Maryland Department of Geology, Mines, and Water Resources (*2*).

Water for Ellicott City and Savage is obtained from nearby streams. Most communities and many schools, rural homes, and farms depend on wells. Most residential developments use well fields.

Residential and industrial expansion are causing an increase in water requirements, and more water storage facilities are needed.

Industries and Markets

Howard County is mostly rural and residential. Most nonfarm areas are suburban and residential rather than industrial or commercial. There is no heavy industry. Some science industries, principally involving the electronic, chemical, and physical sciences, are expanding. Commercial activities are almost entirely related to providing goods and services for the expanding population.

Ellicott City is the chief business center and the major local market for farm products. Eventually, most of the products are marketed elsewhere, chiefly in Baltimore and Washington, D.C. Some livestock and other products are marketed in Lancaster, Pa.

Farming

Despite the recent growth of residential areas in Howard County, farming is still an important enterprise. The total number of farms decreased by about 370 between 1954 and 1959, but the average size increased to 155.9 acres.

In 1959, there were in the county 57 farms less than 10 acres in size, 147 farms between 10 and 49 acres in size, 108 farms between 50 and 99 acres in size, 275 farms between 100 and 499 acres in size, and 31 farms over 500 acres in size. The number of farms under 10 acres and the number over 500 acres in size increased between 1949 and 1959, but the number between 100 and 499 acres in size decreased during that decade.

In 1959, the number of farms totaled 618, of which 452 were operated by full owners, 107 by part-owners, 11 by managers, and 48 by tenants. About half of the farms were the general type, but there were 144 dairy farms, 30 poultry farms, 138 other livestock farms, and 5 cash-grain farms.

Crops were harvested from 36,620 acres in 1959. The most extensively grown crop was hay, which occupied 17,276 acres. Corn for grain was harvested from 5,990 acres, and corn for silage or other purposes from 2,161 acres. Other important field crops were barley (4,383 acres), wheat (3,861 acres), and oats (808 acres).

Apple trees numbered 10,377 and peach trees 9,301 in 1959.

There are many nurseries and greenhouses that grow plants and trees used in landscaping.

In 1959, a total of 34,115 acres was pastured. This acreage included 13,992 acres of cropland used for pasture, 3,513 acres of woodland pasture, and 16,610 acres of other pasture. In addition, 6,233 acres was in highly improved pasture planted to grasses and legumes.

Livestock and livestock products are important farm commodities. In 1959, there were 19,491 cattle and calves, of which 5,627 were milk cows. In the same year, about 332,000 dozens of eggs were sold from commercial farms, 10,340 pounds of wool, 12,070 head of cattle and calves, and 4,574 hogs.

How This Soil Survey Was Made

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this survey efficiently, it is necessary to know the kinds of grouping most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Chester and Baile, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use by man.

Many soil series contain soils that differ in the texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Chester silt loam and Chester gravelly silt loam are two soil types in the Chester series.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, Chester silt loam, 0 to 3 percent slopes, is one phase of Chester silt loam, a soil type that has a slope range of 0 to 25 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew soil boundaries 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 survey 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 management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and occur as individual areas so small in size that it is not practical to show them separately on the map. Such a mixture of soils is shown as one mapping unit and called a soil complex. Ordinarily, a soil complex is named for the major kinds of soils in it, for example, Chillum-Fairfax loams.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Montalto and Relay soils. Also, on most soil maps it is necessary to show areas that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on the soil map like other mapping units, but they are given descriptive names, such as Made land, and are called land types rather than soils.

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

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, and engineers. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, and then adjust them according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Howard County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is

named for the major soils. The soils in one association may occur in another, but in a different pattern and in different proportions.

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

The eight soil associations in Howard County are described in the following pages.

1. Mt. Airy-Linganore-Glenelg association

Dominantly moderately deep, somewhat excessively drained and well-drained, moderately sloping to steep soils

This association is in the extreme western part of Howard County. Mt. Airy soils make up about 40 percent of the association; Linganore soils 35 percent; Glenelg soils 15 percent; and minor soils 10 percent. The association occupies about 1 percent of the county.

The major soils of this association, Mt. Airy, Glenelg, and Linganore, all contain schist fragments. Mt. Airy and Linganore soils are moderately deep and somewhat droughty. Glenelg soils are deep and have a more distinct subsoil than Mt. Airy and Linganore soils. Glenville and Baile soils, which are less well drained than the major soils, occur at the foot of slopes.

Farming on this association is mainly of the general type. On most farms either beef cattle or dairy cattle are raised. Many areas have severe limitations for row crops, because of slope, erosion hazard, or stoniness, but are suited to hay, other forage crops, and pasture. Careful control of grazing is necessary in pastures.

2. Mt. Airy-Glenelg-Chester association

Moderately deep and deep, somewhat excessively drained and well-drained, moderately sloping to steep soils

This association is in the western part of the county. Mt. Airy soils make up about 50 percent of it; Glenelg soils 20 percent; Chester soils 15 percent; and minor soils 15 percent. The association occupies about 6 percent of the county.

The most extensive soils, Mt. Airy and Glenelg, both contain many schist fragments. Mt. Airy soils are moderately deep and well drained or somewhat excessively drained. Glenelg soils are deep and well drained. Chester soils are well drained, deep, and gently sloping; they are on the crests and upper slopes of ridges.

The minor soils of this association are on bottom lands along Cabin Branch and Meadow Branch. These soils, mostly of the Codorus and Hatboro series, have impeded drainage and are subject to flooding.

Farming is mainly of the general type. On most farms livestock is raised. The gently sloping soils are suited to row crops; the sloping and eroded soils are better for forage crops and pasture. Fairly extensive areas on the steeper slopes near Cabin Branch and Meadow Branch are wooded. Limitations on agricultural use of the soils are few.

Residential development in this association is of minor extent. The soils are suitable as sites for residences.

3. Glenelg-Chester-Manor association

Deep, well-drained, gently sloping and sloping soils

This association occupies most of the central part of the county. It extends from Lisbon southeast to the Coastal Plain and from south of Clarksville north to the county line. Glenelg soils make up about 40 percent of the association; Chester soils about 25 percent; Manor soils about 20 percent; and minor soils about 15 percent. This association occupies about 49 percent of the county.

Manor soils are more highly micaceous, more friable, and more easily eroded than Glenelg and Chester soils.

Farming is intensive on this association. Large areas are suited to row crops, hay crops, forage crops, pasture, and orchards. Fairly large areas are still in hardwood forest. Residential development is expanding in the eastern part of this association.

4. Glenelg-Manor-Chester association

Deep, well-drained, moderately steep and steep soils

This association is mostly in the southern part of the county near the Patuxent River, but some areas are in the central part along the Patapsco River, and some smaller areas are east of Clarksville or near Ellicott City. Glenelg soils make up about 40 percent of the association; Manor soils about 35 percent; Chester soils about 10 percent; and minor soils about 15 percent. This association occupies about 22 percent of the county.

Farming on this association is mainly of the general type. The soils are suited to cultivated crops, forage crops, and pasture. Large areas, mainly near the Triadelphia Reservoir, remain in hardwood forest. These areas are suited to recreational areas, parks, and wildlife areas. They include the waterfronts of Triadelphia and Rocky Gorge Reservoirs.

5. Neshaminy-Montalto association

Deep, well-drained, moderately slowly permeable, gently sloping to steep soils

This association occupies small areas in the eastern part of the Piedmont Plateau and, in places, extends onto the Coastal Plain. Neshaminy soils make up about 50 percent of the association; Montalto soils about 30 percent; and minor soils about 20 percent. This association occupies about 2 percent of the county.

Neshaminy soils are brown, but the more strongly weathered Montalto soils are red.

The soils of this association are well suited to farming, but they are rather fine textured and in places are difficult to work. Most of the acreage is in areas of commercial, industrial, and residential development.

6. Relay-Brandywine-Legore association

Deep and moderately deep, well-drained, steep and very steep soils, mostly very stony

This association is mostly on bluffs along the Patapsco River and extends from Elkridge to north of Ellicott

City. Most of Patapsco State Park is in this association. Relay soils make up about 30 percent of this association; Brandywine soils about 30 percent; Legore soils about 20 percent; and minor soils about 20 percent. The association occupies about 3 percent of the county.

Large proportions of the Relay, Brandywine, and Legore soils are stony and steep. Relay soils have a thick solum and are well developed. Brandywine soils have a thin solum, but the underlying gneiss is deeply weathered in most places. Legore soils are stony in many places.

Large areas of these soils are in woodland or residential developments. The farms are small, and most are residential rather than commercial. Some crops are grown on the level and least stony areas, and there are many small pastures. The soils are well suited to parks, wildlife areas, and recreational areas.

7. Beltsville-Chillum-Sassafras association

Deep, moderately well drained and well drained, gently sloping to strongly sloping soils of the Coastal Plain

This association is mostly in the eastern part of the county, on the Coastal Plain. Beltsville soils make up about 40 percent of the association; Chillum soils about 25 percent; Sassafras soils about 15 percent; and minor soils about 20 percent. The association occupies about 13 percent of the county.

Beltsville soils are seasonally wet. They have a dense, slowly permeable subsoil and generally are high in silt. Beltsville soils are moderately well drained, and Chillum and Sassafras soils are well drained. Small areas of minor soils are poorly drained.

These soils are fairly good for farming. They are not naturally fertile but respond well to good management and fertilization. There are some good general farms and livestock farms, but farming is becoming less extensive. Most of the association is being developed for commercial, industrial, and residential uses.

8. Sassafras-Chillum-Aura association

Deep, well-drained soils that have a moderately permeable subsoil, and moderately deep, well-drained soils that have a compact subsoil or substratum

This association consists of small areas in the eastern part of the county, between Laurel and Ellicott City. Sassafras soils make up about 50 percent of the association; Chillum soils about 20 percent; Aura soils about 15 percent; and minor soils about 15 percent. The association occupies about 4 percent of the county.

All the major soils of this association are well drained. Aura and Chillum soils have hard, compact substrata.

The soils of this association are fairly well suited to crops, but the association is located in a part of the county that is now mostly in nonfarm use.

Descriptions of Soils

In this section, each of the soil series represented in Howard County is discussed, a profile of a typical soil of each series is described in detail, and each mapping unit is briefly described. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. In alphabetic order with the series, the miscellaneous land types, which are not true soils, are also described. The approximate acreage and proportionate extent of each mapping unit are given in table 3.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. At the end of the description of each mapping unit are listed the capability unit and the woodland suitability group in which the mapping unit has been placed. The page on which each capability unit and woodland suitability group is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Many terms used in this section and other sections of the survey are defined in the Glossary.

Aldino Series

The Aldino series consists of deep, moderately well drained, very strongly acid soils that have a fragipan (a dense, brittle layer that restricts the passage of water and the development of plant roots). These soils are on uplands. They formed in residuum derived from serpentine rock. The native vegetation is mixed upland hardwoods, mainly oaks.

In cultivated areas, the plow layer is grayish-brown silt loam. The upper part of the subsoil is light yellowish-brown silty clay loam. The lower part is light yellowish-brown to olive, mottled, very dense, very firm or brittle silty clay loam. Moisture moves slowly or very slowly through this layer. Below the subsoil is gritty, decomposed rock material, which overlies rock at a depth of 4 feet or more.

Aldino soils are suited to crops and pasture. Some areas are wooded.

Profile of Aldino silt loam, in a gently sloping wooded area on Berger Road, near Guilford.

O2—½ inch to 0, mat of decomposed organic material.

A1—0 to 1 inch, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; very strongly acid; gradual, smooth boundary. 1 to 2 inches thick.

A2—1 inch to 10 inches, brown (10YR 5/3) silt loam or silt; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; pores filled with very dark gray (10YR 3/2) silty material; very strongly acid; gradual, wavy boundary. 7 to 12 inches thick.

B1—10 to 14 inches, yellowish-brown (10YR 5/4) heavy silt loam; very weak, thin, platy structure; friable when moist, sticky and plastic when wet; roots plentiful; very strongly acid; gradual, smooth boundary. 3 to 5 inches thick.

B2t—14 to 22 inches, light yellowish-brown (10YR 6/4) light silty clay loam faintly variegated with yellowish brown (10YR 5/4); weak, medium, platy structure and moderate, medium, subangular blocky structure; friable to firm when moist, sticky and plastic when wet; few roots; prominent brown (10YR 5/3) clay films; very strongly acid; clear, smooth boundary. 9 to 12 inches thick.

Bx1—22 to 29 inches, light yellowish-brown (10YR 6/4) silty clay loam; common, medium, distinct variegations of pale yellow (2.5Y 7/4) and strong brown (7.5YR 5/6); moderate, thin and medium, platy structure; very firm when moist, brittle when moist or dry,

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Aldino silt loam, 3 to 8 percent slopes, moderately eroded	213	0. 1
Aldino silt loam, 8 to 15 percent slopes, moderately eroded	98	. 1
Aura gravelly loam, 1 to 5 percent slopes, moderately eroded	170	. 1
Aura gravelly loam, 5 to 10 percent slopes, moderately eroded	241	. 1
Aura gravelly loam, 10 to 30 percent slopes, severely eroded	196	. 1
Baile silt loam	3, 318	2. 1
Beltsville silt loam, 0 to 1 percent slopes	108	. 1
Beltsville silt loam, 1 to 5 percent slopes, moderately eroded	1, 383	. 9
Beltsville silt loam, 5 to 10 percent slopes, moderately eroded	557	. 3
Beltsville silt loam, 5 to 10 percent slopes, severely eroded	465	. 3
Beltsville silt loam, 10 to 15 percent slopes, moderately eroded	327	. 2
Brandywine loam, 3 to 8 percent slopes, moderately eroded	883	. 5
Brandywine loam, 8 to 15 percent slopes, moderately eroded	898	. 6
Brandywine loam, 8 to 15 percent slopes, severely eroded	712	. 4
Brandywine loam, 15 to 25 percent slopes, moderately eroded	420	. 3
Brandywine loam, 15 to 25 percent slopes, severely eroded	799	. 5
Brandywine loam, 25 to 60 percent slopes	1, 052	. 6
Brandywine very stony loam, 3 to 25 percent slopes	142	. 1
Chester silt loam, 0 to 3 percent slopes	2, 409	1. 5
Chester silt loam, 3 to 8 percent slopes, moderately eroded	14, 577	9. 1
Chester silt loam, 8 to 15 percent slopes, moderately eroded	2, 875	1. 8
Chester silt loam, 8 to 15 percent slopes, severely eroded	719	. 4
Chester silt loam, 15 to 25 percent slopes, moderately eroded	802	. 5
Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	3, 536	2. 2
Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	2, 530	1. 6
Chillum silt loam, 1 to 5 percent slopes, moderately eroded	882	. 5
Chillum silt loam, 5 to 10 percent slopes, moderately eroded	265	. 2
Chillum gravelly loam, 5 to 10 percent slopes, severely eroded	447	. 3
Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded	304	. 2
Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded	140	. 1
Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded	323	. 2
Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded	401	. 2
Codorus silt loam	3, 873	2. 4
Comus silt loam	697	. 4
Comus silt loam, local alluvium, 3 to 8 percent slopes	1, 199	. 7
Delanco silt loam, 0 to 3 percent slopes	138	. 1
Delanco silt loam, 3 to 8 percent slopes, moderately eroded	241	. 2
Elioak silt loam, 0 to 3 percent slopes	401	. 2
Elioak silt loam, 3 to 8 percent slopes, moderately eroded	2, 779	1. 7
Elioak silt loam, 8 to 15 percent slopes, moderately eroded	987	. 6
Elioak silt loam, 15 to 25 percent slopes, moderately eroded	134	. 1
Elioak silty clay loam, 8 to 15 percent slopes, severely eroded	411	0. 3
Elioak silty clay loam, 15 to 25 percent slopes, severely eroded	126	. 1
Elkton silt loam	94	. 1
Elsinboro loam, 0 to 3 percent slopes	136	. 1
Elsinboro loam, 3 to 8 percent slopes, moderately eroded	356	. 2
Elsinboro loam, 8 to 15 percent slopes, moderately eroded	156	. 1
Evesboro loamy sand, 1 to 5 percent slopes	146	. 1
Evesboro loamy sand, 5 to 15 percent slopes	258	. 2
Fallsington loam	356	. 2
Glenelg loam, 0 to 3 percent slopes	508	. 3
Glenelg loam, 3 to 8 percent slopes, moderately eroded	15, 616	9. 7
Glenelg loam, 8 to 15 percent slopes, moderately eroded	7, 835	4. 9
Glenelg loam, 8 to 15 percent slopes, severely eroded	2, 777	1. 7
Glenelg loam, 15 to 25 percent slopes, moderately eroded	1, 290	. 8
Glenelg loam, 15 to 25 percent slopes, severely eroded	928	. 6
Glenville silt loam, 0 to 3 percent slopes	1, 724	1. 1
Glenville silt loam, 3 to 8 percent slopes, moderately eroded	5, 266	3. 3
Glenville silt loam, 8 to 15 percent slopes, moderately eroded	146	. 1
Gravel pits and quarries	229	. 1
Hatboro silt loam	3, 381	2. 1
Iuka loam, local alluvium, 1 to 5 percent slopes	692	. 4
Kelly silt loam, 3 to 8 percent slopes, moderately eroded	386	. 2
Kelly silt loam, 8 to 15 percent slopes, moderately eroded	145	. 1
Kelly clay loam, 15 to 30 percent slopes, severely eroded	131	. 1
Keyport silt loam, 3 to 10 percent slopes, moderately eroded	124	. 1
Kinkora silt loam	144	. 1
Legore silt loam, 3 to 8 percent slopes, moderately eroded	380	. 2
Legore silt loam, 8 to 15 percent slopes, moderately eroded	143	. 1
Legore silty clay loam, 8 to 15 percent slopes, severely eroded	150	. 1
Leonardtown silt loam	480	. 3
Linganore channery loam, 3 to 8 percent slopes, moderately eroded	212	. 1
Linganore channery loam, 8 to 15 percent slopes, moderately eroded	391	. 2
Linganore channery loam, 15 to 25 percent slopes, moderately eroded	148	. 1
Linganore channery silt loam, 25 to 45 percent slopes	142	. 1
Made land	497	. 3
Manor loam, 0 to 3 percent slopes	284	. 2
Manor loam, 3 to 8 percent slopes, moderately eroded	4, 902	3. 1
Manor loam, 8 to 15 percent slopes, moderately eroded	4, 967	3. 1
Manor loam, 8 to 15 percent slopes, severely eroded	4, 019	2. 5
Manor loam, 15 to 25 percent slopes, moderately eroded	3, 927	2. 4
Manor loam, 15 to 25 percent slopes, severely eroded	5, 005	3. 1
Manor loam, 25 to 45 percent slopes	3, 105	1. 9
Manor gravelly loam, 3 to 8 percent slopes, moderately eroded	1, 863	1. 2
Manor gravelly loam, 8 to 15 percent slopes, moderately eroded	3, 137	2. 0

TABLE 3.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Manor gravelly loam, 8 to 15 percent slopes, severely eroded	913	0.6	Rumford loamy sand, 1 to 5 percent slopes, moderately eroded	82	0.1
Manor very stony loam, 3 to 25 percent slopes	1,239	.8	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	127	.1
Manor very stony loam, 25 to 60 percent slopes	1,759	1.1	Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	90	.1
Mixed alluvial land	416	.3	Sandy and clayey land, gently sloping	360	.2
Montalto silt loam, 3 to 8 percent slopes, moderately eroded	628	.4	Sandy and clayey land, moderately sloping	795	.5
Montalto silt loam, 8 to 15 percent slopes, moderately eroded	193	.1	Sandy and clayey land, moderately steep	338	.2
Montalto silty clay loam, 8 to 15 percent slopes, severely eroded	123	.1	Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded	482	.3
Montalto and Relay soils, 15 to 45 percent slopes	630	.4	Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	723	.4
Montalto and Relay very stony silt loams, 3 to 25 percent slopes	721	.4	Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	295	.2
Montalto and Relay very stony silt loams, 25 to 60 percent slopes	590	.4	Sassafras loam, 1 to 5 percent slopes, moderately eroded	532	.3
Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded	3,084	1.9	Sassafras loam, 5 to 10 percent slopes, moderately eroded	432	.3
Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded	4,590	2.9	Sassafras loam, 10 to 15 percent slopes, moderately eroded	222	.1
Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded	1,706	1.1	Sassafras soils, 15 to 40 percent slopes	348	.2
Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded	3,831	2.4	Stony land	347	.2
Mt. Airy channery loam, 25 to 45 percent slopes	1,747	1.1	Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded	62	(1)
Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	957	.6	Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded	111	.1
Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	595	.4	Watchung silt loam, 0 to 3 percent slopes	341	.2
Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded	224	.1	Watchung silt loam, 3 to 8 percent slopes	214	.1
Relay silt loam, 3 to 15 percent slopes, moderately eroded	209	.1	Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded	190	.1
			Water	640	.4
			Total	160,640	100.0

[1] Less than 0.05 percent.

sticky and plastic when wet; very few roots; distinct, brown (7.5YR 5/4) clay coatings; very strongly acid; gradual, smooth boundary. 5 to 9 inches thick.

Bx2—29 to 36 inches, olive (5Y 5/3) heavy silty clay loam; common, medium, faint mottles of light olive brown (2.5Y 5/4) and common, medium, prominent mottles of strong brown (7.5YR 5/6); strong, thin and medium, platy structure; extremely firm when moist, brittle when dry, sticky and plastic when wet; no roots; prominent brown (7.5YR 5/4) clay coats and flows; very strongly acid; clear, smooth boundary. 5 to 8 inches thick.

IIC1—36 to 48 inches, light brownish-gray (10YR 6/2) gritty loam; massive; very firm when moist, slightly sticky and slightly plastic when wet; abundant fine quartzite gravel and mica flakes; strongly acid to medium acid; clear, wavy boundary. 10 to 15 inches thick.

IIC2—48 to 60 inches +, yellowish-brown (10YR 5/4), soft, weathered serpentine rock of loam texture; medium acid to slightly acid.

The thickness of the solum ranges from about 28 to 45 inches, and the depth to bedrock ranges from about 4 to 6 feet. In places there are loose stones on or near the surface, and in places coarse fragments, gravel, or stones are just above the bedrock. In all horizons, the matrix hue centers on 2.5Y but ranges to 5Y and 7.5YR.

In the A2 horizon, the color generally has a value of 5 and a chroma of 2 or 3. If there is a plow layer, it has the same color range as the A2 horizon.

The B horizon ranges in texture from heavy silt loam to heavy silty clay loam. The clay content averages less than 35 percent. In the B1 and B2t horizons, the matrix color has a value of 5 or 6 and a chroma of 4 or less. These horizons have no gray mottles caused by wetness. In the Bx horizon, the matrix color has a value of 5 or 6 and a chroma of 2 to 4. The mottles in the Bx horizon range in hue from 2.5Y to 7.5YR; their value is 4 or 5; their chroma is generally 4 to 6, but it may be 2 or less in the Bx2 horizon.

Aldino soils are less strongly acid than Glenville, Beltsville, and Leonardtown soils, all of which resemble Aldino soils in having a fragipan. Aldino soils are better drained than either Glenville or Leonardtown soils. Glenville soils formed mainly in material weathered from acid, micaceous rocks. Beltsville and Leonardtown soils formed from old sediments of the Coastal Plain.

Aldino silt loam, 3 to 8 percent slopes, moderately eroded (AdB2).—The profile of this soil is similar to the one described for the series. In practically all cultivated areas, part of the surface layer has been lost through erosion. This soil is seasonally wet and is slow to warm up in spring, but the erosion hazard is the most serious limitation. Included in the areas mapped are a few acres, mostly on the summit of low hills, that are nearly level; a few spots where the subsoil is exposed; and some small spots that are stony.

This soil is suitable for pasture and for most crops. Alfalfa and other perennial crops may be injured by heaving in winter. (Capability unit IIe–13; woodland suitability group 12)

Aldino silt loam, 8 to 15 percent slopes, moderately eroded (AdC2).—This soil generally has a thinner surface layer and a thinner profile than Aldino silt loam, 3 to 8 percent slopes, moderately eroded. Deep plowing may turn up some of the sticky subsoil. Included in the areas mapped are a few acres of severely eroded soils; some spots of stony soils; and some small areas of soils with slopes of slightly more than 15 percent.

The hazard of erosion is the principal limitation. (Capability unit IIIe–13; woodland suitability group 16)

Aura Series

The Aura series consists of well drained or very well drained soils that are only moderately thick over compacted gravelly and sandy material. These soils formed in outwash. They are widely distributed in the eastern part of the county, on the higher parts of the Coastal Plain. The native vegetation is oaks and other upland hardwoods; Virginia pine has invaded in some areas.

In cultivated areas, these soils have a grayish-brown to light yellowish-brown plow layer of gravelly loam. The subsoil is gravelly sandy clay loam, yellowish red in the upper part and red in the lower. The gravel is smoothly rounded, and most of it is 2 inches or less in diameter. The substratum, beginning at a depth of about 30 inches, is hard, compacted, red sand and gravel.

Aura soils are very strongly acid or extremely acid. They are somewhat droughty because the solum is only moderately thick. The root zone is restricted by the compact substratum. These soils are not used extensively for farming. They are in a part of the county where rapid residential and industrial development is taking place.

Profile of Aura gravelly loam, in a gently sloping wooded area just east of Ilchester Road.

O1—2 inches to ¼ inch, litter of oak and dogwood leaves.
O2—¼ inch to 0, decomposed organic material.
A1—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly loam; weak, fine, granular structure; friable when moist, slightly sticky but nonplastic when wet; roots abundant; very strongly acid; clear, smooth boundary. 3 to 5 inches thick.
A2—4 to 14 inches, yellowish-brown (10YR 5/6) gravelly loam, approaching strong brown (7.5YR 5/6) in lower part; weak, very fine, granular structure; friable when moist, nonsticky and nonplastic when wet; roots abundant; very strongly acid; clear, smooth boundary. 8 to 12 inches thick.
B21t—14 to 22 inches, yellowish-red (5YR 5/8) gravelly sandy clay loam; few, thin, reddish-yellow (7.5YR 6/8), horizontal streaks; weak, fine, blocky structure; friable when moist, slightly sticky and slightly plastic when wet; roots common; prominent, yellowish-red (5YR 4/6) clay films and flows; extremely acid; gradual, smooth boundary. 8 to 11 inches thick.
B22t—22 to 32 inches, red (2.5YR 4/8) gravelly fine sandy clay loam; moderate, fine and medium, blocky and subangular blocky structure; very firm when moist, sticky and plastic when wet; few roots; prominent, dark-red (2.5YR 3/6) clay films; extremely acid; abrupt, wavy boundary. 8 to 18 inches thick.
C—32 to 48 inches +, red (2.5YR 4/8), hard, compacted sand and gravel thinly coated with fines; no roots; extremely acid.

The solum of the Aura soils in Howard County is 20 to 36 inches thick, or somewhat thinner than is normal for the series. The gravel content of the A and B horizons ranges up to nearly 50 percent, and that of the C horizon is more than 50 percent in most places.

The A horizon grades from gravelly loam toward loam. The hue of the A horizon is generally 10YR but is 7.5YR in places, the value is 4 or 5, and the chroma 2 to 6. Both value and chroma are lower in the A1 horizon than in the A2.

The B horizon ranges from heavy gravelly sandy loam to heavy gravelly sandy clay loam; the average clay content is less than 35 percent. The more gravel there is in the B horizon, the weaker the structure is. In hue, the B horizon ranges from 7.5YR to 2.5YR; generally, the redder hues are in the lower part of the horizon. The color value in the B horizon is 4 or 5 or, rarely, 3; the chroma is 6 or 8.

The C horizon is red to a depth of 6 feet or more.

Aura soils resemble Elioak, Montalto, and Sunnyside soils in color and drainage but are unlike those soils in being gravelly. Aura soils have a subsoil of sandy clay loam; Elioak and Montalto soils have a clay subsoil; and Sunnyside soils have a sandy clay loam subsoil that is less firm than that of Aura soils, and also a friable C horizon instead of a compact one.

Aura gravelly loam, 1 to 5 percent slopes, moderately eroded (AgB2).—Except for having an A horizon generally less than 7 inches thick, the profile of this soil is like that described for the series. Included in the areas mapped are some areas that have only a little gravel in the surface layer; a few acres that have a browner subsoil; and a few acres so severely eroded that the subsoil is exposed.

This soil is suited to cultivated crops. It is subject to erosion, but droughtiness is a more serious limitation. Contour terracing and stripcropping help to conserve moisture and control erosion. (Capability unit IIs–7; woodland suitability group 12)

Aura gravelly loam, 5 to 10 percent slopes, moderately eroded (AgC2).—Except for the slope, this soil is like Aura gravelly loam, 1 to 5 percent slopes, moderately eroded. Included in the areas mapped are some areas that have only a little gravel in the surface layer; some spots in which the surface layer is more sandy, as well as some in which the subsoil is less red; and some widely scattered areas where the subsoil is exposed.

Because of the slope, erosion is a more serious limitation than droughtiness. (Capability unit IIIe–7; woodland suitability group 16)

Aura gravelly loam, 10 to 30 percent slopes, severely eroded (AgE3).—Most of the original surface layer of this soil has been washed away. The present surface layer is gravelly red material that is likely to be hard and almost impenetrable when dry. Included in the areas mapped are some less gravelly spots and some spots that are less severely eroded.

This soil is not suited to cultivated crops, because of the erosion hazard. It can be used for pasture and woodland. (Capability unit VIIe–2; woodland suitability group 17)

Figure 2.—**Pasture in a drained area of Baile silt loam, near Cooksville.**

Baile Series

The Baile series consists of poorly drained, dominantly gray soils on the Piedmont Plateau. These soils formed partly in materials weathered in place from micaceous rock and partly in alluvium. They occur in upland depressions, around the heads of drains, and on foot slopes adjacent to minor drainageways, many of which lack channels. The native vegetation consists of wetland hardwoods, including oak, red maple, sweetgum, and willow; in some places there is an understory of alder.

These soils have a surface layer of dark-gray silt loam that is slightly sticky and slightly plastic. The subsoil is sticky and plastic, gray, mottled silty clay loam. Water moves moderately slowly through the subsoil. Underneath the subsoil is gray and bluish-gray, loose, weathered rock. The depth to bedrock is ordinarily more than 6 feet.

Baile soils have a high available moisture capacity. They have a seasonally high water table. They are strongly acid to very strongly acid. They are not commonly cultivated but, if artificially drained, are suited to improved pasture (fig. 2). Most undrained areas have remained in woodland. If well managed, these soils are moderately productive.

Profile of Baile silt loam, in a pasture on Manor Lane, about 1 mile north of Elioak.

Ap—0 to 9 inches, dark-gray (10YR 4/1) silt loam; moderate, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; slightly acid (limed); clear, smooth boundary. 8 to 10 inches thick.

B1g—9 to 14 inches, gray (10YR 5/1) light silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure, with a slight tendency toward platiness; firm when moist, sticky and slightly plastic when wet; roots common; slightly acid; clear, wavy boundary. 4 to 10 inches thick.

B21tg—14 to 22 inches, gray (5Y 5/1) silty clay loam; abundant, medium and coarse, prominent mottles of yellowish red (5YR 4/6) and dark brown (7.5YR 4/4); weak, medium and coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; very few roots; some gray (10YR 5/1) clay coats and flows; some fine iron concretions; strongly acid; gradual, irregular boundary. 6 to 15 inches thick.

IIB22tg—22 to 30 inches, gray (N 5/0) silty clay loam; abundant, medium and coarse, prominent mottles of brownish yellow (10YR 6/8) and strong brown (7.5YR 5/6); very weak, platy structure; firm when moist, sticky and plastic when wet; no roots; thin clay coats in pores and on some faces; abundant mica flakes; gritty in lower portion; very strongly acid; abrupt, smooth boundary. 7 to 15 inches thick.

IICg—30 to 60 inches +, bluish-gray (5BG 6/1), highly micaceous saprolite; loam texture in upper portion, grading toward sandy loam below; massive; very friable when moist, slightly sticky when wet, but nonplastic; strongly acid to very strongly acid.

The solum commonly formed in local alluvium over residuum, but in some places it formed entirely in alluvium and in these places usually has a Cg horizon instead of a IICg horizon.

The thickness of the solum ranges from about 30 to 40 inches, and the depth to bedrock ranges from about 6 to 9 feet. In places there are stones of colluvial origin on or near the surface.

In wooded areas, the A1 horizon is very thin and very dark colored and the A2 horizon is somewhat thicker, is gray to light gray in color, and has some high-chroma mottling. In cultivated areas, the plow layer is gray to dark gray.

In the B horizon, the colors range in value from 4 to 6 and in chroma from 0 to 2. The mottles range in value from 4 to 6 and in chroma from 4 to 8. Clay films usually have medium values and very low chromas. The texture of the B2t horizon generally is silty clay loam, but it ranges from heavy silt loam to clay loam high in silt.

The Cg horizon is strongly gleyed, and in places it is mottled with the same colors as the B horizon. Where the Cg horizon is unmottled, it is either greener or bluer in hue than 5Y. In some places, the mottles in this horizon are so coarse and abundant that their color appears to be the matrix color and the gray appears to be the mottling.

Baile soils resemble Elkton, Kinkora, Watchung, and Fallsington soils in drainage and color, but they have a less clayey subsoil than Elkton, Kinkora, and Watchung soils and a slightly more clayey subsoil than Fallsington soils. Baile soils are more wet than Glenville soils, though they occur in similar positions and formed from the same kind of material.

Baile silt loam (Ba).—This soil is in upland depressions. Most of the acreage is nearly level, but some areas have slopes of as much as 3 percent. The profile is similar to the profile described for the series. Included in the areas mapped are a few eroded spots and a few scattered areas that have slopes of more than 3 percent.

This soil is not generally used for cultivated crops. It is wet most of the time because of seepage from higher areas, and it is difficult to drain and to work. It is

suited to grazing but will puddle and compact if grazed when wet. (Capability unit Vw–1; woodland suitability group 1)

Beltsville Series

The Beltsville series consists of moderately well drained, very strongly acid soils that have a fragipan at a depth of about 22 inches. These soils formed in silty and sandy material deposited by wind over very old sandy or gravelly alluvium. They are widely distributed in the eastern part of the county, on the uplands of the Coastal Plain. The native vegetation is mixed upland hardwoods, mainly oaks.

These soils have a surface layer of brown, crumbly silt loam that is somewhat gravelly in places. In forests and other undisturbed areas, the surface layer is thin and dark gray and the subsurface layer is thick and yellow to light yellowish brown. The upper part of the subsoil is yellowish-brown, sticky silty clay loam. The lower part is the fragipan, which consists of dark-brown to olive-brown, mottled silty clay loam or clay loam. The fragipan is dense, firm, and brittle when moist and is very hard and nearly impenetrable when dry. Below the fragipan is gravelly material.

Beltsville soils are often saturated near the surface and at the same time almost dry in the fragipan and below it. These soils were once used for farming, but they are in a part of the county where rapid residential and industrial development is now taking place.

Profile of Beltsville silt loam in a gently sloping pasture just west of U.S. Highway No. 1, near Waterloo.

Ap—0 to 9 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; friable when moist, slightly sticky but nonplastic when wet; roots abundant; few smooth, fine pebbles; slightly acid (limed); abrupt, smooth boundary. 9 to 10 inches thick.

B1—9 to 16 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure with some tendency toward weak platiness; friable when moist, sticky and slightly plastic when wet; roots common; some brown (10YR 5/3) silt coatings; strongly acid; gradual, smooth boundary. 6 to 10 inches thick.

B2t—16 to 22 inches, yellowish-brown (10YR 5/8) silty clay loam faintly variegated with pale brown (10YR 6/3); moderate, thin, platy structure; firm when moist, sticky and plastic when wet; few roots; brown to yellowish-brown (10YR 5/3 to 5/4), prominent clay coatings; strongly acid; clear, smooth boundary. 6 to 8 inches thick.

Bx1—22 to 30 inches, dark-brown (10YR 4/3) silty clay loam to clay loam; abundant, medium, distinct mottles of pale olive (5Y 6/3) and common, medium, prominent mottles of yellowish red (5YR 4/6); strong, thin to medium, platy structure; extremely firm and very brittle when moist, sticky and plastic when wet; very few roots; mottling increases in abundance with depth; prominent brown (10YR 5/3) clay films and flows; very strongly acid; gradual, smooth boundary. 8 to 10 inches thick.

Bx2—30 to 39 inches, olive-brown (2.5Y 4/4) silty clay loam to clay loam; common, medium, distinct mottles of olive (5Y 5/3) and yellowish brown (10YR 5/6); weak, medium, platy structure; very firm when moist, sticky and plastic when wet; less firm and compact than the Bx1 horizon and becomes less dense with depth; considerable coarse sand and some fine to coarse, smooth gravel; a few iron concretions; extremely acid; clear, smooth boundary. 7 to 12 inches thick.

IIC—39 to 54 inches +, variegated reddish-yellow (7.5YR 6/8) and yellowish-brown (10YR 5/6) gritty gravelly clay loam; few, fine and medium, distinct mottles of light olive brown (2.5Y 5/4); massive; very firm when moist, sticky and plastic when wet; fine to coarse, smooth gravel that increases in amount with depth; scattered cherty cobblestones and platy ironstone fragments; extremely acid.

The thickness of the solum ranges from about 36 to more than 60 inches. Fine to coarse, smooth gravel occurs throughout the profile and is most abundant in the IIC horizon. In all horizons, the hue is most commonly 10YR but in places becomes more yellowish with depth.

In uncultivated areas, the A2 horizon generally has a value of 5 and a chroma of 3 to 6. Because the A1 horizon is thin, the plow layer generally has the same color as the A2 horizon.

The B horizon ranges in texture from heavy silt loam to silty clay loam or clay loam, the clay content averaging less than 35 percent. In the B1 and B2 horizons, the color ranges in value from 4 to 6 and in chroma from 3 to 8. The matrix color of the Bx horizon has a value of 4 or 5 and a chroma of 3 to 6. The mottles in the Bx horizon are either yellower or redder in hue than the matrix and either lower or higher in chroma. Mottles having a chroma of 2 occur in this horizon, most commonly in the Bx2. Some profiles lack a Bx2 horizon.

The IIC horizon usually lacks low-chroma mottles. This horizon is as strongly acid, or more so, than the solum.

Beltsville soils resemble Aldino, Glenville, and Leonardtown soils in that they all have a fragipan. Beltsville soils, unless limed, are more acid than Aldino soils. They are less wet than Glenville soils, which developed mainly in residuum from acid, micaceous rocks and consequently contain much fine mica. Beltsville soils generally formed in the same kind of material as Leonardtown soils, which are poorly drained, and Chillum soils, which are well drained.

Beltsville silt loam, 0 to 1 percent slopes (BeA).—The profile of this soil is the one described for the series. The surface layer is thick and crumbly. It quickly becomes saturated when it rains or when snow melts and normally remains wet for a fairly long period, because runoff and permeability are slow. There is little or no hazard of erosion. (Capability unit IIw–8; woodland suitability group 12)

Beltsville silt loam, 1 to 5 percent slopes, moderately eroded (BeB2).—Except for a thinner surface layer, the profile of this soil is like the one described for the series. In practically all cleared areas, part of the surface layer has been lost through erosion, and in many local spots the loss has been severe. Water runs off readily, especially when the soil is wet. Included in the areas mapped are some spots that have a sandy surface layer and some areas that have smooth pebbles in the surface layer.

The hazard of erosion is a more serious limitation than impeded drainage. In wooded areas, however, the hazard of erosion is slight. The pebbles in the included areas are not numerous enough to affect use and management. (Capability unit IIe–13; woodland suitability group 12)

Beltsville silt loam, 5 to 10 percent slopes, moderately eroded (BeC2).—This soil generally has a thinner solum

than Beltsville silt loam, 1 to 5 percent slopes, moderately eroded. Included in the areas mapped are a few wet spots, some small areas that have a sandy surface layer, and some that have a moderate amount of smooth, fine gravel in the suface layer.

This soil is suited to cultivated crops, pasture, or trees. The hazard of erosion is the main limitation. (Capability unit IIIe–13; woodland suitability group 16)

Beltsville silt loam, 5 to 10 percent slopes, severely eroded (BeC3).—Nearly all of the original surface layer of this soil has been lost through erosion. The present plow layer is brighter in color and higher in clay content than the original surface layer. Tilth is poor. Included in the areas mapped are some wet spots and some small areas that are sandy and pebbly.

This soil should be kept in sod most of the time, but under proper management it can be cultivated occasionally. (Capability unit IVe–9; woodland suitability group 17)

Beltsville silt loam, 10 to 15 percent slopes, moderately eroded (BeD2).—Most of this soil is protected by trees or other vegetation. Some areas have been cultivated, and these are severely eroded. Included in the areas mapped are some wet spots, some sandy spots, and some gravelly spots.

This soil is suited to pasture, trees, and an occasional cultivated crop. If it were used regularly for crops, controlling erosion would be difficult. (Capability unit IVe–9; woodland suitability group 16)

Brandywine Series

The Brandywine series consists of excessively drained, gently sloping to very steep soils on the uplands of the Piedmont Plateau. Most areas are on heights above the Patapsco River, and some are above the Patuxent River. These soils formed in gritty material weathered in place from gneiss. The native vegetation consists of oaks and other hardwoods; Virginia pine has invaded some areas.

These soils have a surface layer of dark grayish-brown loam. The subsoil is a thin layer of gritty loam that contains only a little more clay than the surface layer. The depth to the substratum, which consists of gravelly loamy coarse sand, is only about 12 inches. The depth to bedrock is commonly about 7 feet. In some areas there are outcrops and many loose stones.

Brandywine soils are acid. They have a low available moisture capacity.

Profile of Brandywine loam, 8 to 15 percent slopes, moderately eroded, in a pasture about 150 feet north of U.S. Highway No. 40, at Chatham Road.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable when moist, nonsticky and nonplastic when wet; roots abundant; abundant gneiss and quartzite fragments 1 to 4 millimeters in diameter; medium acid; abrupt, smooth boundary. 6 to 8 inches thick.

B2—8 to 12 inches, strong-brown (7.5YR 5/6) very gritty loam to gravelly loam; weak, fine, granular structure and very weak, fine, subangular blocky structure; friable when moist, nonsticky and nonplastic when wet; roots common; some very weak, indistinct, brown coatings; 30 to 60 percent fragments coarser than 2 millimeters; strongly acid; clear, irregular boundary. 2 to 7 inches thick.

C1—12 to 25 inches, brownish-yellow (10YR 6/6) gravelly loamy coarse sand; single grain; loose; roots in upper 6 inches; some inclusions of material similar to the B2 horizon; 50 to 70 percent fragments coarser than 2 millimeters; abundant mica flakes; very strongly acid; abrupt, wavy boundary. 4 to 14 inches thick.

C2—25 to 48 inches, mixed white and olive-brown (10YR 8/2 and 2.5Y 4/4) gravelly coarse sand, mostly coarser than 2 millimeters; consists of disintegrated, coarse-grained gneiss; loose; no roots; very strongly acid.

The thickness of the solum ranges from about 12 to 30 inches, and the depth to bedrock generally is several feet. Most of the coarse material is gravel, but in places there are angular stones. In all horizons, the hue is either 10YR or 7.5YR.

The A horizon is loam or gritty loam. It contains gravel in some places. In uncultivated areas, the A horizon has a color value of 3 or 4 and a chroma of 1 or 2. The Ap horizon has a value of 4 or 5 and a chroma of 1 to 4.

The B horizon generally is moderately gravelly. The B2 horizon has a value of 5 or 6 and a chroma of 4 or 6. The B2 horizon commonly has no structure except that inherited from the parent rock.

Brandywine soils are deeper to bedrock than Mt. Airy soils, which contain thin fragments of mica schist. They are shallower to bedrock and contain more coarse fragments than Manor soils, which are highly micaceous.

Brandywine loam, 3 to 8 percent slopes, moderately eroded (BrB2).—Part of the original surface layer of this soil has been lost through erosion. The solum is thin. Included in the areas mapped are a few scattered spots that are severely eroded, a few spots that are gravelly, and a few that are nearly level.

This soil tends to be droughty, but the erosion hazard is a more serious limitation than droughtiness. (Capability unit IIe–10; woodland suitability group 40)

Brandywine loam, 8 to 15 percent slopes, moderately eroded (BrC2).—The profile of this soil is the one described for the series. Part of the original surface layer has been lost through erosion. Included in the areas mapped are some areas that contain much gravel, commonly quartzite impurities from the parent rock.

The erosion hazard is a serious limitation. (Capability unit IIIe–10; woodland suitability group 40)

Brandywine loam, 8 to 15 percent slopes, severely eroded (BrC3).—Erosion has removed nearly all of the original surface layer of this soil, some of the subsoil, and in spots even some of the substratum. Included in the areas mapped are some gravelly areas.

This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–10; woodland suitability group 40)

Brandywine loam, 15 to 25 percent slopes, moderately eroded (BrD2).—Most areas of this soil are still in woodland. Included in the areas mapped are some gravelly areas. This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–10; woodland suitability group 41)

Brandywine loam, 15 to 25 percent slopes, severely eroded (BrD3).—Erosion has removed all of the original surface layer of this soil and in many places some of the

underlying material. Included in the areas mapped are some gravelly areas.

This soil can be used for pasture or trees. (Capability unit VIe–3; woodland suitability group 41)

Brandywine loam, 25 to 60 percent slopes (BrF).—Most of this soil is severely eroded; some areas are only moderately eroded. Included in the areas mapped are some gravelly spots and some stony areas on the heights along the Patapsco River.

This soil is not suited to cultivated crops, but it can be used for pasture or trees or as recreational areas. (Capability unit VIIe–3; slopes that are exposed to the sun are in woodland suitability group 56; northern slopes that are ordinarily shaded are in group 41)

Brandywine very stony loam, 3 to 25 percent slopes (BwD).—The profile of this soil is like the one described for the series, except that stones and boulders are common, both on the surface and within the profile. This soil can be used for pasture, woodland, or recreational areas. (Capability unit VIs–3; woodland suitability group 41)

Chester Series

The Chester series consists of deep, well-drained, nearly level to steep soils on the uplands of the Piedmont Plateau. These soils occur mostly on hilltops and the upper part of slopes. They formed in material weathered in place from crystalline, and commonly micaceous, rocks. The native vegetation is made up of oaks and other upland hardwoods.

In cultivated areas, the plow layer of these soils may be grayish brown or brown in color. The subsoil is strong-brown, dark yellowish-brown, or yellowish-red silt loam or silty clay loam, firm when moist but sticky and plastic when wet. In places, the subsoil becomes more red in color with increasing depth. Below the subsoil is highly micaceous, very friable, decomposed rock material. Hard rock generally is at a depth of more than 5 feet. In many areas these soils contain hard, white, quartzite gravel; a few spots are stony.

Chester soils are strongly acid. They have a high available moisture capacity.

Profile of a gently sloping Chester silt loam in an oak forest just off Route 144.

O1—2 inches to ½ inch, litter of hardwood leaves and twigs.
O2—½ inch to 0, thin mat of decomposed organic material.
A1—0 to 2 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; loose to very friable when moist, slightly sticky and slightly plastic when wet; roots abundant; medium acid; gradual, smooth boundary. 2 to 3 inches thick.
A2—2 to 6 inches, light yellowish-brown (10YR 6/4) silt loam; weak, coarse, granular structure to very weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; medium acid; gradual, smooth boundary. 4 to 6 inches thick.
B1—6 to 12 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium to coarse, subangular blocky structure; friable to firm when moist, moderately sticky and slightly plastic when wet; roots common; strongly acid; gradual, wavy boundary. 5 to 10 inches thick.
B21t—12 to 23 inches, yellowish-red (5YR 5/6) silty clay loam; strong, medium and coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; thin, yellowish-red (5YR 4/6) clay films; strongly acid; clear, wavy boundary. 8 to 15 inches thick.
B22t—23 to 34 inches, dark yellowish-brown (10YR 4/4) silty clay loam; strong, medium and coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; many voids; almost continuous, prominent, strong-brown (7.5YR 5/6) clay films; strongly acid to very strongly acid; clear, wavy boundary. 9 to 16 inches thick.
B3—34 to 38 inches, yellowish-brown (10YR 5/6) loam; weak, medium to coarse, blocky and subangular blocky structure; friable to firm when moist, slightly sticky and slightly plastic when wet; no roots; a few prominent, reddish-brown and yellowish-red (5YR 4/4 and 4/6) clay films and flows; strongly to very strongly acid; abrupt, irregular boundary. 2 to 8 inches thick.
C—38 to 55 inches +, yellowish-brown (10YR 5/8) saprolite of highly micaceous loam; very friable when moist, slightly sticky and very slightly plastic when wet; no roots; strongly to very strongly acid.

The thickness of the solum ranges from about 28 to 50 inches, and the depth to bedrock ranges from about 4 to more than 10 feet. The content of coarse fragments ranges up to 20 percent, and the fragments range in size from pebbles to stones. Most of the fragments are hard, white quartzite; some are hard gneiss or schist. In cultivated areas, the fragments are concentrated on and near the surface. In some places, vertical injections of quartzite, 4 to 10 inches thick, occur at irregular intervals in undisturbed parts of the solum and in the C horizon. The hue ranges from 10YR to 5YR.

In the A horizon, the color ranges in value from 3 to 6 and in chroma from 1 to 4. The value and chroma are lowest in the thin A1 horizon. The texture of the A horizon is silt loam that has a silt content of only slightly more than 50 percent.

The texture of the B horizon generally is light silty clay loam but includes heavy loam and heavy silt loam; the finest textured part of the Bt horizon is clay loam or silty clay loam, but the uppermost 20 inches of the Bt horizon has an average clay content of less than 35 percent. Generally, some part of the Bt horizon is 5YR in hue. The value in the B horizon is 4 or 5, and the chroma is 4, 6, or 8; the higher chromas commonly are associated with the redder hues. In places, the B2 horizon contains some mica. The B3 and C horizons contain more mica than the B2 horizon and in places are variegated in color.

The C horizon is medium textured, has no low-chroma mottling, and generally is more strongly acid than most of the solum.

Chester soils resemble Elsinboro, Fairfax, and Glenelg soils in some characteristics. Chester soils have a somewhat more clayey B horizon than Elsinboro soils, but they lack evidence of stratification, which generally is apparent in Elsinboro soils. Chester soils are less micaceous than Glenelg soils. The upper horizons of Fairfax soils formed in Coastal Plain sediments deposited over residuum from crystalline rocks.

Chester silt loam, 0 to 3 percent slopes (ChA).—The profile of this soil is the one described for the series. In cultivated areas there is a yellowish-brown plow layer. Included in the areas mapped are some small gravelly areas and a few eroded spots. This soil has few limitations. (Capability unit I–4; woodland suitability group 30)

Chester silt loam, 3 to 8 percent slopes, moderately eroded (ChB2).—The A horizon of this soil is thinner than that in the profile described for the series. The surface layer is yellowish brown because it has been mixed with material from the subsoil. Included in the areas mapped are a few severely eroded spots.

This soil is suited to cultivated crops, pasture, and trees. (Capability unit IIe–4; woodland suitability group 30)

Chester silt loam, 8 to 15 percent slopes, moderately eroded (ChC2).—The surface layer of this soil is thinner than that in the profile described for the series. Except in some wooded areas, much of the original surface layer has been lost through erosion. The present surface layer is yellowish brown.

This soil is suited to cultivated crops, pasture, and trees. (Capability unit IIIe–4; woodland suitability group 30)

Chester silt loam, 8 to 15 percent slopes, severely eroded (ChC3).—Most of the original surface layer of this soil has been lost through erosion, and in places some of the subsoil. The present plow layer is brighter and redder in color than that of less eroded Chester soils because it has been mixed with material from the subsoil. Also, it is more sticky and more difficult to work than that of less eroded soils. Included in the areas mapped are some areas that have a considerable amount of gravel on or near the surface.

This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–3; woodland suitability group 30)

Chester silt loam, 15 to 25 percent slopes, moderately eroded (ChD2).—Most of this soil is still in woodland and consequently is not severely eroded. Erosion has penetrated the subsoil in only a few spots. Included in the areas mapped are a few gravelly areas.

This soil should be kept in hay, pasture, sodded orchards, or other close-growing vegetation. It is suited to occasional cultivation but would be highly susceptible to erosion if cleared. (Capability unit IVe-3; woodland suitability group 31)

Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded (CgB2).—This soil contains large amounts of angular gravel of hard, white quartzite. The gravel content of the plow layer is about 20 percent; that of the subsoil varies from place to place. The plow layer is yellowish brown. Included in the areas mapped are small severely eroded areas.

This soil is suited to cultivated crops, pasture, and trees. The erosion hazard is the main limitation. The gravel does not limit use, but it is so hard that it dulls plowpoints and causes damage to other farm equipment. (Capability unit IIe–4; woodland suitability group 30)

Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded (CgC2).—The gravel on the surface of this soil tends to be concentrated on the lower part of the slopes.

This soil is suited to cultivated crops, pasture, and trees. The erosion hazard is the main limitation. (Capability unit IIIe–4; woodland suitability group 30)

Chillum Series

The Chillum series consists of deep, well-drained, nearly level to steep soils on the uplands of the Coastal Plain. These soils are mostly on hilltops and on the upper part of slopes in areas where there are many drainageways. They formed in silty and sandy eolian deposits over very old sandy and gravelly alluvium that is firm to very hard and somewhat compacted. The native vegetation is made up of oaks and other upland hardwoods; in places, there is a thick ground cover of huckleberry, laurel, and azalea. Virginia pine has invaded some areas.

These soils have a thin surface layer of dark grayish-brown, friable loam or silt loam and a thicker subsurface layer of yellowish-brown, friable loam or silt loam. In places, both layers contain much smooth, round gravel, commonly less than 2 inches in diameter. In cultivated areas, the plow layer generally is brown or dark yellowish brown in color. The subsoil is strong-brown or yellowish-brown, sticky silty clay loam. Below the subsoil is old sandy and gravelly material that is very firm and compacted in the upper part but becomes more loose with increasing depth.

Chillum soils are very strongly acid to extremely acid. They have a high available moisture capacity. Their use is limited by slope, by erosion, and in places by the compact underlying material. These soils are in a part of the county where suburban development is expanding.

Profile of Chillum silt loam, in an oak forest about 290 feet west of G&E pole No. 25, on Meadow Ridge Road.

O1—2 inches to ¼ inch, litter of hardwood leaves and twigs.
O2—¼ inch to 0, thin mat of decomposed organic materials.
A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; evidence of insect and worm activity; some fine, smooth gravel; extremely acid; abrupt, smooth boundary. 2 to 3 inches thick.
A2—3 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine to medium, granular structure; friable when moist; slightly sticky and slightly plastic when wet; roots plentiful; some very fine and some coarse quartz pebbles up to 1 inch in diameter; very strongly acid; gradual, smooth boundary. 6 to 9 inches thick.
B1—10 to 16 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky and slightly plastic when wet; roots plentiful; some fine gravel; many pores and voids; thin, discontinuous clay films; extremely acid; abrupt, wavy boundary. 5 to 12 inches thick.
B21t—16 to 34 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, fine to medium, subangular blocky structure with a tendency toward platiness in lower part; very firm when moist, sticky and plastic when wet; roots common; distinct, brown to strong-brown (7.5YR 5/4 to 5/6) clay films and flows; extremely acid; abrupt, wavy boundary. 14 to 23 inches thick.
IIC1—34 to 57 inches, strong-brown (7.5YR 5/6) very gravelly sandy loam; very compact in upper part, less compact below; very firm in place but brittle or friable when disturbed; few to no roots; gravel coated but only slightly weathered; extremely acid; abrupt, wavy boundary. 14 to 28 inches thick.
IIC2—57 to 90 inches +, brownish-yellow (10YR 6/8), loose, stratified sand and gravel; extremely acid.

The thickness of the solum ranges from about 24 to 36 inches. In the solum there are small amounts of smooth gravel, but in the IIC horizon the gravel content ranges from about 20 to 80 percent and increases with depth.

In the A horizon, the hue generally is 10YR, and the chroma is 2 to 4. The A1 horizon, which is less than 6 inches thick, has a color value of 3 or 4. The A2 and Ap horizons have a value of 4 or 5. The texture of the A horizon is silt loam or loam that is high in silt.

In the B2t horizon, the hue is 10YR or 7.5YR, the value is 4 or 5, and the chroma is most commonly 4 but in places 6. The texture ranges from heavy silt loam to silty clay loam. The clay content of the control section is 18 to 35 percent. In some profiles, there is a somewhat gravelly and sandy B3 horizon between the B2t and the IIC horizon.

The IIC horizon is coarser textured than the A and B horizons and contains gravel. This horizon is hard and firm. It is commonly variegated but ordinarily not with colors of low chroma. It is as strongly acid as the solum. Base saturation is less than 35 percent.

Chillum soils resemble Sassafras soils in color but are finer textured and have a hard, compact IIC horizon. Chillum soils are better drained than the closely associated Beltsville soils, which have a fragipan.

Chillum silt loam, 1 to 5 percent slopes, moderately eroded (CmB2).—The surface layer of this soil is yellowish brown because it has been mixed with material from the subsoil. The depth to the gravelly substratum is less than that in the profile described for the series. Included in the areas mapped are a few spots where drainage of the subsoil is slightly impeded, and a few where the surface layer is pebbly.

This soil is suited to cultivated crops, pasture, and trees. The most serious limitation is the moderate depth to the hard, gravelly substratum, which restricts root development. The hazard of erosion is moderate. (Capability unit IIs–7; woodland suitability group 7)

Chillum silt loam, 5 to 10 percent slopes, moderately eroded (CmC2).—Included in the areas mapped as this soil are a few spots where drainage of the subsoil is somewhat impeded.

This soil is suited to cultivated crops, pasture, and trees. The most serious limitation is the hazard of erosion. The root zone is restricted by the hard, gravelly substratum. (Capability unit IIIe–7; woodland suitability group 8)

Chillum gravelly loam, 5 to 10 percent slopes, severely eroded (ClC3).—As a result of erosion, the plow layer of this soil is about 20 percent gravel. Where there is no vegetation, the surface is almost like a gravel pavement. Included in the areas mapped are spots that are less gravelly and some that have a tight, compact subsoil that impedes drainage.

This soil is suited to pasture, trees, and an occasional cultivated crop. It should have a close vegetative cover most of the time. Plowing would turn under some of the gravel, but it would also turn up the sticky subsoil. (Capability unit IVe–7; woodland suitability group 17)

Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded (ClD2).—The slope makes this soil marginal for cultivation. Included in the areas mapped are a few spots that have impeded drainage and some areas in which the surface layer is less gravelly.

This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–7; woodland suitability group 8)

Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded (ClE2).—Most areas of this soil are still in woodland or other protective vegetation. Included in the areas mapped are a few acres that are slightly steeper, some areas that have less surface gravel, and some spots that are severely eroded.

This soil is suited to pasture and woodland. If cultivated, it would be subject to further erosion. (Capability unit VIe–2; woodland suitability group 9)

Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded (CnB2).—This complex consists of Chillum and Fairfax soils so intermixed that it is not practical to show them separately on the soil map. The Chillum soils have a hard, compact substratum, and the Fairfax soils are underlain by decomposed micaceous rock. The Chillum soils are the more extensive. Included in the areas mapped are a few spots that are severely eroded.

These soils are suited to cultivated crops, pasture, and trees. The limited depth of the Chillum soils governs the use of the complex. (Capability unit IIs–7; woodland suitability group 7)

Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded (CnD3).—This complex consists of Chillum and Fairfax soils so intermixed that it is not practical to show them separately on the soil map. Included in the areas mapped are small wooded areas that are less severely eroded, and somewhat larger areas that are gravelly.

These soils are suited to hay, pasture, and sodded orchards. Because of the slope, the hazard of erosion is severe. (Capability unit VIe–2; woodland suitability group 17)

Codorus Series

The Codorus series consists of moderately well drained, strongly acid to extremely acid soils that are on flood plains, or first bottoms of streams. These soils are located mainly on the Piedmont Plateau but extend along some of the major streams into the Coastal Plain. The native vegetation consists of mixed hardwoods, mostly water-tolerant oaks.

These soils have a fairly thick surface layer of dark-brown, friable silt loam. The upper part of the subsoil is dark yellowish-brown silt loam. The lower part is olive-brown, mottled, somewhat sticky silt loam. Below the subsoil is clayey to somewhat sandy and gravelly material that is of many different colors and is generally mottled. Mica flakes are common in the profile.

Unless artificially drained, Codorus soils are not suited to most crops. Because of the flood hazard, planting may have to be delayed.

Profile of Codorus silt loam on a level, unplowed, idle flood plain of the Little Patuxent River, close to Marriottsville Road.

A1—0 to 11 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure with a tendency toward platiness; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; strongly acid; gradual, smooth boundary. 9 to 12 inches thick.

B1—11 to 19 inches, dark yellowish-brown (10YR 4/4) silt loam; very weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; few roots; strongly acid; clear, smooth boundary. 6 to 9 inches thick.

B2—19 to 28 inches, olive-brown (2.5Y 4/4) heavy silt loam; common, medium, faint mottles of light brownish gray (2.5Y 6/2); weak, medium, subangular blocky structure with a tendency toward platiness; friable when moist, sticky and slightly plastic when wet; very few roots; abundant mica flakes; a few specks and very fine mottles of dark red (10R 3/6); very strongly acid; clear, smooth boundary. 6 to 12 inches thick.

B3—28 to 38 inches, grayish-brown (2.5Y 5/2) loam; common, medium, prominent mottles of dark red (10R 3/6); massive to weak platy structure; very friable when moist, slightly sticky and slightly plastic when wet; no roots; extremely acid; abrupt, smooth boundary. 9 to 11 inches thick.

IIC—38 to 50 inches +, weak-red (2.5YR 4/2) silty clay loam; massive with a very slight tendency toward platiness and blockiness; firm when moist, sticky and plastic when wet; no roots; extremely acid.

The thickness of the solum ranges from 3 to 5 feet, and the depth to bedrock ranges from 6 to more than 20 feet. Some smooth gravel occurs in the profile, but gravel generally is not abundant, except in some places in the IIC horizon. The texture of the solum is loam or silt loam; that of the IIC horizon differs sharply from that of the solum. The IIC horizon is commonly sandy or gravelly and micaceous.

In the A horizon, the color ordinarily is brown or dark brown. In the B horizon, the matrix hue is mostly 10YR or 2.5Y but in places is 7.5 YR. In the B1 and B2 horizons, the values are 4 or 5 and the chromas are 3 or 4. In places there is some high-chroma mottling.

The base saturation is commonly well below 35 percent, except where lime has been applied.

Codorus soils resemble Iuka in several ways. They are finer textured than Iuka soils, and they are micaceous, while Iuka soils are siliceous. Codorus soils formed in the same kind of material as Comus soils, which are well drained, and Hatboro soils, which are poorly drained.

Codorus silt loam (Co).—The profile of this level or nearly level soil is the one described for the series. Included in the areas mapped are small areas in which the flood hazard is severe; these areas are used for pasture or woodland.

This soil is suited to cultivated crops, but for some crops drainage has to be improved. Uncleared areas have good stands of water-tolerant hardwoods. (Capability unit IIw–7; woodland suitability group 4)

Comus Series

The Comus series consists of well-drained, strongly acid soils on flood plains, in depressions, and at the foot of slopes. These soils are mainly on the Piedmont Plateau but extend along some of the major streams into the Coastal Plain. They are flooded at irregular intervals. The native vegetation is mostly oak, but includes hickory, beech, elm, locust, and maple.

These soils have a fairly thick surface layer of dark grayish-brown, friable silt loam. The subsoil is dark yellowish-brown, unmottled, granular, slightly sticky silt loam. It is underlain by gravelly and sandy material that has many mica flakes.

Comus soils are suited to cultivated crops and, if well managed, are highly productive. The flood hazard is only a slight limitation.

Profile of Comus silt loam in a level pasture near the junction of Centennial Lane and Route 144.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; some very fine waterworn gravel; medium acid (limed); clear, smooth boundary. 10 to 11 inches thick.

B—10 to 36 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine to medium, granular structure, with slight tendency toward subangular blockiness; friable when moist, slightly sticky and slightly plastic when wet; roots common; fairly abundant mica flakes; old root channels filled with Ap material; some fine waterworn gravel; strongly acid; clear, wavy boundary. 20 to 30 inches thick.

IIC—36 to 50 inches +, brown (7.5YR 5/4), loose gravelly loamy sand; stratified; very few roots; mica abundant; strongly acid.

The depth to unconforming material in the profile ranges from about 30 to 40 inches, and the depth to bedrock ranges from about 6 to more than 20 feet. In the A and B horizons, the content of waterworn pebbles ranges up to 10 percent, and in the IIC horizon, up to 40 percent. Thin strata, less than 2 inches thick, of fine pebbles, occur at various levels in the profile.

In the A and B horizons, the hue centers on 10YR but ranges to 5YR. In uncultivated areas, there is an A1 horizon less than 6 inches thick. This horizon has a value of 3 or 4 and a chroma of 1 to 3. The Ap horizon has a value of 4 or 5 and a chroma of 2, 3, or rarely 4.

The texture of the A and B horizons is silt loam; the silt content generally is just a little more than 50 percent. The clay content of the textural control section generally is between 10 and 18 percent. In the B horizon, the color value is 4 or 5 and the chroma 3 or 4.

The color of the IIC horizon ranges from pale brown (10YR 6/3) to dark brown (10YR 4/3 or 7.5YR 4/4) or dark yellowish brown (10YR 4/4). At depths of more than 36 inches, there are some low-chroma mottles or streaks. The IIC horizon ranges in texture from sand to silty clay and is gravelly in places. It differs abruptly in texture from the other horizons in the profile.

Comus soils formed from the same kind of material as Codorus soils, which are moderately well drained, and Hatboro soils, which are poorly drained.

Comus silt loam (Cs).—This level or nearly level soil is on flood plains and is associated with Codorus and Hatboro soils. Included in the areas mapped are small areas that are flooded frequently.

Comus soils are suited to cultivated crops, pasture, and trees. Uncleared areas have good stands of mixed hardwoods. Areas that are flooded frequently are suited only to pasture or woodland. (Capability unit I–6; woodland suitability group 4)

Comus silt loam, local alluvium, 3 to 8 percent slopes (CuB).—This soil occurs at the foot of slopes and on sloping rims of upland depressions. It consists of materials that washed down from the adjacent slopes, and it is not subject to flooding. Included in the areas mapped are some

small areas that are somewhat sandy and some that have pebbles in the surface layer.

This soil is suited to cultivated crops, pasture, and trees. The erosion hazard is moderate. (Capability unit IIe–6; woodland suitability group 4)

Delanco Series

The Delanco series consists of moderately well drained, strongly acid to extremely acid soils on terraces along major streams. These soils formed in alluvium washed from the uplands of the Piedmont Plateau. The native vegetation is mixed hardwoods, mainly oaks.

These soils have a plow layer of weak-red, granular silt loam. In wooded areas, the surface layer is thin and dark gray, and the subsurface layer is somewhat thicker and light yellowish brown or light reddish brown. The upper part of the subsoil is yellowish-brown and strong-brown silty clay loam, and the lower part is yellowish-brown to gray, mottled, sticky and plastic clay loam. At a depth of 40 inches is dark-brown sandy clay loam.

Delanco soils are suited to corn, hay crops, and pasture.

Profile of Delanco silt loam, 0 to 3 percent slopes, in an idle area about 200 yards from U.S. Highway No. 40, opposite Turf Valley Golf Course.

Ap—0 to 10 inches, weak-red (2.5YR 4/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B1—10 to 19 inches, weakly variegated yellowish-brown and strong-brown (10YR 5/8 and 7.5YR 5/6) silty clay loam; moderate, fine, blocky structure; friable when moist, sticky and plastic when wet; roots common; very strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B21t—19 to 30 inches, yellowish-brown (10YR 5/8) clay loam faintly variegated and reddish brown (2.5YR 5/4) in lower part; strong, fine, subangular blocky and strong, coarse, blocky structure; firm when moist, sticky and plastic when wet; common, fine mica flakes; distinct to prominent, yellowish-brown and dark yellowish-brown (10YR 5/4 and 4/4) clay coats and flows; very strongly acid; clear, smooth boundary. 11 to 16 inches thick.

B22tg—30 to 40 inches, gray (N 6/0) clay loam; common, medium, distinct mottles of light reddish brown (2.5YR 6/4) and yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; extremely firm when moist, very sticky and very plastic when wet; fine mica abundant; thick, light reddish-brown (2.5YR 6/4) clay coats and flows; extremely acid; clear, smooth boundary. 8 to 12 inches thick.

IIC—40 to 66 inches +, dark-brown (7.5YR 4/4) sandy clay loam; massive; firm when moist; plastic and slightly sticky when wet; some thin strata of sand and fine gravel, and some lenses of gray (N 6/0) clay; extremely acid.

The thickness of the solum ranges from about 28 to 46 inches, and the depth to hard bedrock ranges from 5 to more than 20 feet. Waterworn fragments, ranging in size from pebbles to cobblestones, occur here and there in the profile but mostly in the C horizon. Mica flakes are common.

In the A horizon, the hue ranges from 2.5Y to 2.5YR, depending on the source of the original sediments. The value ranges from 4 to 6 and the chroma from 1 to 4.

The Bt horizon ranges in texture from heavy loam to silty clay loam, clay loam, and, in some places, silty clay. However, the clay content of this horizon generally is less than 35 percent.

In the upper part of the B horizon, the hue is 10YR or 7.5YR, the value ranges from 4 to 6, and the chroma ranges from 6 to 8. The B22t horizon is either dominantly gray with high-chroma mottles or dominantly brown with low-chroma mottles.

The IIC horizon varies in color. In texture, it differs abruptly from the solum. It is more strongly acid than the solum.

Delanco soils have a finer textured B horizon than Woodstown soils but a less fine textured B horizon than Keyport soils. Delanco soils contain mica, and Woodstown and Keyport soils do not. Delanco soils lack the fragipan that is characteristic of Glenville soils.

Delanco silt loam, 0 to 3 percent slopes (DeA).—The profile of this soil is the one described for the series. Because this soil is wet for long periods, planting sometimes has to be delayed. Runoff is slow, and the erosion hazard is slight.

This soil is suited to intensive cultivation, pasture, and woodland. Surface drainage is needed for some crops. (Capability unit IIw–1; woodland suitability group 3)

Delanco silt loam, 3 to 8 percent slopes, moderately eroded (DeB2).—Because of the slope, this soil does not stay wet as long as Delanco silt loam, 0 to 3 percent slopes. Included in the areas mapped are a few areas that have slopes of more than 8 percent. Some of these are severely eroded.

Little artificial drainage is needed, but careful disposal of excess runoff is necessary. (Capability unit IIe–16; woodland suitability group 3)

Elioak Series

The Elioak series consists of deep, well-drained, level to strongly sloping soils on the uplands of the Piedmont Plateau. These soils are located on the upper slopes and summits of hills. They formed from material weathered in place from crystalline rocks high in mica. The native vegetation is mixed hardwoods, mainly oaks. Virginia pine has invaded some areas.

These soils have a surface layer of dark-brown, friable silt loam and a subsurface layer of yellowish-brown, friable silt loam. In cultivated areas, the plow layer is brown or reddish brown. The subsoil ordinarily is red, dark-red, or dark reddish-brown clay loam or clay, firm when moist but plastic and sticky when wet. The underlying material is red, very crumbly to loose, decomposed rock that contains much mica and has a slick, greasy feel. Many areas of these soils contain pebbles of hard, white quartzite.

Elioak soils are strongly acid. The available moisture capacity is high. These soils are suited to cultivated crops, pasture, and trees.

Profile of Elioak silt loam in a moderately sloping wooded area near Simpsonville.

O1—2 inches to ½ inch, loose mat of Virginia pine needles.

O2—½ inch to 0, mat of decomposed organic material.

A1—0 to 5 inches, dark-brown (7.5YR 3/2) silt loam; moderate, fine, granular structure; very friable when

moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; gradual, smooth boundary. 3 to 5 inches thick.

A2—5 to 13 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, granular structure; friable, slightly sticky and slightly plastic; roots plentiful; strongly acid; gradual, smooth boundary. 5 to 10 inches thick.

B21t—13 to 26 inches, dark reddish-brown (2.5YR 3/4) heavy clay loam; moderate, fine to medium, subangular blocky structure; firm when moist, sticky and plastic when wet; roots common; faint to distinct clay films; some mica flakes and fine quartzite gravel; strongly acid; clear, smooth boundary. 11 to 16 inches thick.

B22t—26 to 38 inches, dark-red (2.5YR 3/6) heavy clay loam or clay; strong, medium and coarse, blocky structure; firm when moist, sticky and plastic when wet; few roots; prominent dark reddish-brown (2.5YR 3/4) clay films and flows; mica flakes common; some quartzite fragments; strongly acid; clear, smooth boundary. 11 to 15 inches thick.

B23t—38 to 53 inches, red (2.5YR 4/8) heavy clay loam or clay; moderate, medium, blocky and subangular blocky structure; moderately firm when moist, sticky and plastic when wet; very few roots; distinct, dark-red (2.5YR 3/6) clay films and flows; mica flakes common; many quartzite fragments; strongly acid; clear, wavy boundary. 6 to 20 inches thick.

B3—53 to 67 inches, variegated red and light-red (2.5YR 5/8 and 6/8) silt loam; weak, medium, platy structure; friable when moist, slightly sticky and slightly plastic when wet; no roots; some red (2.5YR 4/6) clay films and flows; strongly acid; gradual, wavy boundary. 0 to 20 inches thick.

C—67 to 87 inches +, red (2.5YR 4/6), highly micaceous saprolite of loam texture; very friable when moist, slightly sticky when wet but nonplastic; some quartzite fragments; strongly acid.

The thickness of the solum generally ranges from about 30 to 45 inches, but if the Bt horizon is especially thick and there is a B3 horizon, as in the profile described, the solum is more than 45 inches thick. The depth to bedrock ranges from about 5 to more than 10 feet. Angular rock fragments that range from pebbles to stones in size make up as much as 20 percent of the soil mass. These fragments are mostly white quartzite. They generally are most abundant on or near the surface of the soil. Vertical injections of quartzite, 4 to 10 inches thick, occur in undisturbed parts of the solum and in the C horizon. The reaction is strongly acid to extremely acid.

In the A1 horizon, the hue ranges from 10YR to 5YR, the value is 3 or 4, and the chroma 2 or 3. In cultivated areas, the hue of the Ap and A2 horizons is the same as that of the A1 horizon, the value is 4 or 5, and the chroma 2 to 4. The texture of the A horizon generally is silt loam, but in severely eroded areas, that of the Ap horizon is silty clay loam.

In the Bt horizon, the hue centers on 2.5YR, but it includes 5YR and 10R. The B3 horizon is variegated with other colors, all of which have chromas of at least 2. The texture of the Bt horizon is heavy clay loam, heavy silty clay loam, or light clay; the clay content is between 35 and 45 percent. Below the control section the clay content is less than 35 percent. The structure of the Bt horizon ordinarily is moderate. That of the lower horizons is strong in places and tends to be platy. Clay films are faint to prominent and generally are continuous.

The thickness of the C horizon ranges from 15 inches to several feet. The hue ranges from 7.5YR to 2.5YR, and the values and chromas are 4 or more. The texture is loam or silt loam or fine sandy loam high in silt. There is more mica in the C horizon than in the solum.

Elioak soils resemble Aura, Montalto, and Sunnyside soils in being well drained and having a red subsoil. They resemble Montalto soils in having a fine-textured subsoil. They are more acid than Montalto soils.

Elioak silt loam, 0 to 3 percent slopes (EkA).—Except that the surface layer is brown, the profile of this soil is like the profile described for the series. The surface layer is brown because the A1 and A2 horizons have been mixed by cultivation. Included in the areas mapped are some areas that contain hard quartzite gravel and a few spots that are slightly eroded.

This soil is suited to cultivated crops, pasture, and trees. Limitations are slight. (Capability unit I–4; woodland suitability group 30)

Elioak silt loam, 3 to 8 percent slopes, moderately eroded (EkB2).—The plow layer of this soil is brown because the A2 and B horizons have been mixed by cultivation. Included in the areas mapped are some areas that have hard, white quartzite gravel in the plow layer.

This soil is suited to cultivated crops, pasture, and trees. The moderate erosion hazard is the main limitation. (Capability unit IIe–4; woodland suitability group 30)

Elioak silt loam, 8 to 15 percent slopes, moderately eroded (EkC2).—The A horizon of this soil is thinner than that of Elioak silt loam, 0 to 3 percent slopes. Because the A1 horizon has been mixed with the A2 and B horizons by cultivation, the plow layer is brown. Included in the areas mapped are some areas that have hard quartzite gravel on or near the surface.

This soil is suited to cultivated crops, pasture, and trees. The erosion hazard is the main limitation. (Capability unit IIIe–4; woodland suitability group 30)

Elioak silt loam, 15 to 25 percent slopes, moderately eroded (EkD2).—Included with this soil in mapping were spots that have slopes of more than 25 percent.

This soil is suited to pasture, orchards, trees, and an occasional cultivated crop. Runoff is rapid. The hazard of erosion is the main limitation. (Capability unit IVe–3; woodland suitability group 31)

Elioak silty clay loam, 8 to 15 percent slopes, severely eroded (ElC3).—The plow layer of this soil is dark reddish-brown or dark-red, very sticky silty clay loam. It is difficult to till and can be worked only within a very narrow range of moisture content.

This soil is suited to pasture, trees, and an occasional cultivated crop. The hazard of erosion is the main limitation. (Capability unit IVe–3; woodland suitability group 30)

Elioak silty clay loam, 15 to 25 percent slopes, severely eroded (ElD3).—Included with this soil in mapping were spots that have slopes of slightly more than 25 percent.

This soil is suited to pasture and woodland. Because of the steep slopes and rapid runoff, the hazard of erosion is severe and the control of erosion is difficult. (Capability unit VIe–2; woodland suitability group 31)

Elkton Series

The Elkton series consists of poorly drained, extremely acid, dominantly gray soils that have a fine-textured subsoil. These soils are located on nearly level upland flats of the Coastal Plain, in the eastern part of the county. They formed in old deposits of clay or silty clay. The native vegetation consists of willow oak, red maple, birch, other hardwoods that tolerate wetness, and, in places, some pond pines.

These soils have a very thin surface layer of very dark grayish-brown, crumbly but somewhat sticky silt loam and a somewhat thicker subsurface layer of the same texture and consistence but grayish brown in color and mottled in places. The subsoil is light-gray or light brownish-gray silty clay or clay that is sticky and plastic and is abundantly mottled with strong brown. Water moves very slowly through the subsoil. Below the subsoil is massive, light-gray clay material that has a bluish cast in places.

Elkton soils have a high water table and are wet much of the year. If drained, they are suited to corn, soybeans, and hay crops. Undrained areas are commonly used for pasture or woodland. Poor drainage is the main limitation. These soils are in a part of the county where rapid residential and industrial development is taking place.

Profile of Elkton silt loam in a nearly level oak and maple forest on Route 32 just west of U.S. Highway No. 1.

O1—2 inches to ½ inch, litter of hardwood leaves and twigs.
O2—½ inch to 0, mat of decomposed organic materials.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; very strongly acid; clear, smooth boundary. 1 to 2 inches thick.
A2g—2 to 12 inches, grayish-brown (2.5Y 5/2) silt loam; few, fine, prominent mottles of strong brown (7.5YR 5/6); moderate, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots common; some fine, smooth gravel; extremely acid; clear, wavy boundary. 5 to 10 inches thick.
B21tg—12 to 22 inches, light brownish-gray (2.5Y 6/2) silty clay; abundant, medium, prominent mottles of strong brown (7.5YR 5/8); moderate, medium to very coarse, blocky and subangular blocky structure; very firm when moist, sticky and plastic when wet; few roots; prominent, gray (10YR 5/1) clay films; some fine, smooth gravel; extremely acid; gradual, smooth boundary. 8 to 12 inches thick.
B22tg—22 to 36 inches, light-gray (5Y 7/1) clay; abundant, medium and coarse, prominent mottles of strong brown (7.5YR 5/8); moderate, medium to very coarse, blocky and subangular blocky structure; very few roots; gray (5Y 5/1) clay films; extremely acid; gradual, smooth boundary. 13 to 20 inches thick.
Cg—36 to 62 inches +, light-gray (5Y 7/1) clay; massive; extremely firm when moist, very sticky and very plastic when wet; no roots; some thin lenses of sand and some fine, smooth gravel; bluish in places; extremely acid.

The thickness of the solum ranges from about 30 to 40 inches. The profile described contains some gravel, but gravel is not typical of Elkton soils.

In cultivated areas, the plow layer is gray to dark gray.

In the B horizon, the matrix hue centers on 2.5Y, but it can be 10YR, 5Y, or N. The value ranges from 5 to 7, and the chroma from 0 to 2. Mottles range from faint to prominent and have a hue of 7.5YR or 10YR. The texture of the B horizon is silty clay or clay; the content of clay is ordinarily between 40 and 50 percent. The structure is mostly moderate blocky or strong blocky.

The color range of the C horizon is the same as that of the B horizon. The reaction is at least as strongly acid as that of the solum. The Cg horizon generally extends to great depths, but in places it is replaced or underlain by an unconforming IIC horizon of massive sandy clay loam, friable sandy loam, or loamy sand.

Elkton soils resemble Baile, Fallsington, Kinkora, and Watchung soils in being poorly drained and dominantly gray in color. Elkton soils contain less silt than Baile soils and less sand than Fallsington soils, both of which have a clay content of less than 35 percent in the Bt horizon. Elkton soils do not contain the fine mica that is characteristic of Kinkora soils, and they are more strongly acid than Watchung soils.

Elkton silt loam (Em).—This soil needs artificial drainage if it is to be used intensively. If drained, it is suited to cultivated crops and pasture. Undrained areas are suited to water-tolerant trees. Large amounts of lime and fertilizer are generally needed for crops and improved pasture. There is practically no hazard of erosion. (Capability unit IIIw–9; woodland suitability group 1)

Elsinboro Series

The Elsinboro series consists of deep, well-drained, strongly acid to extremely acid soils. These soils are located mainly on level to strongly sloping, old stream terraces of the Piedmont Plateau but extend along some of the major streams into the Coastal Plain. They formed mostly in old alluvium washed from areas of crystalline rocks that commonly contain much mica. Where these soils extend into the Coastal Plain, the soil material included old weathered sediments. The native vegetation consists of mixed hardwoods, mainly oaks; there are many hickories and beeches and a few pines.

In uncultivated areas, these soils have a thin surface layer of dark-gray loam and a fairly thick subsurface layer of brown or reddish-brown loam. In cultivated areas, the plow layer is dark brown or dark grayish brown. The subsoil is yellowish-red, rather sticky light silty clay loam, ordinarily becoming somewhat gritty with increasing depth. The material below the subsoil is variable but generally is micaceous silt loam or sandy loam that contains some waterworn gravel.

Elsinboro soils are suited to most uses. They have a high available moisture capacity. They are in a part of the county where rapid residential and suburban development is taking place.

Profile of Elsinboro loam in a cultivated area just east of the main office of the University of Maryland farm on Folly Quarter Road.

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) loam, high in silt; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; some fine pebbles; slightly acid

(limed); clear, smooth boundary. 8 to 10 inches thick.

A2—8 to 13 inches, reddish-brown (5YR 4/4) heavy loam; moderate, fine, blocky structure; friable to somewhat firm when moist, sticky and slightly plastic when wet; roots common; some fine black specks; medium acid; gradual, smooth boundary. 3 to 6 inches thick.

B21t—13 to 35 inches, yellowish-red (5YR 4/8) light silty clay loam; moderate, fine, blocky structure; firm when moist, sticky and plastic when wet; few roots; prominent reddish-brown (5YR 4/4) clay films and flows; some medium, black films and common mica flakes; strongly acid; gradual, smooth boundary. 10 to 20 inches thick.

B22t—35 to 49 inches, yellowish-red (5YR 4/6) light silty clay loam; moderate, fine, blocky and subangular blocky structure; firm when moist, sticky and plastic when wet; very few roots; some prominent, reddish-brown (5YR 4/4) clay films; slightly gritty; many fine mica flakes; very strongly acid; clear, smooth boundary. 8 to 18 inches thick.

C—49 to 60 inches +, variegated brown and yellowish-red (7.5YR 4/4 and 5YR 5/6) micaceous silt loam; massive but showing lines of stratification; friable when moist, sticky and slightly plastic when wet; no roots; some fine, smooth gravel; coarser in texture with depth; very strongly to extremely acid.

The thickness of the solum ranges from about 28 to nearly 50 inches, and the depth to bedrock ranges from about 6 to more than 20 feet. The content of waterworn pebbles and cobblestones ranges up to 20 percent and generally is greatest in the C horizon. Thin strata, less than 2 inches thick, of fine waterworn pebbles are common. Mica is the most evident mineral, and the amount of mica increases abruptly in the C horizon.

In uncultivated areas, the A1 horizon is less than 6 inches thick. The hue of the A horizon centers on 7.5YR but includes 5YR and 10YR; the value is 3 or 4, and the chroma is 2, 3, or 4. The value and chroma are lowest in the A1 horizon. The texture of this horizon is loam that is nearly 50 percent silt.

In the B horizon, the hue is 5YR to 10YR, the value is 4 or 5, and the chroma is 6 or 8; in some places where the hue is 5YR, the chroma is 4. The texture of the Bt horizon is heavy loam, silt loam, clay loam, or light silty clay loam. The clay content ordinarily is less than 35 percent. Sharp differences in texture between layers in the B horizon occur in places; these appear to reflect stratification.

In places there is a IIC instead of a C horizon. The IIC horizon generally is more gravelly and more sandy than the solum. More than one unconformity may occur within the C horizon.

Elsinboro soils resemble Chester, Fairfax, and Glenelg soils. Elsinboro soils have a less clayey B horizon than Chester soils, which have a stronger structuré and stronger horizonation. They have evidences of stratification, which Chester, Glenelg, and Fairfax soils lack. Elsinboro soils are less micaceous than Glenelg soils. Fairfax soils formed in Coastal Plain sediments over residuum from crystalline rocks.

Elsinboro loam, 0 to 3 percent slopes (EnA).—The profile of this soil is the one described for the series. Included in the areas mapped are some areas that have hard gravel on or near the surface.

This soil is suited to cultivated crops, pasture, and trees. It has few limitations. (Capability unit I–4; woodland suitability group 30)

Elsinboro loam, 3 to 8 percent slopes, moderately eroded (EnB2).—The profile of this soil is like the one described for the series except that the surface layer is thinner. Included in the areas mapped are some small areas that are somewhat gravelly and some spots that are severely eroded.

This soil is suited to cultivated crops, pasture, and trees. The moderate hazard of erosion is the main limitation. (Capability unit IIe–4; woodland suitability group 30)

Elsinboro loam, 8 to 15 percent slopes, moderately eroded (EnC2).—The profile of this soil is like the one described for the series except that the surface layer is thinner. Included in the areas mapped are a few gravelly spots, a few that are severely eroded, and some that have slopes of more than 15 percent.

This soil is suited to cultivated crops, pasture, and trees. The hazard of erosion is the main limitation. (Capability unit IIIe–4; woodland suitability group 30)

Evesboro Series

The Evesboro series consists of very deep soils that are somewhat excessively drained to excessively drained, very sandy, and gently sloping to strongly sloping. These soils are on uplands of the Coastal Plain. Dunelike topography is common. These soils formed in old, very thick deposits of sand that have probably been reworked by wind. The native vegetation consists mainly of scrub hardwoods; Virginia pine has invaded some areas.

These soils have a surface layer of dark-gray, loose loamy sand. In cultivated areas, the plow layer is usually grayish brown. The material between depths of 6 and 36 inches is light yellowish-brown, loose loamy sand. It becomes brighter in color and sandier in texture with increasing depth. Below a depth of 36 inches is loose, yellowish-brown gravelly loamy sand. Water moves rapidly to very rapidly through the profile.

Evesboro soils have a low available moisture capacity and are low in fertility.

Profile of Evesboro loamy sand, 1 to 5 percent slopes, in a scrub oak forest on Landing Road about one-fourth of a mile north of Montgomery Road.

O1—1 inch to 0, an uneven litter of oak leaves.

A1—0 to 6 inches, dark-gray (10YR 4/1) loamy sand; single grain; loose; roots plentiful; very strongly acid; abrupt, smooth boundary. 5 to 6 inches thick.

C1—6 to 36 inches, light yellowish-brown to brownish-yellow (10YR 6/4 to 6/6) loamy sand that becomes coarser textured with depth; single grain; loose; roots common in upper part; some fine, smooth gravel and some fine concretions; grades toward yellowish red (5YR 5/6) within 2 inches of lower boundary; extremely acid; gradual, irregular boundary. 20 to 40 inches thick.

C2—36 to 56 inches +, yellowish-brown (10YR 5/4) gravelly loamy sand that has a pinkish cast in places; loose; very few roots; fine or very fine gravel; extremely acid.

The texture grades with depth from loamy sand to sand. No clay bridging between sand grains is apparent. There is no B horizon of clay accumulation. In places the profile is relatively free of coarse fragments, but the content of quartzose pebbles ranges up to 20 percent in the solum and to more than 20 percent in the C2 horizon.

In cultivated areas, the plow layer is grayish brown

or dark grayish brown. In the C horizon, the hue is 10YR or 2.5Y, the value is 5 to 7, and the chroma is 4 to 8.

Evesboro soils are more sandy and more excessively drained than any other soils of Howard County. Evesboro soils grade into Rumford soils, which have a thin Bt horizon of clay accumulation at a depth of about 20 inches.

Evesboro loamy sand, 1 to 5 percent slopes (EvB).—The profile of this soil is the one described for the series.

This soil is suited to pasture, trees, and an occasional cultivated crop. Because of low fertility and seasonal droughtiness, the choice of plants is restricted. This soil blows readily and needs to be protected by hedges and other windbreaks. (Capability unit IVs–1; woodland suitability group 5)

Evesboro loamy sand, 5 to 15 percent slopes (EvC).—This soil is more droughty than Evesboro loamy sand, 1 to 5 percent slopes. It is not suited to cultivated crops or pasture, but it can be used for trees. (Capability unit VIIs–1; woodland suitability group 5)

Fairfax Series

The Fairfax series consists of deep, well-drained, gently sloping to moderately steep soils on uplands. These soils are located on the eastern part of the Piedmont Plateau, near the Coastal Plain. The upper part of the profile formed in silty sediments that were probably deposited by wind. The lower part formed in material that weathered in place from the underlying crystalline, micaceous rocks. The native vegetation consists mainly of oaks, hickories, and other upland hardwoods; Virginia pine has invaded some areas.

These soils have a surface layer of grayish-brown, friable loam or light silt loam, and a brown subsurface layer of the same texture. The upper part of the subsoil is brown light silty clay loam. The lower part is redder in color and contains some mica. Below the subsoil is highly micaceous, decomposed rock material. The depth to hard rock ordinarily is 5 feet or more.

Fairfax soils are suited to all uses. They are very acid. The available moisture capacity is high. The hazard of erosion is the main limitation.

Profile of Fairfax loam, in a gently sloping wooded area on Lark Brown Road, about 1 mile west of Route 175.

O1—1 to ¼ inch, thin litter of hardwood leaves.

O2—¼ inch to 0, thin mat of decomposed organic material.

A1—0 to 4 inches, grayish-brown (10YR 5/2) light loam; weak, fine, granular structure; friable when moist, slightly sticky when wet, but nonplastic; roots abundant; some fine, smooth pebbles; very strongly acid; clear, wavy boundary. 2 to 5 inches thick.

A2—4 to 10 inches, brown (10YR 5/3) very light silt loam; moderate, medium, granular structure to very weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; some fine, smooth gravel; very strongly acid; clear, smooth boundary. 3 to 8 inches thick.

B1—10 to 16 inches, strong-brown (7.5YR 5/6) light silty clay loam; weak to moderate, fine, blocky structure; firm when moist, sticky and slightly plastic when wet; roots common; some fine, smooth pebbles; common voids; extremely acid; gradual, smooth boundary. 3 to 6 inches thick.

B21t—16 to 25 inches, strong-brown (7.5YR 5/8) silty clay loam; moderate to strong, fine and medium, blocky structure; very firm when moist, sticky and plastic when wet; few roots; some fine, smooth pebbles; distinct, reddish-brown to yellowish-red (5YR 4/4 to 4/6) clay films and flows; common pores and voids; extremely acid; clear, smooth boundary. 6 to 12 inches thick.

IIB22t—25 to 35 inches, strong-brown (7.5YR 5/6) silty clay loam, variegated with yellowish red (5YR 5/8); strong, medium, blocky structure with some tendency toward platiness; very compact; very firm when moist, plastic and very sticky when wet; very few roots; prominent brown (7.5YR 5/4) clay films and flows; a few black specks; common, fine and medium, angular pebbles, mostly of quartzite; mica flakes common; extremely acid; abrupt, wavy to irregular boundary. 8 to 18 inches thick.

IIC—35 to 50 inches +, yellowish-red (5YR 5/6), micaceous saprolite of clay loam texture; massive; firm when moist, sticky and plastic when wet; very strongly acid to extremely acid.

The depth to the IIB22t horizon ranges from 16 to 28 inches, and the depth to the IIC horizon ranges from 24 to 45 inches. The depth to bedrock ranges from 4 to more than 6 feet. Above the IIB22t horizon, round pebbles can be found in places, but in the IIB22t and IIC horizons angular quartzite fragments are common.

The A horizon is loam that is high in silt. In cultivated areas, the plow layer generally is dark brown or dark grayish brown.

In the B21t horizon, the hue is 7.5YR or 10YR, the value 4 or 5, and the chroma 6, 8, or, in a few places, 4. The texture of the Bt horizon is heavy silt loam or silty clay loam; the clay content generally is less than 35 percent. In the IIB22t horizon, the hue is 7.5YR or 5YR, the value 5 or 6, and the chroma 6, 8, or, in minor variegations, 4.

In the IIC horizon, the hue generally is 5YR or redder. This layer is variegated in places.

Fairfax soils resemble Chester, Elsinboro, and Glenelg soils, all of which formed entirely in micaceous residuum, rather than partly in old sediments. The profile of Fairfax soils above the IIB22t horizon resembles the profile of Chillum soils, which formed entirely in sediments. In this county Fairfax soils are mapped only with Chillum soils.

Fallsington Series

The Fallsington series consists of poorly drained, dominantly gray soils that occupy flats or nearly level areas on uplands of the Coastal Plain. These soils formed in old deposits of sandy material. The native vegetation consists mostly of birch, holly, wetland oaks, and wetland maples, and includes scattered pond pines.

In cultivated areas, the plow layer generally is dark grayish brown in color. In uncultivated areas, these soils have a very thin surface layer of dark grayish-brown or very dark grayish-brown friable loam and a thicker subsurface layer of gray friable loam commonly mottled with brighter colors. The subsoil is light olive-gray or brownish-gray, fairly sticky sandy clay loam that is mottled in some places. Below the subsoil is loose sandy and gravelly material that extends to considerable depth.

Fallsington soils have a high available moisture capacity. They are extremely acid. The water table is high.

If drained, these soils are suited to corn, soybeans, truck crops, and hay crops. Undrained areas are suited to grazing or woodland. These soils are in a part of the county where rapid suburban expansion is taking place.

Profile of Fallsington loam in a nearly level, idle but recently cultivated area near Dorsey.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam; moderate, fine, granular structure; friable when moist, slightly sticky when wet, but nonplastic; roots plentiful; some fine specks of dusky red (10R 3/3); very strongly acid; clear, smooth boundary. 8 to 10 inches thick.

A2g—10 to 16 inches, gray (10YR 5/1) loam; few, medium, distinct mottles of yellowish brown (10YR 5/6); friable when moist, slightly sticky when wet, but nonplastic; few roots; very strongly to extremely acid; abrupt, wavy boundary. 4 to 9 inches thick.

B21tg—16 to 24 inches, light brownish-gray (2.5Y 6/2) sandy clay loam; few, medium, prominent mottles of yellowish brown (10YR 5/8); weak, fine to coarse, subangular blocky structure; friable to firm when moist, sticky and plastic when wet; few roots; old root channels filled with dark-gray silt and organic matter; extremely acid; clear, wavy boundary. 6 to 12 inches thick.

B22tg—24 to 35 inches, light olive-gray (5Y 6/2) sandy clay loam; moderate, coarse, blocky structure; friable to firm when moist, sticky and plastic when wet; very few roots; old root channels filled with dark-gray silt and organic matter; some very thin bands or strata of sand; no mottling; extremely acid; abrupt, smooth to wavy boundary. 10 to 14 inches thick.

IIC1g—35 to 44 inches, light-gray (2.5Y 7/2) sand; single grain; loose; no roots; no mottling; extremely acid; abrupt, smooth boundary. 8 to 10 inches thick.

IIC2—44 to 96 inches, variegated dark-brown, brownish-yellow, and yellow (10YR 3/3, 6/8, and 7/6) gravelly coarse sand; compact; many concretions; thin veins of incipient ironstone; extremely acid; abrupt, smooth boundary. 3 to 4 feet thick.

IIIC3—96 to 100 inches +, variegated red, yellow, brown, and white fine clay; massive; sticky and plastic; extremely acid.

The thickness of the solum ranges from about 24 to 38 inches. Fine quartz or chert pebbles constitute up to 20 percent of the solum and more than 20 percent of the unconforming C horizons. In some places there are no pebbles in the profile. The hue throughout the profile centers on 2.5Y but includes 10YR and 5Y. In the finest textured horizons the hue is neutral.

The texture of the A horizon is loam. The color has a value of 3 to 5 and a chroma of 1 to 3; the value and chroma are lowest in the A1 horizon.

The texture of the Bt horizon is sandy clay loam, heavy sandy loam, or heavy loam. In the B horizon the matrix color has a value of 4, 5, or 6 and a chroma of 0 to 2. Some parts of the B horizon have yellowish-brown or light olive-brown mottles.

The IIC horizon is coarser textured than the solum. Beneath the IIC1 horizon, the color varies. If there is a IIIC horizon, it is of unconforming texture.

Fallsington soils resemble Baile, Elkton, Kinkora, and Watchung soils, all of which are poorly drained and dominantly gray in color. Fallsington soils have a less silty solum than Baile soils, which contain mica. They are more friable and less slowly permeable than Elkton, Kinkora, and Watchung soils, which have a clayey subsoil. Closely associated with Fallsington soils are the well drained Sassafras soils and the moderately well drained Woodstown soils, all of which formed in the same kind of sediments.

Fallsington loam (Fa).—The profile of this soil is the one described for the series. Included in the areas mapped are a few gently sloping areas that are moderately eroded and some areas that have a more sandy surface layer.

This soil needs artificial drainage for any intensive use. If drained, it is suited to cultivated crops. Undrained areas are suited to pasture and water-tolerant trees. The erosion hazard is slight. (Capability unit IIIw–7; woodland suitability group 1)

Glenelg Series

The Glenelg series consists of deep, well-drained, nearly level to steep soils on the uplands of the Piedmont Plateau. These soils formed from material weathered in place from crystalline rocks that contain large amounts of mica, mostly mica schist. The native vegetation consists of mixed upland hardwoods, mainly oaks.

These soils have a surface layer of very dark gray loam and a subsurface layer of yellowish-brown loam. In cultivated areas, the plow layer is dark brown in color. The subsoil is a brown silty clay loam or heavy silt loam that generally is firm but becomes sticky and plastic when wet. Below the subsoil is highly micaceous, crumbly to almost loose, decomposed rock material. The depth to bedrock is more than 5 feet.

Glenelg soils are strongly acid. They have a high available moisture capacity. If well managed, they are highly productive. The hazard of erosion is the main limitation.

Profile of Glenelg loam, 0 to 3 percent slopes, in a wooded area on Carroll Mill Road.

O1—1 to ¼ inch, thin litter of leaves and twigs.

O2—¼ inch to 0, very thin mat of decomposed organic material.

A1—0 to 2 inches, very dark gray (10YR 3/1) loam; moderate, very fine, granular structure; loose to very friable when moist, slightly sticky when wet, but nonplastic; roots abundant; medium to strongly acid; abrupt, smooth to wavy boundary. 2 to 3 inches thick.

A2—2 to 8 inches, yellowish-brown (10YR 5/4) loam; moderate, medium, granular structure and very weak, coarse, blocky structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; medium to strongly acid; gradual, smooth boundary. 5 to 7 inches thick.

B21t—8 to 15 inches, yellowish-brown (10YR 5/8) heavy silt loam; weak, coarse, subangular blocky structure; friable to firm when moist, sticky and slightly plastic when wet; roots common; some faint clay films; many fine mica flakes; medium to strongly acid; gradual, smooth boundary. 5 to 9 inches thick.

B22t—15 to 25 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate to strong, coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; distinct, yellowish-red (5YR 5/6) clay films and flows; fine mica plentiful; some schist fragments; strongly acid; clear, wavy boundary. 7 to 16 inches thick.

C—25 to 60 inches +, yellowish-red (5YR 4/6) saprolite of loam or silt loam texture; friable; highly micaceous; structure inherited from the rock; slightly sticky and slightly plastic when wet; a few roots in upper part; strongly to very strongly acid.

The thickness of the solum ranges from about 18 to nearly 40 inches, and the depth to bedrock ranges from

about 4 to more than 10 feet. The content of gravel ranges up to 20 percent. In cultivated areas, the gravel generally is on or near the surface. Most of the gravel is angular fragments of hard, white quartzite. There are vertical injections of quartzite, 4 to 10 inches thick, at irregular intervals in undisturbed parts of the solum and in the C horizon.

In the A horizon, the hue centers on 10YR but ranges to include 7.5YR in some places. In the thin A1 horizon, the color has a value of 3 and a chroma of 1. The texture of the A horizon is loam that has a silt content of nearly 50 percent.

In the Bt horizon, the hue centers on 7.5YR but includes 10YR and 5YR. The value is 4 or 5, and the chroma 6 or 8. The texture of the Bt horizon ranges from heavy loam to silty clay loam; the average clay content is less than 35 percent. In some places, there is a thin, discontinuous B3 horizon that has weakly developed structure.

The C horizon is generally more than 3 feet thick, but it is thinner where the profile contains many coarse fragments. This horizon is micaceous. It is variegated in places, but it has no gray colors. It is more strongly acid than the solum.

Glenelg soils resemble Chester, Elsinboro, and Fairfax soils but are more micaceous than any of these. Glenelg soils generally are less red in color and less micaceous than the closely associated Manor soils. Glenelg soils have a subsoil of clay accumulation, but Manor soils do not.

Glenelg loam, 0 to 3 percent slopes (GlA).—The profile of this soil is the one described for the series. Included in the areas mapped are some areas that are somewhat gravelly and a few spots that are moderately eroded.

This soil is suited to cultivated crops, pasture, and trees. It has few limitations. (Capability unit I–4; woodland suitability group 30)

Glenelg loam, 3 to 8 percent slopes, moderately eroded (GlB2).—Except that part of the original surface soil has been removed by erosion, the profile of this soil is like the one described for the series. The surface layer is dark brown because the A1 and A2 horizons have been mixed by cultivation. Included in the areas mapped are some areas that have a somewhat gravelly surface layer and some spots where erosion has removed the surface layer and in places part of the subsoil.

The hazard of erosion is the main limitation. Erosion is not likely in wooded areas. (Capability unit IIe–4; woodland suitability group 30)

Glenelg loam, 8 to 15 percent slopes, moderately eroded (GlC2).—This soil has a thin, dark-brown surface layer. Included in the areas mapped are some gravelly areas.

Most of this soil is still in woodland or has been well managed and protected under cultivation. It is suited to cultivated crops, pasture, and trees. The hazard of erosion is the main limitation. (Capability unit IIIe–4; woodland suitability group 30)

Glenelg loam, 8 to 15 percent slopes, severely eroded (GlC3).—This soil has a yellowish-brown surface layer that is a mixture of the original A and B horizons. Included in the areas mapped are a few somewhat gravelly areas.

This soil is suited to pasture, trees, and an occasional cultivated crop. The hazard of erosion is the main limitation. In many places, this soil is associated with less severely eroded soils or with gently sloping soils. Often it is farmed too intensively with these associated soils. (Capability unit IVe-3; woodland suitability group 30)

Glenelg loam, 15 to 25 percent slopes, moderately eroded (GlD2).—This soil has a thin surface layer. Included in the areas mapped are some areas that have a gravelly surface layer.

This soil is suited to pasture, trees, and an occasional cultivated crop. Most areas are still in woodland or other protective cover. The hazard of erosion is the main limitation. Unprotected areas should be planted to trees and sod crops. (Capability unit IVe–3; woodland suitability group 31)

Glenelg loam, 15 to 25 percent slopes, severely eroded (GlD3).—Included in the areas mapped as this soil are a few gravelly spots.

This soil is unsuitable for cultivated crops. It is suited to hay, pasture, and woodland. Some areas can be used for sodded orchards. Otherwise, this soil should be replanted to trees, and a close-growing ground cover should be maintained until the trees are well enough established to protect the soil adequately. (Capability unit VIe-2; woodland suitability group 31)

Glenville Series

The Glenville series consists of moderately well drained, very strongly acid to extremely acid soils that have a fragipan. These soils are on the Piedmont Plateau. They occur on flats, in depressions, at the foot of slopes, and around the heads of drains. They formed mostly in material that weathered in place from underlying micaceous rocks; in some places they formed partly in alluvium. The native vegetation consists of water-tolerant hardwoods.

These soils have a thin surface layer of dark grayish-brown, friable but sticky silt loam and a somewhat thicker subsurface layer of light yellowish-brown, friable but sticky silt loam. In cultivated areas, the plow layer generally is grayish brown or brown. The upper part of the subsoil is yellowish-brown, sticky silty clay loam. The lower part, which is the fragipan, is yellowish-brown, sticky, platy silty clay loam mottled with gray. Below the pan is friable, micaceous, decomposed rock material. The depth to bedrock generally is more than 5 feet.

Glenville soils are only moderately productive. The fragipan impedes drainage, limits the available moisture capacity, and restricts root development.

Profile of Glenville silt loam, 0 to 3 percent slopes, in an oak and maple forest on Owen Brown Road.

O1—1½ inches to 0, litter of hardwood leaves.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; gradual, smooth boundary. 1 to 4 inches thick.

A2—3 to 9 inches, light yellowish-brown (10YR 6/4) silt loam; weak, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; very strongly acid; clear, smooth boundary. 3 to 8 inches thick.

B2t—9 to 17 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky and slightly plastic when wet; roots plentiful; some faint clay films;

very strongly acid; gradual, smooth boundary. 6 to 9 inches thick.

Bx1—17 to 26 inches, light yellowish-brown (10YR 6/4) light silty clay loam; common, fine and medium, faint mottles of grayish brown (10YR 5/2), increasing in size with depth; strong, medium, platy structure and moderate, medium, blocky structure; very firm and very brittle when moist, sticky and plastic when wet; few roots; thick, prominent, yellowish-brown (10YR 5/6) clay films and flows; mica evident; very strongly acid; gradual, wavy boundary. 8 to 18 inches thick.

Bx2—26 to 37 inches, yellowish-brown (10YR 5/6) light silty clay loam; abundant, medium and coarse, distinct mottles of grayish brown (10YR 5/2) and coarse, faint mottles of light yellowish brown (10YR 6/4); moderate, thin and medium, platy structure with some angular blocks; firm to very firm when moist, sticky and plastic when wet; practically no roots; a few, thick, yellowish-brown (10YR 5/4) clay films and flows; mica flakes common; very strongly acid to extremely acid; abrupt, wavy boundary. 8 to 12 inches thick.

C—37 to 50 inches +, pale-olive (5Y 6/3), highly micaceous saprolite of loam or silt loam texture; blotched and streaked with strong brown (7.5YR 5/6); very friable; very strongly acid to extremely acid.

The thickness of the solum ranges from about 24 inches to 50 inches, and the depth to bedrock ranges from about 4 feet to 10 feet. In places there is some gravel. Gravel on or near the surface commonly is colluvial.

The hue generally is 10YR throughout the solum, but in some places the hue of the A2 horizon is 2.5Y and in others that of the B horizon is 7.5YR. In the A1 horizon, the value is 3 or 4 and the chroma is 1 or 2. If there is an Ap horizon, it has a value of 4 or 5 and a chroma of 2 to 4. In the A2 horizon, the value is 4 to 6 and the chroma is 3 or 4. In the B2t horizon, the value is 4 to 6 and the chroma is 6 or 8. The color of the C horizon varies.

In the A horizon, the content of silt generally is between 50 and 60 percent. The texture of the B2t horizon generally is light silty clay loam, but it includes heavy loam, heavy silt loam, clay loam that tends to be silty, and silty clay loam. The clay content of this horizon is generally between 25 and 35 percent. The Bx horizon has about the same range in texture as the B2t, but in this horizon the clay content decreases with depth. Clay films and flows generally are more prominent in the Bx horizon than in the B2t, but more widely spaced.

In places the C horizon contains fragments of schist and quartzite. This horizon is commonly more acid than the solum.

Glenville soils resemble Aldino, Beltsville, and Leonardtown soils in having a fragipan. Glenville soils are more strongly acid and more micaceous than Aldino soils. They have a less strongly developed fragipan than Beltsville soils, which do not contain mica. Glenville soils formed in residuum, but Beltsville soils and the poorly drained Leonardtown soils formed in very thick deposits of old sediments. Glenville soils formed in the same kind of material as Baile soils, which are poorly drained.

Glenville silt loam, 0 to 3 percent slopes (GnA).—The profile of this soil is the one described as representative of the series.

The main limitations are impeded drainage and seasonal wetness. Drainage is needed for most crops. The choice of crops is limited because the fragipan restricts the root zone. Erosion is not a serious hazard. In some places, however, there is some surface washing, because water penetrates slowly, especially if the soil is already wet. (Capability unit IIw–8; woodland suitability group 12)

Figure 3.—**Head of a gully in an area of Glenville silt loam, 8 to 15 percent slopes, moderately eroded. Runoff frequently forms gullies in some unprotected places.**

Glenville silt loam, 3 to 8 percent slopes, moderately eroded (GnB2).—Included in the areas mapped as this soil are a few acres that are severely eroded.

This soil is suited to cultivated crops, pasture, and trees. The hazard of erosion is the most serious limitation. In some places, drainage is needed for some crops. (Capability unit IIe–13; woodland suitability group 12)

Glenville silt loam, 8 to 15 percent slopes, moderately eroded (GnC2).—Included in the areas mapped as this soil are a few spots that are severely eroded and some that have slopes of more than 15 percent.

Most of this soil is still in woodland or is protected by sod crops. The hazard of erosion is the main limitation. Runoff can cause severe damage (fig. 3). Diversions or ditches that intercept runoff are needed in some places. Drainage generally is not needed. (Capability unit IIIe–13; woodland suitability group 16)

Gravel Pits and Quarries

Gravel pits and quarries (Gp) are areas from which sand, gravel, rock, or other material has been removed for use in highway construction or other building. These areas are no longer of any use for farming. Some could be revegetated if filled and graded and, in some cases, provided with drainage outlets. Even then, they would be suitable only for wildlife or for recreational uses. Some ponds could be created. (Capability unit VIIIs–4; woodland suitability group 21)

Hatboro Series

The Hatboro series consists of poorly drained, very acid soils on the flood plains of streams. These soils are mostly in the Piedmont Plateau but extend along major

streams onto the Coastal Plain. The native vegetation consists mostly of wetland oak but includes sweetgum, holly, maple, and some pond pine.

These soils have a thick surface layer of dark grayish-brown silt loam that has red specks or mottles in places. Below this is light-gray silt loam that is highly mottled and has much gravel in the lower part. The substratum is finer textured but gravelly. Mica flakes are common in the profile.

Hatboro soils ordinarily have a high water table, and they are subject to flooding at irregular intervals. Drainage is needed for most crops.

Profile of Hatboro silt loam in a level pasture just south of Centennial Lane.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; a few reddish-brown specks; moderate, fine to medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; clear, smooth boundary. 9 to 12 inches thick.

B1g—10 to 19 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, prominent mottles of red (2.5YR 4/6); weak, coarse, granular structure to very weak, fine, subangular blocky structure; friable to somewhat firm when moist, sticky and slightly plastic when wet; roots common; strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B21g—19 to 27 inches, light-gray (5Y 6/1), somewhat gritty silt loam; abundant, medium, prominent mottles of strong brown (7.5YR 5/8); massive, or very weak, coarse, blocky structure; compact; firm when moist, slightly sticky and slightly plastic when wet; few roots; some waterworn gravel; strongly acid; clear, smooth boundary. 8 to 10 inches thick.

B22g—27 to 45 inches, light-gray (5Y 6/1) silt loam; abundant, coarse, prominent mottles of strong brown (7.5YR 5/6); massive; evidence of stratification; friable to somewhat firm when moist, slightly sticky and slightly plastic when wet; no roots; common waterworn gravel and abundant mica flakes; strongly acid; abrupt, smooth boundary; 16 to 20 inches thick.

IICg—45 to 54 inches +, gray (N 6/0) gravelly clay loam; abundant, medium and coarse, prominent mottles of yellowish brown (10YR 5/8); massive; stratified; very firm when moist, plastic and very sticky when wet; strongly acid to very strongly acid.

The thickness of the solum ranges from about 24 to nearly 50 inches, and the depth to bedrock generally ranges from 6 to more than 20 feet. The A1 horizon is less than 6 inches thick. Waterworn pebbles can be found anywhere in the profile, but they generally are not abundant except in the IICg horizon. Differences in texture between horizons are the result of sedimentation and stratification, not of clay accumulation by illuviation. The clay content of the control section ranges from 18 to 35 percent but generally is no more than 25 percent.

The hue generally is more yellow in the lower horizons than in the upper horizons and approaches neutral with increasing depth. In some undisturbed areas, the A1 horizon is dark gray or black. The color of the Ap horizon has a value of 4 or, rarely, 5, and a chroma of 1 to 3. That of the B horizon has a value of 4 to 7 and a chroma of 0 to 2. The mottles in the B horizon are redder in hue than in the matrix, and they have a value of 4 or 5 and a chroma of 4 to 8.

The C horizon is unconforming and generally is finer textured than the solum and at least as strongly acid.

Hatboro soils are similar in color to Baile soils, which have well-developed horizons of clay accumulation. They are closely associated with the well drained Comus soils and the moderately well drained Codorus soils.

Hatboro silt loam (Ha).—The profile of this soil is the one described for the series. This nearly level soil has poor surface and internal drainage. It is subject to overflow (fig. 4). A few spots have slopes of more than 2 percent.

If drained, this soil is suited to farming. Uncleared areas support good stands of hardwoods, including red maple, holly, gum, birch, and wetland oak. (Capability unit IIIw–7; woodland suitability group 2)

Iuka Series

The Iuka series consists of moderately well drained, strongly acid to extremely acid soils. These soils are on the Coastal Plain and are located in upland depressions, at the foot of slopes, and along intermittent drainageways that lack channels. They formed in local alluvium or colluvium and have weakly defined horizons. The native vegetation consists of mixed hardwoods, mainly willow oak and other water-tolerant trees.

In cultivated areas, these soils have a plow layer of dark grayish-brown loam. Below this is yellowish-brown, crumbly, slightly sticky loam. The subsoil is pale brown and has gray or light-gray mottles. The substratum ranges from clayey to sandy in texture and generally is gravelly and mottled.

Iuka soils have a seasonally high water table. Drainage is needed for most crops, and planting sometimes has to be delayed.

Profile of Iuka loam, local alluvium, 1 to 5 percent slopes, in a cultivated area about 2 miles south of Waterloo.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable when moist, slightly sticky when wet, but nonplastic; roots abundant; distinctly gritty; some fine, smooth gravel; very strongly acid; abrupt, smooth boundary. 8 to 11 inches thick.

B1—10 to 20 inches, yellowish-brown (10YR 5/4) loam; weak, medium to coarse, granular structure; friable when moist, slightly sticky and slightly plastic when wet;

Figure 4.—**An area of Hatboro silt loam on the flood plain of the Little Patuxent River. This flood followed a brief period of intensive rainfall.**

roots common; some fine smooth gravel; strongly acid to very strongly acid; clear, smooth boundary. 10 to 14 inches thick.

B2—20 to 29 inches, pale-brown (10YR 6/3) loam; common, medium, distinct mottles of gray or light gray (5Y 6/1); very weak, medium, granular structure; friable to somewhat firm when moist, slightly sticky and slightly plastic when wet; few roots; common, fine, smooth gravel; strongly acid; abrupt, smooth boundary. 7 to 13 inches thick.

IIC—29 to 50 inches +, yellowish-brown (10YR 5/4 to 5/6) gravelly light sandy loam; common, medium, prominent mottles of light olive gray (5Y 6/2); single grain; loose; no roots; gravel round to subangular, and coarser than that in solum; some thin lenses of clayey material; extremely acid.

The thickness of the solum ranges from about 25 to 40 inches. Gravel is more abundant in the substratum than in the solum.

The color of the A horizon has a value of 3 to 6 and a chroma of 1 to 4. The value and chroma are lowest in undisturbed areas where the A1 horizon is less than 6 inches thick. The matrix color of the B horizon has a value of 4 to 6 and a chroma of 3 to 6. The hue of the mottles is 10YR or yellower, the value is 3 to 6, and the chroma 0 to 3. The C horizon varies in color and commonly is mottled.

The texture of the IIC horizon is abruptly different from that of the solum. This horizon generally is more acid than the solum.

Iuka soils resemble Codorus soils but lack the finely divided mica that is characteristic of Codorus soils.

Iuka loam, local alluvium, 1 to 5 percent slopes (IuB).—The profile of this soil is the one described for the series. Included in the areas mapped are a few small areas that have slopes of slightly more than 5 percent.

This soil is well suited to most crops except herbaceous perennials. Internal drainage and aeration are restricted. Runoff is fairly rapid, and the erosion hazard is the most serious limitation. (Capability unit IIe-16; woodland suitability group 4)

Kelly Series

The Kelly series consists of somewhat poorly drained to moderately well drained, strongly acid to very strongly acid soils that are located on the uplands of the Piedmont Plateau. These soils formed in clay that weathered in place from underlying rocks. The underlying rocks generally are dark colored, very fine grained, nonacid, and very hard. Diabase is one of the more common rocks. The native vegetation consists of mixed hardwoods, mainly white oaks; Virginia pine has invaded in some areas.

These soils have a thin surface layer of sticky, dark olive-gray silt loam and a slightly thicker subsurface layer of sticky, olive-gray silt loam. The subsoil is dark yellowish-brown to brown or dark-brown, very fine clay that is extremely sticky and plastic when wet and very hard when dry. It has mottles of gray and other colors below a depth of 12 inches. Below the subsoil is massive, mottled, olive-gray clay that directly overlies hard rock at a depth of about 36 inches. Gravel is abundant in some places, and some areas are very stony. These soils become less acid with increasing depth and are almost neutral just above bedrock.

Kelly soils have a high available moisture capacity. They are limited by impeded drainage, a restricted root zone, the hazard of erosion, and stoniness in some places. These soils are unsuitable for deep-rooted crops and for crops that require good drainage and soil aeration.

Profile of a gently sloping Kelly silt loam in a white oak forest, about 550 feet east of U.S. Highway No. 29 and 1,000 feet south of Route 144.

O1—1 inch to 0, litter of leaves, mostly of white oak.

A1—0 to 2 inches, dark olive-gray (5Y 3/2) silt loam; weak, fine, granular structure; friable when moist, moderately sticky and slightly plastic when wet; roots abundant; some small gabbro fragments; strongly to very strongly acid; clear, smooth boundary. 2 to 3 inches thick.

A2—2 to 7 inches, olive-gray (5Y 4/2) silt loam; weak, thin, platy structure and fine, granular structure; friable when moist, moderately sticky and moderately plastic when wet; roots common; a few small iron concretions and gabbro fragments; very strongly acid; abrupt, smooth boundary. 4 to 7 inches thick.

B21t—7 to 12 inches, yellowish-brown (10YR 5/4) silty clay; moderate, medium, blocky structure; very firm when moist, sticky and plastic when wet; roots common; some olive-gray (5Y 4/2) coatings of silt or clay; very strongly acid; gradual, smooth boundary. 5 to 8 inches thick.

B22t—12 to 22 inches, dark yellowish-brown (10YR 4/4) clay; common, fine and medium, distinct mottles of light brownish gray (10YR 6/2 and 2.5Y 6/2); strong, medium, blocky structure; extremely firm when moist, extremely sticky and very plastic when wet; very few roots; prominent grayish-brown (10YR 5/2) clay films and flows; some tendency toward platiness in lower part; many fine iron concretions; some fragments of gabbro and quartzite; very strongly acid; gradual, smooth boundary. 9 to 13 inches thick.

B23t—22 to 29 inches, brown (10YR 4/3) clay; abundant, medium and coarse, prominent mottles of olive yellow (2.5Y 6/8) and dark olive gray (5Y 3/2); moderate, fine to medium, blocky structure with tendency toward platiness; very firm when moist, very sticky and very plastic when wet; no roots; many concretions; some distinct, gray (5Y 5/1) clay films and flows; medium acid; gradual, smooth boundary. 5 to 8 inches thick.

Cg—29 to 36 inches, olive-gray (5Y 4/2) fine silty clay to clay; common, coarse, prominent mottles of brown (10YR 5/3); massive, or very weak blocky structure in upper part; very firm when moist, plastic and very sticky when wet; no roots; many fine concretions; a few thin, grayish-brown (2.5Y 5/2) clay flows in extreme upper part; slightly acid to neutral; abrupt, wavy boundary. 6 to 14 inches thick.

R—36 inches +, bedrock of hard gabbro.

The thickness of the solum ranges from about 26 to 45 inches. The depth to bedrock generally ranges from 40 to 60 inches, but in some places in Howard County the depth is less than 40 inches. Coarse fragments, generally of diabase, gabbro, or quartzite, constitute about 3 to 10 percent of the solum. Fine iron concretions are common throughout the profile.

The matrix hue of all horizons is 10YR or yellower. In the A1 horizon, the value is 3 or 4 and the chroma 1 or 2. In the A2 horizon, the value is 4 or 5 and the chroma 2 or 3. The mottles and the Bt horizon are of the same hue as the matrix, but the value is 4 to 6. A high chroma is common but in places the chroma is 2 or less.

The clay content of the Bt horizon is generally between 45 and 60 percent. The C horizon is less acid than the solum.

Kelly soils formed from the same general kind of material as Relay and Watchung soils. They are less well drained and have finer textured subsoil than Relay soils. Watchung soils are poorly drained and dominantly gray.

Kelly silt loam, 3 to 8 percent slopes, moderately eroded (KeB2).—The profile of this soil is the one described for the series. Included in the areas mapped are some gravelly spots and a few areas that are severely eroded.

This soil is suited to pasture, trees, and an occasional cultivated crop. Wetness is the main limitation. Artificial drainage is needed if crops are to be grown. Protection against further erosion is needed also. (Capability unit IVw–3; woodland suitability group 33)

Kelly silt loam, 8 to 15 percent slopes, moderately eroded (KeC2).—Included in the areas mapped as this soil are some gravelly spots and some severely eroded spots.

This soil is suited to pasture, trees, and an occasional cultivated crop. Wetness is the main limitation. Artificial drainage is needed if crops are to be grown. Protection against further erosion is needed also. (Capability unit IVw–3; woodland suitability group 33)

Kelly clay loam, 15 to 30 percent slopes, severely eroded (KcE3).—Nearly all of the original surface layer of this soil has been lost through erosion. The subsoil contains more clay than silt. It is sticky and, therefore, is difficult to work and manage. Included in the areas mapped are some gravelly spots.

Because of the hazard of erosion, this soil is not suited to cultivated crops. It can be used to a limited extent for growing hay, and well-sodded areas can be used for grazing. This soil needs to be revegetated for control of erosion. It is suited to wildlife and woodland. (Capability unit VIIe–2; woodland suitability group 34)

Keyport Series

The Keyport series consists of deep, moderately well drained, strongly acid to extremely acid soils that have a moderately fine textured to fine textured subsoil. These soils are located on the uplands of the Coastal Plain. They formed in old deposits of clay or silty clay. The native vegetation is mixed water-tolerant hardwoods, mainly oaks and hickories.

These soils have a very thin surface layer of very dark grayish-brown silt loam and a somewhat thicker subsurface layer of brown silt loam. Both layers are crumbly but slightly sticky. The upper part of the subsoil is sticky and plastic, yellowish-brown clay loam or silty clay loam. The lower part is very plastic and very sticky, gray clay mottled with strong brown. Water and roots penetrate this layer, but slowly. In places, the lower part of the subsoil is slightly pink in color. Below the subsoil is massive, compact clay or sandy clay.

Keyport soils have a high available moisture capacity. They are moderately productive but are limited by impeded drainage and the hazard of erosion. They are unsuitable for alfalfa and other deep-rooted perennials.

Profile of a gently sloping Keyport silt loam in a wooded area just southeast of the intersection of U.S. Highway No. 1 and Route 32.

O1—2 inches to 0, litter of leaves, mostly from oaks.

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; strongly acid; clear, smooth boundary. ½ inch to 2 inches thick.

A2—1 inch to 7 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; some fine, smooth gravel; strongly acid; gradual, smooth boundary. 5 to 7 inches thick.

B21t—7 to 18 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, fine to coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; roots fairly common; distinct but not prominent clay films; strongly acid; clear, wavy boundary. 9 to 12 inches thick.

B22tg—18 to 37 inches, gray (10YR 6/1) clay; common, medium, prominent mottles of strong brown (7.5YR 5/8); moderate, coarse, blocky structure; firm when moist, very sticky and very plastic when wet; few roots; some pale-red (2.5YR 6/2) clay coats and flows; very strongly acid to extremely acid; diffuse boundary. 15 to 25 inches thick.

B23tg—37 to 44 inches, pinkish-gray (5YR 7/2) clay or heavy clay loam; abundant, medium and coarse, prominent mottles of strong brown (7.5YR 5/6); moderate to strong, medium to coarse, blocky structure; extremely firm when moist, very sticky and very plastic when wet; no roots; prominent, light reddish-brown (5YR 6/4) clay films and flows; some very thin strata of fine sand; extremely acid; abrupt, smooth boundary. 0 to 12 inches thick.

IIC—44 to 54 inches +, light-gray (5Y 7/2) very sandy clay; massive; compact; extremely firm when moist, sticky and plastic when wet; no roots; extremely acid.

The thickness of the solum ranges from about 36 to more than 50 inches. Throughout the solum, the hue generally is 10YR or yellower, but there are some spots that have a hue redder than is normal for the series.

In the A horizon, the color ranges in value from 3 to 6 and in chroma from 1 to 4. The value and chroma generally are lowest in the A1 horizon.

The texture of the Bt horizon generally is clay but in places is heavy clay loam, heavy silty clay loam, or silty clay. The clay content ranges from about 35 to more than 50 percent. In the B21t horizon, the color has a chroma of at least 6, except in the gleyed parts, where the chroma is 1 or 2.

Some profiles lack a B23tg horizon. In places, there is a B22t horizon instead of a B22tg. The B22t horizon is yellowish brown and has low-chroma mottles.

Some profiles have a C horizon instead of a IIC horizon.

Keyport soils resemble Delanco and Woodstown soils in color and drainage but are unlike those soils in having a fine clay subsoil. Keyport soils formed in the same kind of material as Elkton soils, which are dominantly gray and poorly drained.

Keyport silt loam, 3 to 10 percent slopes, moderately eroded (KhC2).—The profile of this soil is like the one described for the series. Included in the areas mapped are a few spots that have a somewhat sandy surface layer and some that are severely eroded.

This soil is suited to cultivated crops, pasture, and trees. Drainage is needed for some crops. Tightness and wetness of the lower subsoil limit the growth of other plants. Some areas are still in woodland. The hazard of erosion is the most serious limitation (Capability unit IIIe–13; woodland suitability group 9)

Kinkora Series

The Kinkora series consists of poorly drained, dominantly gray, strongly acid soils that are located on level to gently sloping terraces along some of the major streams of the Piedmont Plateau. These soils formed in old alluvium that contained much fine mica. The native vegetation is mainly water-tolerant oaks and other wetland hardwoods, and there are some maples, birches, and sweetgums.

These soils have sticky and plastic surface and subsurface layers of dark grayish-brown or very dark grayish-brown silt loam. The subsoil is sticky and plastic, grayish-brown or light olive-gray clay or silty clay that has many brown or red mottles. Water moves very slowly through this layer. Below the subsoil is mottled gray clay that is gravelly in some places.

Kinkora soils have a high available moisture capacity. Because of wetness, they generally are not cultivated. If drained, they are suited to improved pasture. Undrained areas generally remain in woodland.

Profile of Kinkora silt loam in an idle area opposite Turf Valley golf course on U.S. Highway No. 40.

Ap1—0 to 4 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant; neutral (limed); abrupt, smooth boundary. This layer is 3 to 5 inches thick and is a recent overwash deposit.

Ap2—4 to 12 inches, dark grayish-brown (2.5Y 4/2) heavy silt loam; common, fine, prominent mottles of dark reddish brown (2.5YR 3/4); weak, fine to medium, granular structure; friable when moist, sticky and moderately plastic when wet; roots common; a tendency toward thin platiness; a former plow layer that has been covered by overwash material; slightly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B21tg—12 to 20 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, blocky structure; very firm when moist, plastic and very sticky when wet; few roots; some fine waterworn gravel; mica flakes common; very dark grayish-brown (2.5Y 3/2) clay films; medium acid; gradual, smooth boundary. 8 to 10 inches thick.

B22tg—20 to 34 inches, light olive-gray (5Y 6/2) clay; common, medium to coarse, prominent mottles of red (2.5YR 4/8) and strong brown (7.5YR 5/8) and common, medium, faint mottles of olive (5Y 5/3); strong, medium, blocky structure; extremely firm when moist, very sticky and very plastic when wet; very few roots; some waterworn gravel; mica flakes common; prominent, grayish-brown (2.5Y 5/2) clay films and flows; strongly acid; gradual, smooth boundary. 11 to 16 inches thick.

C1g—34 to 50 inches, gray (N 6/0) clay; abundant, medium and coarse, prominent mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8); massive; firm when moist, very sticky and very plastic when wet; no roots; common waterworn gravel and many mica flakes; strongly acid; abrupt, smooth boundary. 14 to 19 inches thick.

IIC2g—50 to 60 inches +, gray (N 5/0) gravelly silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/8); massive; very firm when moist, sticky and plastic when wet; no roots; strongly acid.

The thickness of the solum ranges from about 24 to 50 inches, and the depth to bedrock ranges from 5 to more than 20 feet. Waterworn pebbles and cobblestones occur at various levels in the profile but commonly are most abundant in the C and IIC horizons. In all horizons, the matrix hue ranges from 10YR to 5Y and N.

In wooded areas, the A1 horizon is dark gray or very dark gray and generally is less than 6 inches thick; the A2 horizon is gray and generally mottled. The matrix color generally has a value of 4 or 5 in the A2 and Ap horizons, and a chroma of 0 to 2 in all parts of the A horizon.

In the Bt horizon, the matrix color has a chroma of 1 or 2 or, rarely, 0. The mottles generally have a hue of 10YR or 7.5YR, but in places the hue is redder than 7.5YR; the value is generally 4 to 6 and the chroma 4 to 8. In some profiles, there is very little mottling of the B horizon. The texture of the Bt horizon is clay, silty clay, heavy clay loam, or silty clay loam. The clay content is 35 to 60 percent.

The texture of the C horizon generally is coarser than that of the Bt horizons, and that of the IIC horizons is even coarser than the C horizons. Both the C and IIC horizons are commonly neutral in hue. Mottling occurs in some places. The C and IIC horizons are moderately to highly micaceous, gravelly or cobbly in places, and stratified.

Kinkora soils resemble Baile, Elkton, Fallsington, and Watchung soils, all of which are poorly drained, dominantly gray soils. Kinkora soils have a less silty Bt horizon than Baile soils and a less sandy Bt horizon than Fallsington soils. Kinkora soils contain mica, but Elkton soils do not. They formed from different materials, are less acid, and are more fertile than Elkton soils. Kinkora soils are more strongly acid than Watchung soils.

Kinkora silt loam (Kn).—The profile of this soil is the one described for the series. Most areas of this soil are nearly level, but there are a few small areas that have slopes of more than 3 percent.

This soil is well suited to grazing, but during wet periods, grazing should be limited to prevent puddling and compacting of soil. If well managed, this soil produces excellent pastures. It generally is not used for crops, because drainage is difficult and expensive, and the sticky plow layer is difficult to work except within a narrow range of moisture content. (Capability unit Vw–1; woodland suitability group 1)

Legore Series

The Legore series consists of deep, well-drained, gently sloping to sloping soils on the uplands of the Piedmont Plateau. These soils formed in material that weathered in place from very hard, dark-colored, nonacid rocks, mainly diabase and diorite. The native vegetation is mixed hardwoods, mainly oaks.

These soils have a thin to moderately thick surface layer of granular to somewhat sticky, very dark brown or dark grayish-brown silt loam. In cultivated areas, the plow layer generally is dark brown. The subsoil is sticky and plastic, brown to reddish-brown clay loam. Beneath the subsoil is yellowish, very friable to loose, decomposed rock material. The depth to bedrock is ordinarily more than 5 feet.

Legore soils have a high available moisture capacity and are medium acid. If well managed, they are highly productive. The hazard of erosion is the main limitation.

Profile of Legore silt loam, 3 to 8 percent slopes, in a cultivated area about 1,200 feet northeast of the entrance to Trinity School.

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; moderate, fine to medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; slightly acid; clear, smooth boundary. 8 to 10 inches thick.

B21t—9 to 20 inches, reddish-brown (5YR 5/4) light clay loam; strong, fine, blocky structure; very firm when moist, sticky and plastic when wet; roots fairly common; some diabase and quartzite fragments; prominent, reddish-brown (5YR 4/4) clay films; medium acid; gradual, smooth boundary. 8 to 12 inches thick.

B22t—20 to 28 inches, brown to strong-brown (7.5YR 5/4 to 5/6) clay loam that is high in silt; weak to moderate, fine, blocky and subangular blocky structure; very firm when moist, plastic and very sticky when wet; very few roots; some hard quartzite and diabase fragments; prominent, brown (7.5YR 5/4) clay films and flows; medium acid; abrupt, wavy boundary. 5 to 12 inches thick.

C1—28 to 42 inches, brownish-yellow (10YR 6/6) diabase saprolite of loam texture; very friable when moist, slightly sticky and slightly plastic when wet; very few roots; a few mica flakes and some rock fragments; slightly acid; clear, wavy boundary. 10 to 17 inches thick.

C2—42 to 60 inches, light yellowish-brown (10YR 6/4) saprolite of fine sandy loam texture; loose; no roots; some mica flakes and abundant rock fragments; slightly acid; abrupt, irregular boundary. 15 to more than 30 inches thick.

R—60 inches +, hard, unweathered diabase.

The thickness of the solum ranges from about 20 to 34 inches, and the depth to bedrock is ordinarily between 5 and 10 feet. In places the profile contains coarse fragments that range from pebbles to boulders in size. There are no colors in the profile that are indicative of wetness.

The texture of the A horizon ordinarily is silt loam, but in severely eroded areas the plow layer has a finer texture. In the A horizon, the color has a value of 3 or 4 and a chroma of 2 to 4; a value of 3 generally occurs only where the A1 horizon is less than 6 inches thick.

The texture of the Bt horizon is clay loam or silty clay loam. The content of clay is between 27 and 35 percent. The color of the Bt horizon has a value of 4 or 5 and generally a chroma of 4 but in some places a chroma of 3 or 6.

The texture of the C horizon is coarser than that of the Bt horizon. In many places the C horizon is faintly variegated.

Legore soils resemble Montalto, Neshaminy, and Relay soils. They have a coarser textured Bt horizon than Montalto soils. They are generally less acid than Neshaminy soils. They have a brown to reddish-brown Bt horizon, and the Relay soils an olive or olive-brown Bt horizon.

Legore silt loam, 3 to 8 percent slopes, moderately eroded (LeB2).—The profile of this soil is the one described for the series. Included in the areas mapped are some gravelly areas, some spots that are severely eroded, and some places where the depth to bedrock is about 24 inches.

This soil is suited to cultivated crops, pasture, and trees. The hazard of erosion is the main limitation. (Capability unit IIe–10; woodland suitability group 40)

Legore silt loam, 8 to 15 percent slopes, moderately eroded (LeC2).—Included in the areas mapped as this soil are a few gravelly areas. This soil is suited to cultivated crops, pasture, and trees. Most of the acreage is still in woodland. The hazard of erosion is the main limitation. (Capability unit IIIe–10; woodland suitability group 40)

Legore silty clay loam, 8 to 15 percent slopes, severely eroded (LgC3).—The original surface layer of this soil has been lost through erosion. Either the subsoil or a sticky, clayey plow layer is exposed. Included in the areas mapped are a few gravelly areas.

This soil is suited to pasture, trees, and an occasional cultivated crop. The hazard of erosion is severe. (Capability unit IVe–10; woodland suitability group 40)

Leonardtown Series

The Leonardtown series consists of poorly drained, extremely acid, level to very gently sloping soils that have a fragipan. These soils are on Coastal Plain uplands that lack channeled drainageways. They formed in silty wind-deposited material underlain at a considerable depth by other kinds of material. The native vegetation consists of wetland hardwoods, including sweetgum and maple.

These soils have a surface layer of dark grayish-brown, friable to firm silt loam and a thicker subsurface layer of grayish-brown, friable to firm silt loam. The upper part of the subsoil is olive-gray, very firm light silty clay loam. The lower part is the fragipan; it consists of gray silty clay loam mottled with brown and is very firm, dense, and compact. Below the pan is firm, grayish-brown, mottled silt loam that contains some smooth gravel. This generally is underlain at some depth by sandy or gravelly material.

Leonardtown soils have a moderate available moisture capacity. They generally are low in natural fertility, but if well managed they are moderately productive. The fragipan impedes drainage and limits the root zone. A perched water table is likely to form above the fragipan. Crops that are deep rooted and those that require good drainage and aeration are not suitable. These soils are in a part of the county where residential and commercial development is taking place.

Profile of Leonardtown silt loam in a cultivated area about 1 mile northeast of Glenmar.

Ap—0 to 8 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, very thin, platy structure and moderate, fine, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant; a little fine, smooth gravel; very strongly acid; clear to abrupt, smooth boundary. 7 to 9 inches thick.

A2—8 to 13 inches, grayish-brown (2.5Y 5/2) silt loam; some faint streaks of dark gray (5Y 4/1); weak, thin, platy structure; friable to firm when moist, sticky and slightly plastic when wet; roots fairly common; extremely acid; abrupt, smooth boundary. 3 to 6 inches thick.

B2tg—13 to 18 inches, olive-gray (5Y 4/2) light silty clay loam; strong, thin to medium, platy structure; very firm when moist, sticky and plastic when wet; few roots; some thin clay films; some fine, smooth gravel;

extremely acid; abrupt, smooth boundary. 6 to 8 inches thick.

Bx—18 to 34 inches, gray (5Y 5/1) silty clay loam; common, medium, distinct mottles of light olive brown (2.5Y 5/4); very strong, medium and thick, platy structure; extremely firm when moist, sticky and plastic when wet; no roots; some fine, smooth gravel and some very thin lenses of fine sand; extremely dense and compact; extremely acid; abrupt, irregular boundary. 13 to 23 inches thick.

Cg—34 to 44 inches +, grayish-brown (2.5Y 5/2) silt loam; common, medium to coarse, distinct mottles of yellowish brown (10YR 5/6); massive or very weak, thick, platy structure in upper part; firm when moist, sticky and slightly plastic when wet; no roots; some fine gravel, increasing in quantity with depth; extremely acid.

The thickness of the solum ranges from about 30 to 40 inches. In some profiles, the fragipan extends into the C horizon; in fact, the pan in the profile described is somewhat thinner than is typical. Rounded pebbles of quartzose occur in the profile in places. Such pebbles most commonly occur in the C horizon, and if they are abundant, the horizon is designated a IIC. The matrix hue ranges from 2.5Y to neutral, and it generally becomes more yellow or more close to neutral with increasing depth. In the upper part of the profile, even in the A horizon, there is low-chroma mottling in places.

In the A horizon, the texture is silt loam; the A1 horizon generally is 2 inches or less in thickness and is dark gray or dark grayish brown in color.

In the B and C horizons, the matrix color has a value of 5, 6, or, less commonly, 4, and a chroma of 0 to 2. The hue of the mottles in these horizons is 2.5Y, 10YR, or 7.5YR, the value 5 to 7, and the chroma generally 4, 6, or 8. The texture of the B2tg horizon is heavy loam, heavy silt loam, or light silty clay loam, and that of the Bx horizon centers on silty clay loam. If there is an unconforming IIC horizon, its texture ranges from heavy sandy loam to heavy loam.

Leonardtown soils resemble Aldino, Beltsville, and Glenville soils in having a fragipan but are more poorly drained than any of these. They are associated with Elkton and Fallsington soils, which are as poorly drained as Leonardtown soils but do not have a fragipan.

Leonardtown silt loam (Ll).—This soil is level to gently sloping; in a few places the slope is 3 or 4 percent. The profile is the one described for the series. Drainage is poor; water moves slowly through the profile, and little or none runs off.

If drained, this soil is suited to cultivation; undrained areas are suited to pasture and woodland. The choice of crops is restricted because the root zone is shallow. There is little hazard of erosion, but a few gullies have formed where runoff from other soils concentrates. (Capability unit IVw–3; woodland suitability group 11)

Linganore Series

The Linganore series consists of moderately deep, well-drained to somewhat excessively drained soils that are located on ridgetops and steep slopes on the uplands in the extreme western part of the county. These soils formed from material weathered in place from hard, slaty, gray to almost black rock. The native vegetation consists of mixed hardwoods; Virginia pine has invaded some areas.

These soils have a thin surface layer of dark-gray, crumbly loam and a somewhat thicker, subsurface layer of grayish-brown or light brownish-gray, crumbly silt loam. As much as 40 percent of both these layers consists of slaty fragments of rock. In cultivated areas, the plow layer is grayish brown or dark grayish brown in color. The subsoil is brown, sticky light silty clay loam. From 50 to more than 70 percent of this layer consists of rock fragments. Below the subsoil is a mass of slaty fragments that are coated with clay or silty clay. Unfragmented rock is at a depth of about 24 inches.

Linganore soils have a moderate available moisture capacity and are very strongly acid to extremely acid. If well managed, they are moderately productive. Moderate depth and the hazard of erosion are the main limitations.

Profile of Linganore channery loam, 3 to 8 percent slopes, in a cultivated area on Penn Shop Road, near Long Corner.

Ap—0 to 8 inches, grayish-brown (10YR 5/2) channery loam; weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; about 30 to 40 percent slaty fragments that are mostly about 2 inches in length; very strongly acid; clear, smooth boundary. 7 to 9 inches thick.

B2t—8 to 18 inches, brown (10YR 5/3) very channery light silty clay loam; weak, fine, subangular blocky structure; friable to firm when moist, sticky and slightly plastic when wet; roots common; some thin, discontinuous clay films; 50 to more than 70 percent slaty fragments; strongly acid; clear, irregular boundary. 5 to 12 inches thick.

B3—18 to 21 inches, dark grayish-brown (10YR 4/2) very channery silt loam; weak, coarse, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; very few roots; medium to strongly acid. 3 to 6 inches thick.

C—21 to 27 inches, gray and dark-gray fragments of rock, mostly very hard and coated with yellowish brown (10YR 5/6); few or no roots; medium acid; abrupt, irregular boundary. 3 to 8 inches thick.

R—27 inches +, hard, dark-gray, slaty schist.

The thickness of the solum ranges from about 12 to 24 inches, and the depth to bedrock generally is less than 3 feet. In places, there are some outcrops of bedrock. The A horizon is less than 50 percent fragments, and the B and C horizons more than 50 percent. In all horizons, the hue ranges from 10YR to 2.5Y. Base saturation is more than 35 percent.

The texture of the A horizon is loam, but that of the plow layer in eroded areas is silt loam. The A1 horizon is very thin and is very dark gray. In the Ap and A2 horizons, the color has a value of 4 or 5 and a chroma of 1 to 3.

The texture of the B2t horizon is heavy silt loam or light silty clay loam. The color has a value of 4 or 5 and a chroma of 3 or 4. The B3 horizon is very thin. It has a lower chroma than the B2t horizon.

Linganore soils have a finer textured subsoil and are shallower than the associated Manor soils, which formed in material weathered from soft micaceous rock. Linganore, Brandywine, and Mt. Airy soils all have a high content of rock fragments, but the kind of rock in Linganore soils is different from that in Brandywine and Mt.

Airy soils. Linganore soils have a Bt horizon of clay accumulation, which Brandywine and Mt. Airy soils lack.

Linganore channery loam, 3 to 8 percent slopes, moderately eroded (LnB2).—The profile of this soil is the one described for the series. This soil has a thin solum and is moderately deep to bedrock. It is suited to cultivated crops, pasture, and trees. The hazard of erosion and the moderate depth severely limit the use of this soil. (Capability unit IIIe–10; woodland suitability group 51)

Linganore channery loam, 8 to 15 percent slopes, moderately eroded (LnC2).—Included in the areas mapped as this soil are some small spots that have impeded subsoil drainage. This soil is suited to pasture, trees, and an occasional cultivated crop. Droughtiness and the hazard of erosion are the main limitations. (Capability unit IVe–10; woodland suitability group 51)

Linganore channery loam, 15 to 25 percent slopes, moderately eroded (LnD2).—Included in the areas mapped as this soil are some spots that have impeded subsoil drainage.

This soil is not suited to cultivated crops but is suited to pasture, trees, and sodded orchards. The hazard of erosion is the main limitation. (Capability unit VIe-3; woodland suitability group 52)

Linganore channery silt loam, 25 to 45 percent slopes (LoE).—This soil has a thin solum. It is more easily eroded than the other Linganore soils. Many areas are already severely eroded, and the hazard of further erosion is severe.

This soil is suited to limited grazing and to woodland. It should have a permanent cover of vegetation, to keep runoff from damaging areas downslope. (Capability unit VIIe–3; slopes that are exposed to the sun are in woodland suitability group 58, north slopes that are ordinarily shaded are in group 52)

Made Land

Made land (Md) consists of areas that have been so disturbed or modified by grading or filling that the soils cannot be classified (fig. 5).

Most of the acreage originally consisted of Brandywine soils, but no characteristic soil profile can now be recognized. This land type is used for residential or commercial developments or other nonfarm purposes. (Not in a capability unit; woodland suitability group 21)

Manor Series

The Manor series consists of very deep, well-drained to somewhat excessively drained soils that are located on the nearly level to steep uplands of the Piedmont Plateau. Most of these soils are in the east-central part of the county, and some are on the uplands above the Patuxent River. These soils formed in deep materials that weathered in place from soft, micaceous rocks and consequently contain large amounts of mica. The native vegetation is mixed upland hardwoods, mainly oaks; Virginia pine has invaded some areas.

These soils have a thin surface layer of dark-brown, crumbly loam. In cultivated areas, the plow layer is brown or reddish brown in color. The subsoil is yellowish-red to light-red, crumbly but slightly sticky loam that

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Figure 5.—Aerial view of Made land on U.S. Highway No. 40 near St. Johns Lane.

contains much fine mica and some small, soft rock fragments. Below the subsoil is highly micaceous, very crumbly to loose, decomposed rock material that is dominantly red in color but in places is variegated with many colors. The depth to bedrock is 6 to more than 10 feet. The bedrock is rather soft and is not clearly differentiated from the decomposed rock material just above it. Some areas contain much gravel of hard, white quartzite. The gravel is mostly on or near the surface of the soil.

Manor soils have a high available moisture capacity. They are strongly acid to very strongly acid. Although highly susceptible to erosion, they are suitable for a variety of uses. Some farms consist almost entirely of Manor soils. Some areas, particularly some along or near U.S. Highway No. 29, have been used as building sites.

Profile of Manor loam, 0 to 3 percent slopes, in a wooded area on Folly Quarter Road.

O1—2 inches to 0, litter of hardwood leaves.

A1—0 to 6 inches, dark-brown (7.5YR 4/4) loam; weak, fine, granular structure; very friable when moist, slightly sticky and slightly plastic when wet; roots abundant; some tendency toward fine platiness; strongly acid to very strongly acid; gradual, smooth boundary. 4 to 6 inches thick.

B2—6 to 30 inches, yellowish-red (5YR 4/8) loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; common to plentiful roots in upper portion; few, fine, very friable schist fragments that decrease in number with increasing depth; moderately micaceous; strongly acid to very strongly acid; clear, smooth boundary. 15 to 24 inches thick.

C1—30 to 40 inches, yellowish-red (5YR 4/6), highly micaceous, very friable saprolite of loam texture; some very thin bands of white, olive green, red, and brown; slightly sticky; very few roots; very strongly acid; diffuse boundary. 8 to 20 inches thick.

C2—40 to 60 inches +, weak-red (10YR 4/3), slightly coherent loam that consists almost entirely of fine mica; no roots; very strongly acid.

The thickness of the solum ranges from about 15 to 30 inches but is ordinarily no more than 2 feet thick. The depth to bedrock ranges from about 6 to more than 10 feet. In places the profile contains some schist fragments. Angular fragments of hard, white quartzite, which are remnants of quartzite intrusions, are few to

abundant. There are no significant differences in texture between the A, B, and C horizons.

The hue of the B2 horizon generally is 5YR but includes 7.5YR and ranges to either 10YR or 2.5YR, the value is 4 or 5, and the chroma is 4 to 8. In places, the C horizon is variegated with various colors.

Manor soils formed in the same kind of materials as Chester, Elioak, Elsinboro, Glenelg, and Glenville soils. They are associated with Mt. Airy soils, which are only about 3 feet deep and contain many fragments of mica schist. Manor soils are deeper than Brandywine soils, which are more than 50 percent fragments of quartzite or gneiss.

Manor loam, 0 to 3 percent slopes (MlA).—The profile of this soil is the one described for the series. Included in the areas mapped are some areas that contain gravel of hard, white quartzite.

This soil is suited to cultivated crops, pasture, and trees. It has few limitations. (Capability unit IIs–25; woodland suitability group 43)

Manor loam, 3 to 8 percent slopes, moderately eroded (MlB2).—Except that the surface layer is thinner, the profile of this soil is like the one described for the series. Included in the areas mapped are some severely eroded spots.

This soil is suited to cultivated crops, pasture, and trees. The hazard of erosion is moderate. (Capability unit IIe–25; woodland suitability group 43)

Manor loam, 8 to 15 percent slopes, moderately eroded (MlC2).—Except that the surface layer is thinner, the profile of this soil is like the one described for the series. This soil is suited to cultivated crops, pasture, and trees. (Capability unit IIIe–25; woodland suitability group 43)

Manor loam, 8 to 15 percent slopes, severely eroded (MlC3).—Nearly all of the original surface layer of this soil has been lost through erosion. This soil is suited to pasture and woodland. It is marginal for cultivated crops. The hazard of erosion is severe. (Capability unit IVe–25; woodland suitability group 43)

Manor loam, 15 to 25 percent slopes, moderately eroded (MlD2).—Most areas of this soil are still in woodland. In some large areas the profile contains much gravel of hard, white quartzite, mostly in the plow layer.

This soil is suited to pasture, trees, and an occasional cultivated crop. If cleared and cultivated, it will erode. (Capability unit IVe–25; woodland suitability group 44)

Manor loam, 15 to 25 percent slopes, severely eroded (MlD3).—Most areas of this soil have been cleared and cultivated. Included in the areas mapped are some gravelly areas.

This soil is no longer suitable for cultivation. It should have a protective cover of pasture, lawn, or sodded orchard. (Capability unit VIe–3; woodland suitability group 44)

Manor loam, 25 to 45 percent slopes (MlE).—Most of this soil is still in woodland. Some cleared areas are severely eroded. Included in the areas mapped are some areas that are gravelly and some spots that have a somewhat clayey subsoil.

This soil is suited to limited grazing and to use for woodland, wildlife areas, or recreation areas. (Capability unit VIIe–3; woodland suitability group 44)

Manor gravelly loam, 3 to 8 percent slopes, moderately eroded (MgB2).—Between 15 and 20 percent of the surface layer of this soil is angular gravel of hard, white quartzite. The subsoil contains smaller amounts of gravel. The gravel does not limit the use of this soil, but it damages farm implements. Included in the areas mapped are some areas where the surface layer and part of the subsoil have been lost through erosion.

This soil is friable, crumbly, and micaceous. It tends to dry out quickly, but the deep root zone partly offsets this effect. The hazard of erosion is the main limitation. (Capability unit IIe–25; woodland suitability group 43)

Manor gravelly loam, 8 to 15 percent slopes, moderately eroded (MgC2).—This soil is suited to cultivated crops, pasture, and trees. It is used mostly for forage crops, pasture, or small grain and is only occasionally used for corn or other clean-tilled crops. The hazard of erosion is severe, but the gravel on and near the surface of the soil checks erosion to some extent. (Capability unit IIIe–25; woodland suitability group 43)

Manor gravelly loam, 8 to 15 percent slopes, severely eroded (MgC3).—All of the original surface layer of this soil, and in many places much of the subsoil, have been lost through erosion. The plow layer is redder than the original surface layer and more erodible. This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–25; woodland suitability group 43)

Manor very stony loam, 3 to 25 percent slopes (MnD).—This soil contains many loose stones, rock outcrops, and boulders. Included in the areas mapped are some areas that have a more clayey subsoil and some spots that are redder than is characteristic of Manor soils.

This soil is suited to woodland and wildlife. Cultivation is impossible unless some of the stones are removed. If stones are removed, this soil is suited to permanent pasture and hay. (Capability unit VIs–3; woodland suitability group 44)

Manor very stony loam, 25 to 60 percent slopes (MnF).—This soil is located mainly on bluffs above the Patapsco and Patuxent Rivers and their chief tributaries. It is suited to use as recreation areas and as wildlife areas. Most areas are still in woodland. Some timber products are harvested. (Capability unit VIIs–3; woodland suitability group 45)

Mixed Alluvial Land

Mixed alluvial land (Mo) consists of soil material washed from uplands and deposited on flood plains. It ranges from sand to clay in texture and is gravelly in places. Drainage varies but is commonly poor. Most areas are subject to flooding.

This land type is not cultivated. Most of it is in woodland or is idle. Some areas are used to a limited extent for pasture. (Capability unit VIw–1; woodland suitability group 2)

Montalto Series

The Montalto series consists of very deep, well-drained soils on gently sloping to steep uplands of the Piedmont Plateau. These soils formed from materials that weathered in place from hard, almost black rock, mostly dia-

base. They are located on elongated ridges where dikes of this rock are at the surface. The native vegetation consists of mixed hardwoods, mainly oaks.

These soils have a dark reddish-brown surface layer of crumbly but somewhat sticky silt loam and a yellowish-red subsurface layer of the same texture and consistence. In cultivated areas, the plow layer generally is reddish brown in color. The subsoil is red or dark-red, firm silty clay, clay, or silty clay loam. Below the subsoil is red or yellowish-red, crumbly, decomposed rock material. The depth to bedrock is more than 5 feet.

Montalto soils have a high available moisture capacity. They are highly productive if well managed. The hazard of erosion is the main limitation. Stones and gravel limit the use of some areas.

Profile of Montalto silt loam, 3 to 8 percent slopes, moderately eroded, in a pasture area just south of Guilford.

Ap—0 to 10 inches, reddish-brown (5YR 4/3) silt loam; moderate to strong, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; slightly acid (limed); abrupt, smooth boundary. 9 to 10 inches thick.

B21t—10 to 17 inches, yellowish-red (5YR 4/6) heavy silty clay loam; moderate, fine, blocky structure; firm when moist, sticky and plastic when wet; roots common; some distinct, dark reddish-gray (5YR 4/2) coatings; some black specks or very weak concretions; medium acid; gradual, smooth boundary. 7 to 12 inches thick.

B22t—17 to 38 inches, red (2.5YR 4/6) clay or silty clay; moderate to strong, fine, blocky structure; firm when moist, sticky and plastic when wet; few roots; some concentrically weathered diabase fragments; prominent, dark-red (2.5YR 3/6) clay films and flows, thickest on rock fragments; medium acid; gradual, smooth boundary. 15 to 25 inches thick.

B3—38 to 46 inches, dark-red (2.5YR 3/6) silty clay loam; weak, fine to medium, subangular blocky structure; firm when moist, sticky and plastic when wet; very few roots; many concentrically weathered diabase fragments; a few clay films; somewhat gritty adjacent to rock fragments; medium acid; clear, smooth boundary. 6 to 10 inches thick.

C—46 to 60 inches +, yellowish-red (5YR 4/6) loam; massive; very friable when moist, slightly sticky but nonplastic when wet; no roots; abundant small diabase fragments; gritty; slightly acid.

The thickness of the solum ranges from about 27 to 60 inches, and the depth to bedrock ranges from about 5 to 12 feet. Coarse fragments of diabase, ranging from pebbles to boulders in size, are scattered through the profile. The range in base saturation is 40 to 80 percent.

The texture of the original A horizon is silt loam. In severely eroded areas, the texture of the plow layer is finer than silt loam. The hue generally is 5YR but ranges to 7.5YR and 2.5YR. In the thin A1 horizon, the color has a value of 3 and a chroma of 2, and in the A2 and Ap horizons, a value of 4 or, rarely, 3 and a chroma of 2 to 4.

The texture of the Bt horizon is predominantly clay or silty clay but ranges to heavy clay loam. The clay content is more than 35 percent. The hue ranges from 2.5YR to 10R, commonly becoming redder with increasing depth; the value is 3 to 4, and the chroma is 4 to 6. The texture of the B3 horizon is coarser than that of the Bt horizons.

The color of the C horizon differs from place to place and commonly is variegated.

Montalto soils resemble Legore, Neshaminy, and Relay soils, all of which were derived from similar kinds of basic rock, but Montalto soils are more red and have a finer textured subsoil than the other soils. Montalto and Neshaminy soils are deep; Legore and Relay soils have a thinner solum. Like Montalto soils, Aura, Elioak, and Sunnyside soils are well drained and have a red subsoil. Aura and Sunnyside soils have a less fine textured subsoil than Montalto soils.

Montalto silt loam, 3 to 8 percent slopes, moderately eroded (MpB2).—The profile of this soil is the one described for the series. Included in the areas mapped are some slightly gravelly spots, some areas that are severely eroded, and some areas that are nearly level.

This soil is suited to crops. The hazard of erosion is moderate. (Capability unit IIe–4; woodland suitability group 30)

Montalto silt loam, 8 to 15 percent slopes, moderately eroded (MpC2).—This soil is suited to cultivated crops, pasture, and trees. Runoff is rapid, and the hazard of erosion is severe. Included in the areas mapped are a few somewhat gravelly areas. (Capability unit IIIe–4; woodland suitability group 30)

Montalto silty clay loam, 8 to 15 percent slopes, severely eroded (MqC3).—All of the original surface layer of this soil has been lost through erosion. In cultivated areas, the plow layer generally is red because plowing turns up large amounts of subsoil. The plow layer is sticky and difficult to work except within a fairly narrow range of moisture content. Included in the areas mapped are some gravelly areas.

This soil is suited to pasture, trees, and an occasional cultivated crop. (Capability unit IVe–3; woodland suitability group 30)

Montalto and Relay soils, 15 to 45 percent slopes (MrE).—Most areas of these soils are severely eroded and have a silty clay loam surface layer; some spots, however, are less severely eroded and have a silt loam surface layer. Included in the areas mapped are some gravelly spots and some that have slopes of more than 45 percent.

These soils are suited to pasture and woodland. (Capability unit VIe–2; woodland suitability group 31)

Montalto and Relay very stony silt loams, 3 to 25 percent slopes (MsD).—These soils have stones a foot or more in diameter in the soil and on the surface and generally no more than 30 feet apart. Included in the areas mapped are some areas that have a sticky surface layer and impeded subsoil drainage; these areas are shown on the soil map by wet-spot symbols.

These soils are suited to woodland. Some hay crops and pasture plants can be grown where the terrain is such that mowing is possible. (Capability unit VIs–3; woodland suitability group 30)

Montalto and Relay very stony silt loams, 25 to 60 percent slopes (MsF).—These soils are suited to woodland. Some areas are in Patapsco State Park. Included in the areas mapped are some small areas that are less stony. (Capability unit VIIs–3; woodland suitability group 32)

Mt. Airy Series

The Mt. Airy series consists of moderately deep, very strongly acid, somewhat excessively drained soils that are located on the higher parts of the Piedmont Plateau. These soils are dominant in a large part of the western part of the county. They formed from material that weathered in place from hard slaty rocks that contained much mica. The native vegetation consists of mixed upland hardwoods, mainly oaks; Virginia pine has invaded some areas.

These soils have a very thin surface layer of dark grayish-brown, friable loam and a somewhat thicker subsurface layer of yellowish-brown, friable loam. These layers are about 35 percent flat fragments of rock. In cultivated areas, the plow layer generally is brown or yellowish brown. The subsoil is strong-brown, friable loam that is 60 to 80 percent flat fragments of rock. Below the subsoil is a mass of fragmented rock coated with clayey material. The depth to bedrock generally is about 30 inches.

Mt. Airy soils have a low to moderate available moisture capacity. If well managed, they are moderately productive. The moderate depth of the root zone and the hazard of erosion are the main limitations. Some farms are almost entirely on Mt. Airy soils.

Profile of Mt. Airy channery loam in a gently sloping wooded area on Windsor Forest Road.

O1—1½ inches to ½ inch, litter of oak leaves.
O2—½ inch to 0, thin mat of decomposed organic materials.
A1—0 to 3 inches, dark grayish-brown (10YR 4/2) channery loam; weak, fine, granular structure; very friable when moist, slightly sticky and very slightly plastic when wet; roots abundant; strongly acid; clear, smooth boundary. 2 to 3 inches thick.
A2—3 to 10 inches, yellowish-brown (10YR 5/4) channery loam; weak, fine, granular structure; very friable when moist, slightly sticky and slightly plastic when wet; roots plentiful; about 30 to 35 percent flat fragments of mica schist; very strongly acid; gradual, smooth boundary. 3 to 7 inches thick.
B2—10 to 23 inches, strong-brown (7.5YR 5/6) very channery loam that is high in silt; weak to moderate, fine and medium, subangular blocky structure; friable when moist, sticky and slightly plastic when wet; roots common; slightly finer in texture than the A horizon; about 60 to 80 percent flat fragments of schist; very strongly acid; clear, wavy boundary. 5 to 15 inches thick.
C&B—23 to 30 inches, fragmented and slightly decomposed schist; fragments coated with strong-brown (7.5YR 5/6) clayey material that is sticky and plastic, slick and micaceous; very few roots; less coated, less fragmented, and much harder with depth, grading from about 90 percent fragments to almost solid schist; very strongly acid; gradual, irregular boundary. 6 to 16 inches thick.
R—30 inches +, bedrock of hard mica schist.

The thickness of the solum ranges from about 15 to 36 inches, and the depth to bedrock ranges from 20 to 40 inches. The content of schist fragments ranges from about 15 to 35 percent in the A horizon, from about 60 to 80 percent in the B2 horizon, and up to nearly 100 percent in the C&B horizon. The texture of the A and B horizons is loam, but the proportion of fine particles is high. The clay content of the B2 horizon is 2 or 3 percent greater than that of the A horizon.

In the A horizon, the hue centers on 10YR but ranges to 2.5Y and 7.5YR; the value ranges from 3 to 6; and the chroma from 1 to 4. The lowest values and chromas are in the A1 horizon, the middle values and chromas are in the Ap horizon, and the highest are in the A2 horizon.

In the B2 horizon, the hue centers on 7.5YR but ranges from 10YR to 5YR, the value is 4 or 5, and the chroma is 4 or 6.

The hue of the C&B horizon is like that of the B2 horizon, but in places the value is higher than that of the B2 horizon.

Mt. Airy soils resemble Brandywine soils, but Mt. Airy soils are shallow to bedrock and contain flat fragments of schist, and Brandywine soils are deeper to bedrock and contain coarse fragments of angular gneiss and quartzite. In some areas Mt. Airy soils are closely associated with Manor soils, which are very deep to bedrock and contain fewer rock fragments than Mt. Airy soils.

Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded (MtB2).—The profile of this soil is like the one described for the series. In cultivated areas, the surface layer is yellowish brown because the A1 and A2 horizons have been mixed. Included in the areas mapped are a few spots that are nearly level and some that are severely eroded.

This soil is limited by a restricted root zone, the hazard of erosion, rock fragments, and a low available moisture capacity. (Capability unit IIIe–10; woodland suitability group 51)

Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded (MtC2).—This soil is suited to pasture, trees, and an occasional cultivated crop. Many areas produce hay or pasture. (Capability unit IVe–10; woodland suitability group 51)

Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded (MtC3).—Nearly all of the original surface layer of this soil has been lost through erosion. Plowing turns up the thin subsoil layer and, in severely eroded spots, some of the fragmented rock beneath the original subsoil.

This soil has severe limitations for cultivated crops but is suited to woodland and controlled grazing. The main limitations are a shallow root zone, the hazard of erosion, and a low available moisture capacity. This soil is too shallow for most orchard crops. (Capability unit VIe–3; woodland suitability group 51)

Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded (MtD2).—This soil has severe limitations for cultivated crops but is suited to pasture and woodland. The hazard of erosion is the main limitation. Included in the areas mapped are some severely eroded areas. (Capability unit VIe–3; woodland suitability group 52)

Mt. Airy channery loam, 25 to 45 percent slopes (MtE).—Most uncleared areas of this soil are only slightly or moderately eroded, but some cleared areas are severely eroded. Included in the areas mapped are some areas that have slopes of more than 45 percent.

This soil is suited to use as woodland and as wildlife habitat. If cleared it can be used for limited grazing. (Capability unit VIIe–3; slopes that are exposed to the sun are in woodland suitability group 58, northern slopes that are ordinarily shaded are in group 52)

Neshaminy Series

The Neshaminy series consists of deep, well-drained, gently sloping to moderately steep soils that are located on the uplands of the Piedmont Plateau. These soils formed in material weathered in place from fairly dark-colored rock, such as granodiorite, or from a mixture of light- and dark-colored rock, such as mica schist and diorite or diabase. The native vegetation consists of mixed upland hardwoods, mainly oaks.

These soils have a dark grayish-brown surface layer of friable but slightly sticky silt loam and a brown subsurface layer of the same texture and consistence. In cultivated areas, the plow layer generally is dark brown. The subsoil is brown, reddish-brown, or yellowish-red, firm but sticky silty clay loam. It commonly becomes redder and slightly coarser textured with increasing depth. Below the subsoil is decomposed rock material. The depth to bedrock ordinarily is more than 5 feet.

Neshaminy soils have a high available moisture capacity. They are slightly acid to medium acid. If well managed they are highly productive. The main limitation is the hazard of erosion.

Profile of Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded, in a cultivated area on Old Montgomery Road.

Ap—0 to 11 inches, brown or dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; some fine and coarse quartzite gravel; slightly acid (limed); clear, smooth boundary. 9 to 12 inches thick.

B21t—11 to 23 inches, brown or dark-brown (7.5YR 4/4) silty clay loam; moderate to strong, fine, blocky structure; firm when moist, sticky and plastic when wet; roots common; some coarse sand and fine gravel of quartzite; distinct to prominent, dark-brown (7.5YR 3/4) clay films; medium acid; gradual, smooth boundary. 9 to 14 inches thick.

B22t—23 to 37 inches, yellowish-red (5YR 4/6) silty clay loam; strong, fine and medium, blocky structure; firm when moist, sticky and plastic when wet; few roots; prominent, reddish-brown (5YR 4/3) clay films; some coarse sand and fine gravel of quartzite; medium acid; gradual, smooth boundary. 12 to 18 inches thick.

B23t—37 to 50 inches, reddish-brown (5YR 4/4) light silty clay loam or heavy silt loam; moderate, fine to coarse, blocky and subangular blocky structure; firm when moist, sticky and plastic when wet; no roots; distinct, reddish-brown (5YR 4/3 or 4/4) clay coatings; abundant coarse sand and fine gravel of quartzite; medium acid; abrupt, wavy to irregular boundary. 8 to 24 inches thick.

C—50 to 60 inches +, variegated yellowish-red, strong-brown, and yellow (5YR 5/6, 7.5YR 5/6, and 10YR 7/6) saprolite of loam or silt loam texture; friable when moist, slightly sticky and slightly plastic when wet; no roots; medium acid to slightly acid.

The thickness of the solum ranges from about 34 to more than 50 inches, and the depth to bedrock ranges from about 6 to 10 feet. Angular pebbbles of quartzite and stones of acid crystalline rock, basic rock, or quartzite occur in all horizons. The lower part of the solum and the C horizon are medium acid to neutral. Base saturation generally is more than 35 percent.

The hue of the A horizon is 10YR or 7.5YR, the value is 3 or 4, and the chroma 2 to 4. The value and chroma are lowest where the A1 horizon is less than 6 inches thick. Unplowed areas have a thin A2 horizon. The texture of the A horizon generally is silt loam, but in severely eroded areas the plow layer is somewhat finer textured.

The hue of the upper part of the B horizon generally is 7.5YR; that of the lower part is 5YR; in places, that of the lowest part is 2.5YR. The chroma generally ranges from 3 to 8, but in the finest textured part of the Bt horizon, the chroma is 6 or 8. The clay content of the Bt horizon generally is less than 35 percent, but in some places it is more.

The C horizon is one color in some places and variegated in others. In texture it generally is silt loam or heavy loam.

Neshaminy soils are less red than Elioak and Montalto soils and have a less fine textured subsoil than Montalto soils. They are less strongly acid than Elioak soils. Neshaminy soils are thicker than Legore soils and have stronger horizonation. They are more acid and ordinarily less red than Chester soils but are brighter colored than those soils.

Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded (NeB2).—The profile of this soil is the one described for the series. Most areas have lost part of the original surface layer through erosion. Included in the areas mapped are some small areas that are gravelly, some that are severely eroded, and a few that are nearly level.

This soil is suited to cultivated crops, pasture, and trees. The hazard of erosion is moderate. (Capability unit IIe–4; woodland suitability group 30)

Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded (NeC2).—This soil is suited to cultivated crops, pasture, and trees. The main limitation is the hazard of erosion. Included in the areas mapped are some gravelly areas and a few severely eroded spots. (Capability unit IIIe–4; woodland suitability group 30)

Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded (NsD3).—This soil is shallow to bedrock. The plow layer, which consists largely of subsoil, is finer textured and more sticky than that of the less eroded Neshaminy soils. Included in the areas mapped are some gravelly areas.

This soil is severely limited in use for cultivated crops but is suited to pasture, trees, and sodded orchards. (Capability unit VIe–2; woodland suitability group 31)

Relay Series

The Relay series consists of deep, well-drained, moderately sloping soils on the uplands of the Piedmont Plateau. These soils generally are located between Ellicott City and the eastern boundary of the county. They formed in residuum from rocks that are high in magnesium, such as gabbro. Some areas are very stony. The native vegetation consists of mixed hardwoods.

These soils have a thin surface layer of very dark grayish-brown, friable silt loam and a thin subsurface layer of olive-gray, friable silt loam. In cultivated areas, the plow layer generally is dark grayish brown in color. The subsoil is olive-brown to olive, plastic and sticky clay loam or clay. Below the subsoil is firm, sticky, decomposed rock material that varies in color but generally is olive gray to olive green. This material becomes

more friable and more loose with increasing depth. The depth to bedrock is ordinarily more than 5 feet.

Relay soils have a high available moisture capacity. They are very strongly acid near the surface but become less acid with increasing depth. If well managed, they are highly productive. The main limitation is the hazard of erosion. In places stoniness is a limitation. Some severely eroded areas are limited by a fine-textured, sticky plow layer.

Profile of Relay silt loam, 3 to 15 percent slopes, in a wooded area on College Avenue in Ilchester.

O1—2 inches to ½ inch, litter of hardwood leaves and twigs.
O2—½ inch to 0, thin mat of decomposed organic material.
A1—0 to 4 inches, very dark grayish-brown (2.5Y 3/2) silt loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; roots abundant; very strongly acid; abrupt, smooth boundary. 2 to 4 inches thick.
A2—4 to 8 inches, olive-gray (5Y 4/2) heavy silt loam; moderate, medium to coarse, granular structure; friable to somewhat firm when moist, slightly sticky and slightly plastic when wet; roots plentiful; very strongly acid; abrupt, smooth boundary. 4 to 6 inches thick.
B21t—8 to 15 inches, light olive-brown (2.5Y 5/4) silty clay loam; strong, medium and coarse, blocky structure; firm when moist, sticky and plastic when wet; roots common; some fine rock fragments; distinct, olive (5Y 5/3) clay films; very strongly acid; gradual, smooth boundary. 6 to 10 inches thick.
B22t—15 to 23 inches. olive-brown (2.5Y 4/4) clay loam; very strong, medium, blocky structure; very firm when moist, very sticky and very plastic when wet; few roots; prominent, olive-gray (5Y 4/2) clay films and flows; some specks of red and light green; strongly acid; clear, smooth boundary. 7 to 10 inches thick.
B23t—23 to 27 inches, olive (5Y 5/4) light clay loam; moderate, fine and medium, blocky structure; very firm when moist, sticky and plastic when wet; very few roots; few but prominent olive-gray (5Y 5/2) clay films and flows; abundant fine specks of olive green; strongly acid; clear, smooth boundary. 4 to 6 inches thick.
C1—27 to 33 inches, yellowish-brown (10YR 5/6) light clay loam; massive; firm when moist, sticky and plastic when wet; few roots; abundant, fine rock fragments; strongly acid; abrupt, smooth boundary. 5 to 8 inches thick.
C2—33 to 44 inches, olive-gray (5Y 4/2) light silt loam; somewhat gritty; massive; friable when moist, sticky and slightly plastic when wet; no roots; medium acid; clear, wavy boundary. 8 to 15 inches thick.
C3—44 to 60 inches, yellowish-brown (10YR 5/6) gritty saprolite of loam texture; massive; friable when moist and becomes more friable with increasing depth; no roots; slightly acid; abrupt, irregular boundary. 10 to 20 inches thick.
R—60 inches +, hard, unweathered gabbro.

The thickness of the solum ranges from about 15 to 30 inches, and the depth to bedrock ranges from about 5 to 10 feet. Coarse fragments that range from pebbles to boulders in size can be found anywhere in the profile. In eroded areas, the texture of the surface horizon is silt loam, silty clay loam, or clay loam. In the solum, the hue centers between 2.5Y and 5Y but ranges toward 5GY.

The color of the A1 horizon has a value of 3 and a chroma of 2 or 3, and that of the Ap and A2 horizons has a value one or two units higher.

In the B horizon, the content of clay is between 26 and 35 percent. The color has a chroma of 3, 4, or, rarely, 6.

The C horizon contains less clay than the B horizon and is more variable in color than the solum. In many places the hue is 10YR and the chroma 6. In places, the solum and the saprolite are greener than those in the profile described. Red and green specks are characteristic. Base saturation is more than 50 percent.

Relay soils resemble Legore soils but are more olive and less brown in color. The olive colors are inherited from the parent rock and do not indicate impeded drainage or impeded aeration.

Relay silt loam, 3 to 15 percent slopes, moderately eroded (ReC2).—The surface layer of this soil is olive gray to olive brown because the upper layers have been mixed during cultivation. Even in the least eroded areas, the solum is only moderately thick. Included in the areas mapped are some severely eroded spots.

This soil is suited to cultivated crops, pasture, and trees. The main limitation is the hazard of erosion. (Capability unit IIIe–10; woodland suitability group 40)

Rumford Series

The Rumford series consists of deep, somewhat excessively drained, nearly level to moderately sloping soils on the uplands of the Coastal Plain. These soils have a thin subsoil that is only slightly finer textured than the surface layer. They formed in unconsolidated beds of old, very sandy sediments that contain only moderate amounts of clay and very little silt. The native vegetation consists mainly of scrub-type hardwoods; Virginia pines have invaded some areas.

In uncultivated areas, these soils have a thin surface layer of dark-colored, crumbly to loose loamy sand and a very thick subsurface layer of light yellowish-brown, crumbly to loose loamy sand. In cultivated areas, the plow layer generally is grayish brown or dark grayish brown in color. The subsoil is yellowish-brown to strong-brown sandy loam that is crumbly and slightly sticky. Below the subsoil is stratified material that is sandy, loose, and in places gravelly.

Rumford soils have a low available moisture capacity. They are very strongly acid to extremely acid. The main limitation is the hazard of erosion. These soils are in a part of the county where suburban development is taking place.

Profile of Rumford loamy sand, 1 to 5 percent slopes, moderately eroded, in a cultivated area on Route 175 about three-fourths of a mile north of Jessup.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loamy sand; weak, medium, granular structure; loose to very friable when moist; roots abundant; very strongly acid; abrupt, wavy boundary. 8 to 10 inches thick.
A2—9 to 16 inches, light yellowish-brown (10YR 6/4) loamy sand; very weak, medium, granular structure; very friable when moist; roots plentiful; very strongly acid; clear, smooth boundary. 6 to 10 inches thick.
B1—16 to 20 inches, yellowish-brown (10YR 5/6) light sandy loam; weak, medium, subangular blocky structure; very friable when moist, slightly sticky but nonplastic when wet; roots common; strongly acid to very strongly acid; gradual, smooth boundary. 0 to 6 inches thick.
B2t—20 to 31 inches, strong-brown (7.5YR 5/8) heavy sandy loam; moderate, medium, subangular blocky structure; friable when moist; slightly sticky and slightly

plastic when wet; few roots; clay bridging and discontinuous, thin clay films that are most prominent in pores; about 5 percent fine, smooth gravel; very strongly acid; clear, irregular boundary. 8 to 15 inches thick.

C—31 to 48 inches +, yellowish-brown (10YR 5/6) loamy sand; single grain; loose to very friable when moist; very few roots; 5 to 8 percent fine, smooth gravel; very strongly acid to extremely acid.

The thickness of the solum ranges from about 24 to 36 inches. In places, there is fine, smooth gravel in the profile. The gravel generally becomes more abundant with increasing depth, but in any horizon the total content generally is less than 15 percent. There is very little silt in the profile. Base saturation is very low.

The color of the A horizon ranges in value from 3 to 6 and in chroma from 1 to 4. The value and chroma are lowest in the thin A1 horizon.

The hue of the B horizon is 7.5YR but ranges to include 5YR and, in the transitional B1 horizon, 10YR. The value is 5 or 6, and the chroma is 6 to 8. The average clay content of the B2t horizon is less than 18 percent.

The color of the C horizon is the same as that of the B horizon, but in places it is more yellow and has a higher value. The texture is coarser than that of the B horizon.

Rumford soils are coarser textured than Sassafras soils and are lower in content of clay and silt in all parts of the solum. The Bt horizon of Rumford soils is thinner and less strongly developed than that of the Sassafras soils.

Rumford loamy sand, 1 to 5 percent slopes, moderately eroded (RuB2).—The profile of this soil is the one described for the series. This soil is suited to cultivated crops, pasture, and trees. Because of the sandy texture, the capacity to retain moisture and the capacity to retain plant nutrients are low. Water infiltrates rapidly, and the hazard of erosion generally is minor. (Capability unit IIs–4; woodland suitability group 7)

Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RuC2).—This soil has a low available moisture capacity. It is suited to cultivated crops, pasture, and trees. The main limitation is the hazard of erosion. Included in the areas mapped are some severely eroded areas where plowing has turned up some of the subsoil material. (Capability unit IIIe–33; woodland suitability group 8)

Rumford loamy sand, 10 to 15 percent slopes, moderately eroded (RuD2).—Except that the surface layer is only 10 to 12 inches thick, the profile of this soil is like the one described for the series. The soil has a low available moisture capacity. The hazard of erosion is the main limitation. Included in the areas mapped are some severely eroded areas. (Capability unit IVe–5; woodland suitability group 8)

Sandy and Clayey Land

Sandy and clayey land is located mainly in the eastern and southeastern parts of the county, on the upper part of the Coastal Plain. It consists mainly of very old deposits of clay covered by a mantle consisting mostly of sand but containing some finer textured material and, in places, large amounts of fine to medium gravel. This surface mantle abruptly overlies the clay, to which it is not related geologically or otherwise. In places it is very thin, but it ranges up to several feet in thickness. The clay deposits are silty in places and sandy in others. The colors include red, purplish red, gray, yellow, pink, and white. The clay is very plastic and sticky, but its most important characteristic is very poor stability.

Sandy and clayey land is not productive, even under good management. The available moisture capacity is low, and the supply of plant nutrients is very low. Suitability for crops varies with the texture and thickness of the surface layer. Some areas are cultivated, and some have been stripped for mining clay, but most are idle, or are wooded, or are used for residential development.

Sandy and clayey land, gently sloping (ScB).—Some of this land type is used for farming, but high yields normally cannot be expected. Control of erosion is needed, whatever kind of cropping system is used. The practices needed depend upon the condition of the particular field. (Capability unit IIIe–41; woodland suitability group 16)

Sandy and clayey land, moderately sloping (ScD).—Because of slope, this mapping unit is readily eroded. Determining the degree of erosion is difficult. The underlying clay is at or near the surface in some places and deep beneath the sandy material in others.

This land type is suited to pasture and trees but not to cultivated crops. (Capability unit VIe–2; woodland suitability group 16)

Sandy and clayey land, moderately steep (ScE).—This land type is unsuited to cultivated crops but is suited to very limited grazing. A vegetative cover should be maintained. Woodland with an understory of shrubs and a ground cover of grasses, vines, and other plants gives effective protection. (Capability unit VIIe–2; woodland suitability group 16)

Sassafras Series

The Sassafras series consists of deep, well-drained, gently sloping to steep soils that are located on the uplands of the Coastal Plain. These soils formed in unconsolidated beds of very old, dominantly sandy sediments. The native vegetation consists of mixed hardwoods, mainly oaks; Virginia pine has invaded some areas.

These soils have a thin surface layer of dark grayish-brown, crumbly loam or sandy loam. In cultivated areas, the plow layer generally is brown or grayish brown in color. The subsoil is firm to crumbly and somewhat sticky, brown to strong-brown or sometimes reddish-brown sandy clay loam or heavy loam. Below the subsoil is sandy material, generally loose and in many places stratified. Some areas contain much smooth, round gravel less than 1 inch in diameter.

Sassafras soils are strongly acid to very strongly acid. The main limitation is the hazard of erosion. Many areas of these soils are in a part of the county where suburban development is taking place.

Profile of Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded, in a gently sloping wooded area about 2 miles southeast of Waterloo.

O1—1 to ¼ inch, litter of leaves and twigs.
O2—¼ inch to 0, thin mat of decomposed organic material.
A1—0 to 2 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; weak, fine to medium, granular structure; very friable when moist; roots abundant; strongly acid to very strongly acid; clear, smooth boundary. 2 to 3 inches thick.
A2—2 to 12 inches, yellowish-brown (10YR 5/4) gravelly sandy loam; weak, medium, granular structure; friable when moist, slightly sticky but nonplastic when wet; roots plentiful; very strongly acid; clear, smooth boundary. 7 to 10 inches thick.
B21t—12 to 18 inches, brown (7.5YR 4/4) gravelly heavy loam; moderate, fine to medium, blocky structure; friable when moist, slightly sticky and slightly plastic when wet; roots common; discontinuous clay films; strongly acid to very strongly acid; gradual, wavy boundary. 5 to 10 inches thick.
B22t—18 to 36 inches, strong-brown (7.5YR 5/6) gravelly sandy clay loam; moderate, medium to coarse, blocky structure; firm when moist, sticky and slightly plastic when wet; few roots; prominent, almost continuous clay coats; less gravelly than horizons above; very strongly acid; gradual, irregular boundary. 15 to 24 inches thick.
C—36 to 56 inches +, strong-brown (7.5YR 5/8) loamy sand; structureless (single grained); mostly loose, but stratified with some moderately compact strata; some gravel and scattered iron concretions; very strongly acid to extremely acid.

The thickness of the solum ranges from about 30 to 48 inches. There is much round gravel in the profile, especially in the sandy loams.

The hue of the A horizon generally is 10YR, the value ranges from 3 to 5, and the chroma from 1 to 4. The value and chroma are lowest in the A1 horizon. The texture is loam or sandy loam.

The hue of the B horizon is dominantly 7.5YR but includes 5YR and 10YR. The value ranges from 4 to 6, and the chroma from 4 to 8. The texture of the Bt horizon generally is sandy clay loam but ranges to heavy sandy loam and heavy loam. The average content of clay is more than 18 percent but generally less than 30 percent.

The color of the C horizon is similar to that of the B horizon, but in places the value and chroma are higher. The texture of the C horizon is more sandy than that of the B horizon.

Sassafras soils resemble Chillum, Montalto, and Neshaminy soils but are coarser textured than any of these. They are closely associated with Rumford and Sunnyside soils. They are finer textured than Rumford soils and are less red, especially in the subsoil, than Sunnyside soils. Sassafras soils formed in the same kind of material as the moderately well drained Woodstown soils and the poorly drained Fallsington soils.

Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded (SfB2).—The profile of this soil is like the one described for the series. In cultivated areas, the surface layer is brown or grayish brown in color as a result of mixing of the A1 and A2 horizons. Included in the areas mapped are some small areas that are almost level, some areas where the soil contains very little gravel, and some severely eroded spots.

This soil is suited to cultivated crops, pasture, and trees. It is easily plowed and cultivated. Water infiltrates readily. The gravel can damage farm implements. The main limitation is the hazard of erosion. (Capability unit IIe–5; woodland suitability group 7)

Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (SfC2).—This soil takes in water readily. It is suited to cultivated crops, pasture, and trees. The hazard of erosion is severe. Included in the areas mapped are some severely eroded areas, a few small areas that have shallow gullies, and small areas where there is only a little gravel in the plow layer. (Capability unit IIIe–5; woodland suitability group 8)

Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded (SfD2).—This soil is suited to pasture, trees, and an occasional cultivated crop. The hazard of erosion is severe. Included in the areas mapped are some severely eroded areas. (Capability unit IVe–5; woodland suitability group 8)

Sassafras loam, 1 to 5 percent slopes, moderately eroded (SlB2).—The surface layer of this soil contains very little gravel. The hazard of erosion is the main limitation. Included in the areas mapped are a few level areas and a few severely eroded spots. (Capability unit IIe–4; woodland suitability group 7)

Sassafras loam, 5 to 10 percent slopes, moderately eroded (SlC2).—This soil is suited to cultivated crops, pasture, and trees. The main limitation is the hazard of erosion. Included in the areas mapped are some small areas in which the surface layer is a little more sandy and some severely eroded areas. (Capability unit IIIe–4; woodland suitability group 8)

Sassafras loam, 10 to 15 percent slopes, moderately eroded (SlD2).—Most of this soil is still in woodland. This soil is suited to pasture, hay, sodded orchards, trees, or an occasional cultivated crop. Included in the areas mapped are some small areas in which the surface is a little more sandy, a few severely eroded spots, and a few spots that have impeded subsoil drainage. (Capability unit IVe–3; woodland suitability group 8)

Sassafras soils, 15 to 40 percent slopes (SsE).—Some areas of these soils have a loam surface layer, but most have a sandy loam surface layer. Many areas are gravelly. Included in the areas mapped are some spots of fairly deep sand and some areas that have impeded drainage in the subsoil.

These soils are not suited to cultivated crops but are suited to hay, pasture, and trees. The hazard of erosion is slight in wooded areas but severe in cultivated areas. (Capability unit VIe–2; woodland suitability group 9)

Stony Land

Stony land (St) is located on heights along the Patapsco and Patuxent Rivers. It consists of areas that are too stony for normal soil development. The stones are mostly chlorite schist, granitized schist, gneiss, gabbro, and diorite. The terrain is sloping to very steep. (Capability unit VIIIs–1; woodland suitability group 59)

Sunnyside Series

The Sunnyside series consists of deep, well-drained, gently sloping to moderately sloping soils that are located on the uplands of the Coastal Plain. These soils formed in unconsolidated beds of fine sandy sediments that contained much red clay. The native vegetation consists of

mixed hardwoods, mainly oaks; Virginia pine and shortleaf pine have invaded some areas.

These soils have a thin surface layer of dark grayish-brown fine sandy loam and a brown to yellowish-red subsurface layer of the same texture. In cultivated areas, the plow layer generally is brown or reddish brown in color. The subsoil is yellowish-red or red, firm to crumbly, somewhat sticky fine sandy clay loam or very fine sandy loam that becomes redder with increasing depth. Below the subsoil is stratified but crumbly loamy and sandy material that varies in color but is mostly red. In places, this material overlies an old deposit of firm, red clay.

Sunnyside soils have a moderate available moisture capacity and are extremely acid. If well managed, they are moderately to highly productive. They are in a part of the county where residential and industrial development is now taking place.

Profile of Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded, in a cultivated area just west of U.S. Highway No. 1 near the Prince Georges County line.

Ap—0 to 10 inches, brown (10YR 5/3) fine sandy loam; weak, fine to medium, granular structure; friable when moist, slightly sticky but nonplastic when wet; roots abundant; strongly acid; clear, smooth boundary. 9 to 10 inches thick.

B21t—10 to 27 inches, yellowish-red (5YR 5/6 to 5/8) fine sandy clay loam; moderate, fine to medium, subangular blocky structure; firm when moist, sticky and plastic when wet; roots common in upper portion; prominent, strong-brown (7.5YR 5/6) clay films and flows; some fragments of ferruginous sandstone (ironstone); very strongly acid; gradual, smooth boundary. 15 to 20 inches thick.

B22t—27 to 37 inches, red (2.5YR 5/6) light sandy clay loam; weak, fine to medium, subangular blocky structure; friable to firm when moist, slightly sticky and slightly plastic when wet; few roots; thin, strong-brown (7.5YR 5/8) clay films; some very thin inclusions of very fine sand; fragments of ferruginous sandstone; very strongly acid to extremely acid; clear, smooth boundary. 8 to 10 inches thick.

C1—37 to 44 inches, reddish-brown (2.5YR 5/4) fine sandy loam variegated with white and pale red; stratified and has pockets and thin lenses of fine sand; very friable when moist, slightly sticky when wet; no roots; extremely acid; abrupt, smooth boundary. 6 to 9 inches thick.

IIC2—44 to 60 inches +, red (2.5Y 4/6) clay; massive; firm when moist, very sticky and very plastic when wet; no roots; some pockets of fine sand in upper part; extremely acid.

The thickness of the solum ranges from about 30 to 40 inches. In places, fine smooth gravel is found above the IIC2 horizon.

The hue of the A horizon is 10YR or 7.5YR, the value ranges from 3 to 5, and the chroma from 1 to 4. The value and chroma are lowest in the thin A1 horizon.

The hue of the B horizon ranges from 5YR to 2.5YR to 10R; almost without exception, some part of the B horizon has a hue of 2.5YR. The color ranges in value from 4 to 6 and in chroma from 4 to 8. The texture of the Bt horizon generally is fine sandy clay loam, but in places it grades toward heavy sandy loam. The Bt horizon is low in silt, and its clay content is between 18 and 30 percent.

The C horizon is more sandy than the B horizon. It is similar in color to the B horizon. The texture of the IIC horizon varies but in all profiles differs abruptly from that of the C1. In Howard County it is generally clay. In some profiles there is no IIC horizon.

Sunnyside soils resemble Aura, Elioak, and Montalto soils in being well drained and having a red subsoil. Sunnyside soils have a sandy clay loam subsoil, but Elioak and Montalto soils have fine clay subsoils. Sunnyside soils are thicker than Aura soils, which commonly are very gravelly and have a hard, compact subsoil and substratum.

Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded (SuB2).—The profile of this soil is the one described for the series. Included in the areas mapped are some nearly level spots and some severely eroded spots.

This soil is suited to farming, but most of it is in a part of the county where commercial, residential, and industrial development is now taking place. (Capability unit IIe–5; woodland suitability group 7)

Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded (SuD2).—The profile of this soil is like the one described for the series. Included in the areas mapped are a few severely eroded spots.

This soil is suited to pasture, lawns, hay, sodded orchards, and an occasional cultivated crop. Most areas are used for nonfarm purposes. (Capability unit IVe–5; woodland suitability group 8)

Watchung Series

The Watchung series consists of poorly drained soils that are located on upland flats, on foot slopes, and in depressions. They formed in residuum weathered from hard, black rock, commonly diabase. The native vegetation consists mostly of water-tolerant oaks and other wetland hardwoods.

These soils have a surface layer of dark grayish-brown, sticky silt loam. Fine material washed from higher areas has accumulated on the surface. The subsoil is sticky and plastic, grayish-brown to olive or olive-gray, mottled, very firm fine silty clay or clay. Water moves slowly through the subsoil. The material below the subsoil is not so fine nor so sticky. The depth to bedrock is about 5 feet.

Watchung soils are strongly acid near the surface but become less acid with increasing depth and are nearly neutral near bedrock. These soils are either very wet and sticky or very dry and hard, depending on the season. They are seldom cultivated, because they are very difficult to work. Most areas remain in woodland.

Profile of Watchung silt loam, 0 to 3 percent slopes, in a gently sloping area that was once cultivated, just north of Route 103.

Ap—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; abundant, fine, dark-green specks; moderate, fine, granular structure; friable when moist, sticky and slightly plastic when wet; roots abundant in upper 4 inches; very strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B21tg—9 to 15 inches, grayish-brown (2.5Y 5/2) fine silty clay; common, medium, faint mottles of yellowish brown (10YR 5/4) and abundant dark-green specks; moderate, medium and coarse, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; traces of mica and some gravel fragments; very strongly acid; gradual, smooth boundary. 6 to 8 inches thick.

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B22tg—15 to 22 inches, olive-gray (5Y 5/2) fine silty clay; abundant, medium, prominent mottles of dark yellowish brown (10YR 4/4); moderate to strong, fine, blocky structure; very firm when moist, plastic and very sticky when wet; very few roots; distinct clay films and flows; traces of mica; strongly acid; gradual, smooth boundary. 6 to 10 inches thick.

B23tg—22 to 36 inches, olive (5Y 5/3) clay or fine silty clay; abundant, medium and coarse, prominent mottles of yellowish red (5YR 5/6); strong, fine and medium, blocky structure; extremely firm when moist, very sticky and very plastic when wet; very few roots; prominent olive-gray (5Y 5/2) clay films and flows; some fragments of decomposed diabase; medium acid; gradual, smooth boundary. 12 to 20 inches thick.

C1g—36 to 46 inches, grayish-brown (2.5Y 5/2) silty clay loam; few, medium, prominent mottles of yellowish red (5YR 4/6); massive to very weak blocky structure; firm when moist, sticky and plastic when wet; no roots; some diabase fragments and iron concretions; slightly acid; abrupt, smooth boundary. 9 to 12 inches thick.

C2g—46 to 60 inches +, olive-gray (5Y 5/2), friable saprolite of silt loam texture; common, coarse, prominent mottles of dark reddish brown (5YR 4/4) and abundant, dark-green specks; massive; no roots; neutral.

The thickness of the solum ranges from about 24 to 40 inches, and the depth to bedrock ranges from about 5 to 10 feet.

In wooded areas there is a thin A1 horizon. The color of this horizon generally has a value one unit lower than the value of the Ap horizon in the profile described.

The texture of the B2tg horizon is mainly silty clay but includes clay and heavy silty clay loam. The clay content is more than 35 percent. The matrix color of this horizon has a value of 4 or 5 and a chroma of 1, 2, or, in some places, 3. Clay films generally are darker colored than the interior of peds. Green specks, which are fine remnants of decomposed rock, are common.

The texture of the C horizon is coarser than that of the B horizon and commonly shows traces of rock structure. The matrix color has about the same range as that of the B horizon. Base saturation is very high, ranging up to 90 percent in the C2g horizon.

Watchung soils are less acid than Baile, Elkton, Fallsington, and Kinkora soils, all of which resemble Watchung soils in being poorly drained and dominantly gray in color. Baile soils have a silty clay loam subsoil; Fallsington soils, a sandy clay loam subsoil; and Elkton and Kinkora soils, a clay or silty clay subsoil.

Watchung silt loam, 0 to 3 percent slopes (WcA).—The profile of this soil is the one described for the series. This soil is very wet. It is difficult to drain and difficult to work. It has severe limitations for cultivated crops but is suited to pasture, if grazing is controlled, and to wetland trees. It is also suitable for wildlife habitats and recreational areas. The hazard of erosion is slight. (Capability unit Vw–1; woodland suitability group 1)

Watchung silt loam, 3 to 8 percent slopes (WcB).—Included in the areas mapped as this soil are some areas that have a less fine textured and less sticky subsoil and a few that have slopes of more than 8 percent. This soil is suited to improved pasture, but grazing should be limited and controlled to prevent the destruction of sod. Wetness and the hazard of erosion are the main limitations. (Capability unit VIw–2; woodland suitability group 1)

Woodstown Series

The Woodstown series consists of deep, moderately well drained, gently sloping, extremely acid soils that are located on the uplands of the Coastal Plain. These soils formed in unconsolidated beds of very old sandy materials that contain moderate amounts of silt and clay. The native vegetation consists of mixed hardwoods that tolerate wetness, mainly oak and hickory, but some holly and maple.

These soils have a thin surface layer of dark grayish-brown, friable sandy loam and a somewhat thicker subsurface layer of grayish-brown, friable sandy loam. In cultivated areas, the plow layer generally is grayish brown in color. The subsoil is yellowish-brown, friable to firm but somewhat sticky sandy clay loam that has mottles in the lower part. Below the subsoil is loose sandy material or, in some places, gravelly material.

Woodstown soils have a moderate available moisture capacity. If well managed, they are moderately to highly productive.

Profile of Woodstown sandy loam, 1 to 5 percent slopes, in a nearly level wooded area about 500 yards due east of the intersection of U.S. Highway No. 1 and Route 32.

O1—3 inches to ½ inch, litter of leaves and twigs.

O2—½ inch to 0, thin mat of decomposed organic materials.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) sandy loam; moderate, fine, granular structure; very friable when moist, slightly sticky but nonplastic when wet; roots abundant; strongly acid; clear, smooth boundary. 2 to 4 inches thick.

A2—3 to 11 inches, grayish-brown (2.5Y 5/2) sandy loam; weak, fine, granular structure; friable when moist, slightly sticky but nonplastic when wet; roots plentiful; strongly acid; clear, wavy boundary. 6 to 13 inches thick.

B21t—11 to 24 inches, yellowish-brown (10YR 5/6) sandy clay loam; weak to moderate, medium, blocky and subangular blocky structure; friable to firm when moist, sticky and slightly plastic when wet; roots common; few but prominent brown (7.5YR 5/4) clay films; grayish silt linings in old root channels; slight tendency toward platiness in lower part; very strongly acid; gradual, smooth boundary. 10 to 14 inches thick.

B22t—24 to 34 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, medium, distinct mottles of light brownish gray (2.5Y 6/2) and few, coarse, distinct mottles of yellowish red (5YR 5/6); weak, medium, blocky structure; firm when moist, sticky and slightly plastic when wet; very few roots; prominent, yellowish-brown (10YR 5/6 to 5/8) clay films and flows; very strongly acid to extremely acid; abrupt, wavy boundary. 7 to 15 inches thick.

IICg—34 to 50 inches +, light-gray (5Y 7/1) very gravelly coarse sand; single grain; loose; a few large blotches of yellowish brown (10YR 5/6); extremely acid.

The thickness of the solum ranges from about 28 to 42 inches. The solum is as much as 10 percent gravel, mostly quartz, and the IIC horizon more than 50 percent.

The color of the A horizon ranges in value from 3 to 6 and in chroma from 1 to 4. The value and chroma are lowest in the A1 horizon.

The texture of the B horizon generally is sandy clay loam but in places is heavy loam or heavy sandy loam. The clay content of the Bt horizon is between 18 and 30 percent. The hue of the thick B21t horizon is 10YR or 2.5 Y, the value is 5 or 6, and the chroma 6 to 8. There is no low-chroma mottling in this horizon. The hue of the

B22t horizon is 10YR, 2.5Y, or 5Y; the value and chroma are the same as in the B21t horizon. There is low-chroma mottling in the B22t, and in places high-chroma mottling. Below the B horizon in some profiles there is a C horizon of sandy loam or an abruptly unconforming IIC horizon of either much coarser textured or much finer textured material.

Woodstown soils are somewhat similar to Delanco and Keyport soils. They have a less fine textured subsoil than either the micaceous Delanco soils or the Keyport soils. Woodstown soils formed in the same kind of material as the well-drained Sassafras soils and the poorly drained Fallsington soils.

Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded (WoB2).—This soil has been plowed and is moderately damaged by erosion, but the profile is otherwise like the one described for the series. Included in the areas mapped are a few nearly level spots, some small gravelly areas, some severely eroded spots, and a few areas that have slopes of more than 5 percent.

If cultivated regularly, this soil needs to be protected against erosion. Drainage is needed for some crops, or at least spot drainage. (Capability unit IIe–36; woodland suitability group 3)

Use and Management of Soils

This section of the soil survey has several parts. The first explains the system of capability classification used by the Soil Conservation Service, suggests management practices for each capability unit, describes basic practices applicable to all the soils in the county, and gives estimates of average yields of commonly grown crops. Other sections tell about the use of the soils as woodland, discuss the potentials of the soils for development of wildlife habitats, describe engineering uses of the soils, and discuss certain recreational and other nonfarm uses of the soils.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on the limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soils, and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit.

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

Class I. Soils have few limitations that restrict their use.

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

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

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

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

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

Class VII. Soils have very severe limitations that make them unsuitable for cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VIII. Soils and land types have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within each capability 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 some parts of the United States but not in Howard County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses identified by *w*, *s*, and *c*, because the soils in this class are subject to little or no erosion, though they have other limitations that restrict their use to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within each subclass. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or Vw–1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within the subclass. In the following pages, the capability units in Howard County are described, and suggestions for the use and management of the soils are given. The capability units are not numbered consecutively, because a statewide system is used for numbering capability units in Maryland and not all of the units in the system are represented in this county.

CAPABILITY UNIT I–4

This capability unit consists of deep, well-drained, medium-textured, nearly level soils of the uplands. These soils are uneroded or only slightly eroded. They retain moisture and plant nutrients well and are fairly easy to work.

The soils of this unit are well suited to general crops, forage crops, pasture, orchard crops, and truck crops. They are highly productive and can be intensively cultivated if they are well managed. Good management includes minimum tillage, the use of all available crop residues, growing legumes and green-manure crops, keeping the supply of plant nutrients high, and applying lime as needed. Neither artificial drainage nor special practices for erosion control are needed.

CAPABILITY UNIT I–6

Only one soil, Comus silt loam, is in this capability unit. This soil is deep, well drained, and nearly level, and it is medium textured throughout. Infrequent flooding is a slight hazard.

This soil is nearly as good for agriculture as the soils of capability unit I–4. It is well suited to corn, forage crops, and pasture. Most areas lack the good air drainage necessary for orchards, however, and early truck crops are generally ruled out by the hazard of flooding. Minimum tillage and good management of crop residues are important. The channels of streams need improvement in some places, and the streambanks need to be stabilized.

CAPABILITY UNIT IIe–4

This capability unit consists of deep, well-drained, medium-textured soils on uplands. These soils are gently sloping. They are moderately eroded, and a few small areas of included soils are severely eroded. Further erosion is a moderate hazard.

Except for the gentle slopes and moderate erosion, the soils are similar to the soils of capability unit I–4. They are suited to general crops, forage crops, pasture, and truck crops. In places better air drainage makes them even more desirable for orchards than the soils of unit I–4.

Contour tillage, if feasible, and a rotation at least 3 years long are advisable. Good management also includes minimum tillage, use of crop residues, including hay or some other close-growing crop in the rotation, growing legumes and green-manure crops, keeping the supply of plant nutrients high, and applying lime as needed.

CAPABILITY UNIT IIe–5

This capability unit consists of deep, well-drained, moderately coarse textured soils that are gently sloping and moderately eroded. These soils are on uplands. They have a friable or very friable plow layer of sandy loam or fine sandy loam. Moisture and plant nutrients are retained moderately well, and the soils are easy to work. Further erosion is a moderate hazard.

These soils are suited to cultivated crops. They need to be protected by a plant cover as much of the time as feasible. A suitable rotation is one that is at least 3 years long and that includes only one clean-tilled crop during the 3-year period. Tilling on the contour, where feasible, and farming in contoured strips are good practices. Good management also includes minimum tillage, the use of crop residues, maintaining a good supply of plant nutrients, and applying a moderate amount of lime as needed. Rotation grazing of pastures will increase carrying capacity.

CAPABILITY UNIT IIe–6

Only one soil, Comus silt loam, local alluvium, 3 to 8 percent slopes, is in this capability unit. This soil is deep and well drained. It is on foot slopes and in depressions on uplands.

This soil is similar to the Comus soil in capability unit I–6, except that it is more sloping. Erosion is a moderate hazard; flooding is not a hazard.

This soil is suited to most of the crops grown in the county. Rotation farming and contour tillage are advisable. Some areas are not suitable for orchards, because air drainage is inadequate. In places intercepting and diverting runoff from adjacent higher areas is necessary to prevent excessive washing during periods of heavy rainfall or rapid snowmelt.

CAPABILITY UNIT IIe–10

This capability unit consists of gently sloping, moderately eroded soils that are rather shallow to moderately deep. These soils are medium textured and are well drained or somewhat excessively drained. They are on uplands.

These soils are moderately susceptible to erosion. Because they are already rather shallow in some places, even small losses of soil material would be damaging. Therefore, practices that control erosion are needed. A rotation at least 3 years long is generally satisfactory. With this rotation, minimum tillage and growing crops in narrow contour strips are desirable practices. A rotation that is 4 or 5 years long and that includes more hay or other close-growing crops than the 3-year rotation will provide better erosion control than one that contains less hay. If a small grain is included in the rotation, it should be seeded in fall after the corn crop is harvested. These soils are suitable for sodded orchards.

CAPABILITY UNIT IIe–13

Moderately well drained, medium-textured, gently sloping soils that are moderately eroded are in this capability unit. The subsoil of these soils is slowly or very slowly permeable.

Runoff is rapid enough that further erosion is a hazard. These soils also have somewhat impeded internal drainage. At times they are too wet for crops to make good growth, and at other times they are too dry. Providing protection from erosion, however, is more important than improving drainage. Nevertheless, good management includes not only practices that help to control erosion but also practices that remove excess surface water, especially in spring. Excess moisture may delay planting in spring.

These soils are well suited to corn, soybeans, some hay crops, and pasture. They are not well suited to crops that may be damaged by frost heaving in winter. If field crops are grown, a good supply of plant nutrients must be maintained, and lime is necessary.

CAPABILITY UNIT IIe–16

This capability unit consists of moderately well drained, medium-textured, gently sloping soils that have a moderately permeable subsoil. These soils are moderately eroded.

These soils tend to be wet in spring. As a result, planting is often somewhat delayed. Protecting the soils from erosion is more important, however, than improving drainage. Stripcropping, interceptor ditches and diversions, and sodded waterways help to control erosion and to dispose of excess water safely. Improvement in internal drainage is not necessary for some crops, particularly corn and soybeans. Where improvement is necessary, it can generally be supplied by spot drainage provided by tile lines or ditches. A rotation that is at least 3 years long is suitable. These soils are not well suited to crops that could be damaged by frost heaving in winter.

CAPABILITY UNIT IIe–25

This capability unit consists of well-drained or somewhat excessively drained, medium-textured, gently sloping soils on uplands. These soils are underlain by loose micaceous material. They are moderately eroded.

These are among the most easily eroded soils in the county. Nevertheless, if they are carefully managed, they are suited to all the crops commonly grown in the county. They are well suited to orchards.

These soils need to be protected by a cover of plants as much of the time as feasible. Runoff can be controlled by contour stripcropping, good management of crop residues, and minimum tillage. Excess water can be dispersed through sodded waterways that lead to safe outlets. A suitable rotation is one that is at least 3 years long. Fertilizer and lime are needed. Wherever feasible, fruit trees should be planted on the contour. The areas around the trees ought to be kept in sod or a cover crop most of the time.

CAPABILITY UNIT IIe–36

Only one soil, Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded, is in this capability unit. This soil is moderately well drained, and it has a moderately permeable subsoil. It is on uplands.

This soil is similar to the soils of capability unit IIe–16, but its plow layer is more sandy. The plow layer is easy to work, and the subsoil is generally easy to drain.

For some crops, particularly corn and soybeans, improvement in drainage is not needed, though seasonal wetness can delay planting in spring. Tile lines are suitable for whatever drainage may be necessary. A rotation at least 3 years long is advisable. Stripcropping and providing interceptor ditches and diversions that lead to sodded waterways help to control erosion and to dispose of excess water safely. Some crops are subject to damage from frost heaving in winter. Generally, however, frost heaving is a less serious hazard than on other soils of the county that are not well drained.

CAPABILITY UNIT IIw–1

Delanco silt loam, 0 to 3 percent slopes, is the only soil in this capability unit. It is a moderately well drained, medium-textured soil on uplands. Permeability is moderately slow in the subsoil.

This soil is similar to the soils of capability unit IIe–6, but it is nearly level and is only slightly susceptible to erosion. This soil is moderately wet, but the common crops can generally be grown if adequate drainage is provided. Some perennial crops, however, are likely to be damaged by frost heaving in winter. Draining this soil is not difficult; tile or open ditches can be used to dispose of seasonal excess water. This soil dries less quickly and warms less readily than most better drained soils. As a result, planting may be somewhat delayed in spring.

CAPABILITY UNIT IIw–7

Codorus silt loam is the only soil in this capability unit. It is a nearly level, moderately well drained, medium-textured soil that is subject to infrequent flooding. This soil is on flood plains throughout the county, but it is most extensive in the central and western parts.

If drainage is improved, this soil can be used for many different crops, although planting of some crops may be delayed. Most of the acreage is in pasture, but some is still wooded. V-type ditches can be used to improve drainage, and runoff from adjacent higher areas should be intercepted and diverted. The stream channels need to be kept clean, and some of them ought to be deepened and straightened.

CAPABILITY UNIT IIw–8

Nearly level, moderately well drained, medium-textured soils on uplands make up this capability unit. Permeability is slow or very slow in the subsoil.

Water infiltrates slowly, and it drains through the profile even more slowly. The soils can be cultivated satisfactorily only within a narrow range of moisture content. In areas that are cultivated, the surface layer tends to pack after heavy rains. Drainage is the most important requirement (fig. 6). V-type ditches, properly spaced, are generally adequate for removing the excess water. If the soils are properly drained, cultivated only when they are neither too wet nor too dry, and otherwise well managed, moderate to fairly high yields can be obtained of most of the crops commonly grown in the area. These soils are not well suited to crops that are damaged by frost heaving in winter.

Figure 6.—**Grassed waterway through an area of Glenville silt loam, 0 to 3 percent slopes, which is in capability unit IIw-8. This waterway is used to dispose of runoff that flows from steeper soils of capability unit IIIe–10.**

CAPABILITY UNIT IIs–4

Rumford loamy sand, 1 to 5 percent slopes, moderately eroded, is the only soil in this capability unit. It is a deep, somewhat excessively drained, coarse-textured soil on uplands. The surface layer of this soil is thick, and it consists of very friable to loose loamy sand. The subsoil is thin and consists of friable sandy loam over loamy sand. The supply of plant nutrients and the content of organic matter are low. Also, this soil is rather low in moisture-storing and moisture-supplying capacity.

This soil is well suited to most crops. It is especially well suited to home gardens because it is easy to work. This soil warms up quickly in spring, and planting can generally be done early. Supplemental irrigation is desirable, and it is necessary in especially dry seasons, if economic yields are to be maintained. If moisture and plant nutrients are supplied, yields are generally very good.

CAPABILITY UNIT IIs–7

This capability unit consists of gently sloping, moderately eroded soils that are dominantly moderately deep, well drained, and medium textured. These soils are on uplands. They are underlain by hard or compacted gravelly material in most places. In some of them, the lower part of the subsoil is hard also.

These soils are subject to further erosion. They need to be well protected to prevent additional losses of soil material. Their chief limitation for agriculture, however, is the restricted depth to which roots can penetrate. Roots generally do not penetrate the hard layers to any extent. Therefore, plants are likely to be damaged by lack of moisture when the soil material above the hard layers dries out. Management practices are needed that conserve moisture, maintain fertility, and reduce or prevent damage from erosion. Further erosion would make these soils even shallower over the restrictive layers.

CAPABILITY UNIT IIs–25

Only one soil, Manor loam, 0 to 3 percent slopes, is in this capability unit. This soil is on uplands. It is well drained or somewhat excessively drained and is medium textured. The moisture-holding capacity is rather low. This soil is highly erodible. It is underlain by loose micaceous material.

Except that this soil is more nearly level and is not significantly eroded, it is similar to the soils of capability unit IIe–25. It can be used for nearly all the crops commonly grown in the county. The chief limitations for agricultural use are the fairly low moisture-holding and moisture-supplying capacity. This soil is generally on ridgetops, within much larger areas of more strongly sloping Manor soils. In most such areas, it is well suited to orchards.

In cultivated areas close-growing crops ought to be grown at least part of the time, and keeping the orchards in a cover crop or sod is advisable. In dry seasons, sprinkler irrigation can be highly effective.

CAPABILITY UNIT IIIe–4

In this capability unit are deep, well-drained, medium-textured soils on uplands. These soils are moderately sloping and are moderately eroded. They occur extensively in all parts of the county and are important for agriculture.

Further erosion is a severe hazard unless these soils are protected. A rotation that is 5 years long is suitable, and hay or some other close-growing crop should be grown most of the time. Other good management practices are keeping tillage to a minimum and growing crops in contour strips. Buffer strips of sod between strips planted to crops are beneficial. Diversions and waterways for carrying off excess water ought to be well sodded.

Planting orchards on the contour is advisable. The areas around the trees ought to be kept in a green-manure crop, a cover crop, or sod most of the time.

CAPABILITY UNIT IIIe–5

Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded, is the only soil in this capability unit. This is a deep, well-drained, moderately coarse textured soil on uplands. It is highly susceptible to further erosion.

The moderate slopes limit the use of this soil for crops unless rather complex practices that control erosion and conserve moisture are intensively applied. This soil is easy to till. It is not advisable to grow tilled crops more often than 1 year in 4, and the soils ought to be protected the rest of the time by close-growing vegetation. Contour stripcropping, diversions, and sodded waterways help to control erosion and conserve moisture. Minimum tillage is a desirable practice, also. This soil is somewhat droughty. Therefore, irrigation would be helpful in long, dry periods.

CAPABILITY UNIT IIIe–7

Well-drained, medium-textured soils on uplands are in this capability unit. These soils are moderately deep over a hard, compact lower subsoil or underlying material. They are moderately sloping and moderately eroded.

The soils of this unit are similar to the soils of capability unit IIs–7 but have stronger slopes, and so are more susceptible to further erosion. Therefore, controlling erosion is more important than overcoming the limitation of restricted root depth.

These soils are suited to general crops, pasture, and orchards. Good management consists of planting crops in contour strips, keeping tillage to a minimum, and carefully disposing of excess water while conserving as much water as possible.

These soils are largely in the path of expanding residential development. Many areas are idle, and some are being mined or exploited for the underlying deposits of gravel.

CAPABILITY UNIT IIIe–10

This capability unit consists of shallow to moderately deep, well-drained or somewhat excessively drained soils that are medium textured. These soils are gently sloping or moderately sloping and are moderately eroded. They are on uplands.

The soils of this unit are similar to those of capability unit IIe–10, but they either have stronger slopes or are shallower over hard bedrock. Loss of only a small additional amount of soil material would be serious.

The soils of this unit have low moisture-supplying capacity, and they tend to be droughty. They are used for most crops and for pasture. If enough lime and fertilizer are applied, the soils are well suited to clover, mixed hay,

and bluegrass or mixed pasture plants. A suitable rotation is one that is 4 or 5 years long and that includes at least 3 years of hay or pasture. Crops should be planted in fairly narrow contour strips. If runoff is diverted to the sodded strips, most of the water can be absorbed by the soils. Any excess water can be channeled through well-sodded waterways that lead to carefully prepared outlets. Supplemental irrigation is of value during dry seasons.

Pastures on these soils ought to be well established before they are grazed. Then, grazing needs to be carefully regulated, according to the carrying capacity of the pasture. Some areas of these soils are in areas of expanding residential development.

CAPABILITY UNIT IIIe–13

This capability unit consists of moderately well drained, medium-textured, moderately sloping soils that are moderately eroded. Natural drainage is restricted because permeability of the subsoil is slow or very slow.

Except that these soils have stronger slopes, they are similar to the soils of capability unit IIe–13. The soils are not especially fertile or productive, but they can be cultivated and are important to farming. Some corn and hay are produced, and a few areas are used for pasture. Many areas are idle, and others have been used for residential development.

Preventing further erosion is the major management requirement. If feasible, runoff from higher areas should be diverted around these soils into well-sodded waterways. These soils should not be plowed, except at long intervals, and tillage ought to be kept to a minimum. Crops should be planted in contour strips, and long rotations are advisable. If worked or grazed when wet, these soils tend to puddle and become even more difficult to manage.

CAPABILITY UNIT IIIe–25

This capability unit consists of well-drained or somewhat excessively drained, medium-textured, moderately sloping soils on uplands. These soils are moderately eroded and are highly susceptible to further erosion. They are underlain by loose micaceous material.

The soils of this unit are similar to those of capability units IIe–25 and IIs–25, except that they have stronger slopes and consequently are more easily eroded. They are suited to crops and pasture, but intensive good management is seriously needed. A tilled crop can be grown once every 4 or 5 years if protective practices are used. In some places it is advisable to grow only hay and to plow and reseed only if the surface soil becomes sodbound. Hayfields can be grazed part of the time.

Contour tillage and stripcropping (fig. 7) are beneficial. Strips narrower than those used on less sloping soils are desirable. Because these soils are easily eroded, special care is needed in disposing of excess water.

CAPABILITY UNIT IIIe–33

Rumford loamy sand, 5 to 10 percent slopes, moderately eroded, is the only soil in this capability unit. It is a deep, somewhat excessively drained, coarse-textured soil on uplands. Its subsoil is sandy loam.

This soil has stronger slopes than the Rumford soil of capability unit IIs–4, but it is similar to that soil in other respects. Like that soil, it is rather low in moisture-storing and moisture-supplying capacity and low in supply of plant nutrients and content of organic matter.

Figure 7.—**Contour stripcropping on soils of capability unit IIIe–25. The strip in the center and the one in the background are pasture.**

Protection from erosion is the principal management need. In addition, a good supply of moisture must be maintained if good yields are to be obtained. Supplemental sprinkler irrigation is desirable, and it may be necessary in dry seasons. Stripcropping and tilling on the contour are good practices that help both to reduce erosion and to conserve moisture. A rotation that is at least 4 years long is suitable. This soil is especially desirable for home gardens.

CAPABILITY UNIT IIIe–41

Only Sandy and clayey land, gently sloping, is in this capability unit. This land type is dominantly well drained and has variable texture. The upper part is a sandy mantle that ranges from a few inches to several feet in thickness. Beneath it is highly unstable clay, of various colors but dominantly red.

This land can be cultivated, but it is very low in fertility, tends to be droughty, and erodes very easily if it is not protected and stabilized. Management practices are needed that check erosion, conserve moisture, and supply plant nutrients. Even under good management, yields are not satisfactory.

This soil is in the part of the county where rapid expansion of residential developments is taking place. Some of the areas are used for clay pits.

CAPABILITY UNIT IIIw–7

This capability unit consists of nearly level soils that are medium textured. Permeability is moderate or moderately slow in the subsoil. The soils are poorly drained, and the areas on bottom lands are subject to frequent severe flooding.

Unless adequate drainage is provided, the use of these soils for crops is severely limited. Drainage can be supplied either by V-type ditches or by tile. All areas not subject to frequent flooding are well suited to corn, soybeans, and pasture. None of the acreage is much used for hay or small grains. Streams in the frequently flooded areas need channel improvement and bank stabilization.

CAPABILITY UNIT IIIw–9

The only soil in this capability unit is Elkton silt loam. This soil is nearly level and is poorly drained. It has a fine-textured, very slowly permeable subsoil that makes it difficult to drain. Field ditches are generally used to remove excess water.

This soil is hard when dry and sticky when wet. Therefore, it can be worked only within a narrow range of moisture content. Corn, soybeans, and other crops can be grown if drainage is improved and lime and fertilizer are applied.

CAPABILITY UNIT IVe–3

This capability unit consists of deep, well-drained, medium-textured soils that are strongly sloping or moderately sloping. Some of these soils are already severely eroded, and the hazard of further erosion is very severe.

Except for stronger slopes, more severe erosion, and greater susceptibility to further erosion, the soils of this unit are similar to the soils of capability units I–4, IIe–4, and IIIe–4. These soils are marginal for cultivation, but good yields of the common crops can be obtained under careful management. Practices that help to control erosion in areas used for crops include contour stripcropping, with the crops grown in narrow strips; a rotation that is at least 5 years long; minimum tillage; use of buffer strips; and retaining crop residues on the surface or plowing them roughly into the surface layer. Terraces may also be beneficial in some places. Runoff can be disposed of safely through sodded diversions and waterways. Carefully planned and maintained outlets are necessary.

These soils are not suited to soybeans, because soybeans do not provide adequate control against erosion. A suitable rotation is one in which hay is grown for at least 4 years in succession. The hay can be grazed part of the time, or permanent pasture can be established. The soils are suitable for well-sodded orchards, especially if the trees are planted on contour terraces.

CAPABILITY UNIT IVe–5

Deep, well-drained or somewhat excessively drained soils that are moderately coarse textured or coarse textured are in this capability unit. These soils are on uplands. They are strongly sloping and moderately eroded. The hazard of further erosion is very severe.

The soils of this unit have a sandy surface layer that is easy to work, and they warm up fairly early in spring. Because of the erosion hazard, it is advisable to grow tilled crops only once in 5 or more years. The crops should be grown in narrow contour strips wherever feasible. Safer uses for these soils are permanent hay, permanent pasture, or contoured orchards in which the trees are surrounded by a permanent ground cover. Whether the soils are used for a tilled crop or for less intensive use, moisture ought to be conserved and all applicable measures to control erosion must be intensively applied. Irrigation is beneficial but may not be economically feasible. Yields of most crops are low to moderate.

CAPABILITY UNIT IVe–7

In this capability unit are well-drained, deep, medium-textured soils that are underlain by hard or compacted material. Some of these soils are strongly sloping, and some are moderately sloping and severely eroded.

The soils of this unit are similar to some of the soils of units IIs–7 and IIIe–7, except that they have stronger slopes or are more seriously eroded. They are not suited to regular cultivation. It is advisable to grow a clean-tilled crop no oftener than once in 5 years and long-term hay or other close-growing crops the rest of the time. Growing more row crops would encourage erosion. These soils are better kept in permanent hay, carefully managed permanent pasture, or sodded orchards or other plantings of trees than used for crops that require cultivation.

CAPABILITY UNIT IVe–9

This capability unit consists of moderately well drained, medium-textured soils that have a slowly permeable subsoil. Some of these soils are strongly sloping, and others are moderately sloping and severely eroded.

These soils are similar to the soils of units IIe–13 and IIIe–13, but they have either stronger slopes or more severe erosion. They are marginal for cultivation; using them for cultivated crops would cause continued erosion. The effective rooting depth is already shallow, and additional losses of soil would render these soils unfit for any intensive use. In emergency, these soils can perhaps be used for tilled crops once in 5 or more years if all appropriate erosion control practices are intensively applied. Pasture or permanent hay are more suitable uses. Because of the slowly permeable subsoil, these soils are not well suited to orchards, but they are well suited to some woodland trees.

CAPABILITY UNIT IVe–10

Shallow to moderately deep, well-drained or somewhat excessively drained soils are in this capability unit. These soils are medium textured. Some are strongly sloping, and others are moderately sloping and severely eroded.

These soils are similar to the soils of units IIe–10 and IIIe–10, but stronger slopes and more severe erosion severely limit their use. Because of the somewhat limited depth to bedrock, further appreciable losses of soil material would be serious. A tilled crop could be grown 1 year in 5 if all appropriate measures were used to protect the soils. Safer uses are hay, carefully managed pasture, or sodded orchards. The soils are fairly well suited to use as woodland.

CAPABILITY UNIT IVe–25

This capability unit consists of well-drained or somewhat excessively drained, medium-textured, highly erodible soils that are underlain by loose micaceous material. Some of these soils are strongly sloping, and others are moderately sloping and severely eroded.

The soils of this unit are similar to those of capability units IIe–25, IIs–25, and IIIe–25, but they have much stronger slopes or are more severely eroded, or both. The effective rooting depth is still adequate, but further erosion is likely if the soils are not carefully protected at all times. Any cultivation should be on the contour, and a tilled crop should be grown no oftener than once in 5 or more years. Terraces need a dense cover of vegetation. They fail if they are not carefully constructed and maintained. Accumulated water in terrace channels must be quickly, but safely, disposed of through heavily sodded

waterways that have adequate outlets. Pasture, permanent hay, or sodded orchards are safer uses than crops that require cultivation.

CAPABILITY UNIT IVw–3

This capability unit consists of poorly drained to moderately well drained soils that have a slowly permeable subsoil. Some have a dense, platy subsoil, and others have an extremely clayey and plastic subsoil.

The soils of this unit are wet for fairly long periods. If they can be drained, they are suitable for pasture and for some field crops. They are difficult to drain well enough to be suitable for the usual crops, but corn, hay, and soybeans are sometimes grown.

Even if these soils are adequately drained, they are difficult to manage. They are hard when dry, and their tough subsoil interferes with deep plowing. Removing the excess water without increasing the hazard of erosion is the chief management problem. The dense, almost impermeable subsoil makes removal of the water difficult. Tile lines are not effective, but shallow ditches can be used to remove surface water from the more nearly level areas.

Runoff is rapid on the stronger slopes, and further erosion is a serious hazard. Runoff must be intercepted and carefully disposed of, or it causes serious damage in cultivated areas. Hay and pasture are safer and more suitable uses for these soils than crops that require cultivation. The soils can also be used for wildlife.

CAPABILITY UNIT IVs–1

Evesboro loamy sand, 1 to 5 percent slopes, is the only soil in this capability unit. It is sandy and excessively drained.

This soil is deep and easy to work. It is rapidly permeable. The supply of plant nutrients is low, and the capacity to retain moisture is very low. Wind erosion is a hazard, and this soil needs to be protected by vegetation much of the time. Other suitable practices are the following: Including a close-growing crop in the rotation; planting crops in strips crosswise to the direction of the most erosive winds; and establishing local windbreaks. The supply of organic matter can be increased by keeping crop residue on the surface or plowing it into the surface layer.

In Howard County this soil is not used extensively for agriculture. Because it is easily tilled, however, it is sometimes used for home gardens. Some lime and large amounts of fertilizer are required. Slow-release fertilizers are especially effective. Annual crops need irrigation in dry years.

CAPABILITY UNIT Vw–1

This capability unit consists of poorly drained, medium-textured soils that have a slowly or very slowly permeable subsoil. It is very difficult to drain these soils well enough to make them suitable for cultivated crops.

The soils of this unit are on upland flats, in depressions, and in gently sloping areas around and above the heads of drains. They also occupy low spots on old stream terraces. Most of the areas that have been cleared are idle or in improved or partly improved pastures. Many spots support water-tolerant trees or other woodland plants. A few areas are in hay or corn. Improved pasture is generally the most intensive suitable use.

Figure 8.—**An open-ditch drain in an improved pasture on Baile silt loam, which is in capability unit Vw–1.**

Drainage ought to be improved as much as feasible by intercepting runoff from higher areas and by using open ditches (fig. 8) to dispose of surface water. Tile drains generally do not function well in these tight soils.

CAPABILITY UNIT VIe–2

In this capability unit are dominantly deep, well-drained soils that are steep or strongly sloping. Most of these soils are severely eroded.

These soils occur as small areas in all parts of the county. They are either too steep or too severely eroded to be suitable for clean-tilled crops. Even if no crops except hay are grown, some further erosion may occur unless intensive practices are used to protect the soils. Generally, pasture is the most intensive suitable use. The pastures must be well managed and protected from overgrazing. Any areas that are now wooded should probably remain in trees, and some areas might well be reforested.

CAPABILITY UNIT VIe–3

This capability unit consists dominantly of shallow soils that are well drained to excessively drained. These soils are steep or strongly sloping. They are severely eroded and are highly susceptible to further erosion.

These soils are not suitable for cultivation. Much of the acreage has been cleared, but the steepest, least eroded areas are still in trees. Most of the cleared areas are used for pasture, are idle, or are in some farm use.

Pastures may be developed by liming, fertilizing, and seeding these soils. Grazing should not be allowed until the sod is well established, and then only moderate grazing ought to be permitted at any time. Controlling brush and weeds is difficult. In areas that are too steep or too rough for mowing, the brush and weeds must be controlled by hand or by chemicals. Terraces in the pastures would slow runoff and permit water to soak in.

Woodland is a better use for these soils than poorly managed pasture. Many of the areas are suitable for trees and could be reforested.

CAPABILITY UNIT VIw–1

Only Mixed alluvial land is in this capability unit. It is a nearly level, wet land type that is subject to frequent, and sometimes severe, flooding.

This land type consists of a mixture of individual soils. The soils are not mapped separately, because they are too variable in depth, texture, and other characteristics. The texture of the surface layer ranges from sand and gravel to silt or clay.

This land is most commonly used as woodland or as wildlife habitat. If it is drained, protected from flooding, and well managed, it is suitable for hay or pasture. Cultivation is generally not feasible.

CAPABILITY UNIT VIw–2

Watchung silt loam, 3 to 8 percent slopes, is the only soil in this capability unit. It is poorly drained.

This soil is hard when dry, tough when moist, and sticky when wet. The subsoil is so slowly permeable that drainage, except partial drainage to improve grazing, is generally impractical. This soil is so wet, so difficult to drain, and so difficult to work that it is not suitable for cultivated crops. Some areas are in trees, some are idle, and a few are used for grazing. The areas to be grazed can be improved by ditching, seeding, applying fertilizer and lime, and controlling brush and weeds. There is a slight hazard of erosion if cover is not maintained.

CAPABILITY UNIT VIs–3

This capability unit consists of well-drained to excessively drained soils that are gently sloping to moderately steep. These soils are very stony.

These soils are too steep and too stony to be suitable for cultivated crops. They can be used for pasture, or possibly for limited production of hay. If used for pasture or hay, they must be partly cleared of stones, limed and fertilized, and seeded with an appropriate mixture. After pastures are established, grazing should be limited. Overgrazing or overtrampling will result in erosion. Wooded areas ought to remain so, and some areas could be reforested. Moderate returns can be obtained from properly managed woodland.

CAPABILITY UNIT VIIe–2

In this capability unit are somewhat poorly drained to well-drained soils that have a clayey subsoil. These soils are steep. Most of them are severely eroded, and further erosion is a hazard.

These soils are not suitable for cultivation. They can be used for limited grazing. Intensive preparation is necessary to establish good pastures, and careful control of grazing is necessary to maintain them. Woodland is a more suitable use.

CAPABILITY UNIT VIIe–3

Well-drained to excessively drained soils that are steep or very steep make up this capability unit. These soils are dominantly shallow over bedrock. They are severely eroded in many places and are subject to further erosion.

Cultivation of these soils is not safe, and grazing is severely limited, even under the most intensive management. Most cleared areas are severely eroded. The less eroded areas are wooded.

Much of the cleared acreage of these soils ought to be reforested. Livestock should be kept out of wooded or reforested areas, and fires should be prevented.

CAPABILITY UNIT VIIs–1

Evesboro loamy sand, 5 to 15 percent slopes, is the only soil in this capability unit. It is excessively drained and is very sandy throughout. The slopes are irregular.

This soil is droughty and low in natural fertility. It is not suited to cultivation, but it can be used for very limited grazing, as woodland, or for gardens that receive especially intensive management. The areas that have not been cleared and farmed provide shelter for wildlife, mainly quail, rabbits, and squirrels. Most of the areas are in the path of residential development in the eastern part of the county.

CAPABILITY UNIT VIIs–3

In this capability unit are soils that are well drained, steep or very steep, and very stony. These soils are too steep and too stony to be suitable for farm use, even for grazing. They are suited to trees, and they can be used for watershed protection, wildlife habitat, and some kinds of recreation. Returns from woodland products are fairly good. On the steepest slopes, growing timber or tree farming may not be economically feasible. Much of the acreage is in Patapsco State Park.

CAPABILITY UNIT VIIIs–1

Only one miscellaneous land type, Stony land, is in this capability unit. This land type is of no use for farming. Some areas have a cover or a partial cover of trees, but management for the production of wood crops would not be economically feasible. These areas make good habitat for some kinds of wildlife.

CAPABILITY UNIT VIIIs–4

This capability unit consists of Gravel pits and quarries. All of the soil material has been removed from the areas.

These areas are of no use for farming. Some of the gravel pits can be revegetated so as to improve their appearance and provide shelter for wildlife. Some of the excavations can be used for ponds.

General Management Requirements

Some of the management practices needed to insure optimum yields of crops and, at the same time, to conserve the soils can conveniently be summarized for all the soils of the county. Among these are the adequate use of lime and fertilizer, proper tillage, drainage of wet soils, and irrigation of soils in dry years.

Lime and fertilizer

The soils of Howard County need lime and fertilizer for most crops. All of the soils are acid, and some are extremely acid. Many are moderate in fertility, and some are low to very low. The amount of lime and the kinds and amounts of fertilizer needed can be judged by observing how well crops have responded in the past, by determining the yield level at which the farmer is operating,

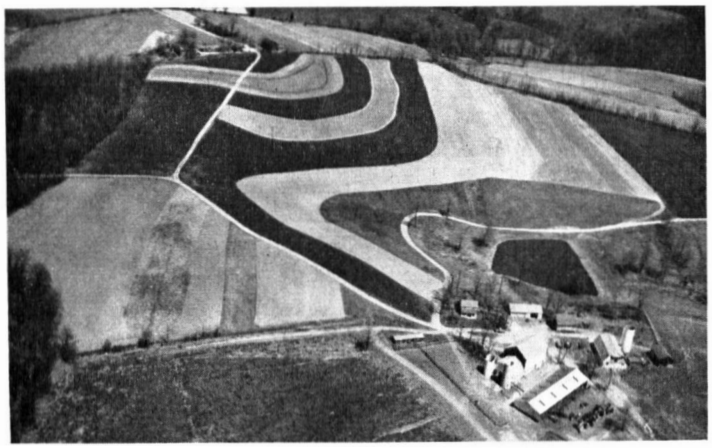

Figure 9.—**Contour stripcropping, near Annapolis Rock, on Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded.**

and by studying records of previous management, especially the results of chemical tests.

Lime generally is needed about once every 3 years. Evesboro and other very sandy soils need about 1 ton per acre. Most other soils need 2 to 3 tons per acre. Wet soils that have a high content of clay, the Elkton and Kinkora soils, for example, need 3 to 5 tons or more.

Too much lime is as bad as too little, particularly for sandy soils.

Tillage

The continued use of heavy machinery to cultivate row crops damages soil structure and causes compaction. Soils that are normally moist or wet in spring, such as those of the moderately well drained to poorly drained Aldino, Elkton, Kelly, and Leonardtown series, are most likely to be affected.

Compaction impedes infiltration and aeration. It slows internal drainage, an effect that is especially damaging to poorly drained soils, such as those of the Baile, Elkton, Fallsington, Hatboro, Leonardtown, and Watchung series. Compaction of sloping soils increases the amount and rate of runoff and the hazard of erosion. To restore good structure to already compacted soils, the organic-matter content should be replenished and sod crops should be grown.

Sloping soils that are susceptible to erosion but suitable for cultivation should be tilled on the contour and stripcropped on the contour (fig. 9). Contour tillage reduces by 20 to 40 percent the annual loss of soil through erosion, as compared to the loss resulting from tillage without regard to slope. Contour stripcropping reduces the loss by 60 to 75 percent. The steeper the slope, the narrower the strips need to be.

Drainage

Many farms in Howard County are located mostly on well-drained soils. Only about 15 percent of the acreage needs artificial drainage. About two-thirds of the total acreage that requires drainage consists of moderately well drained or somewhat poorly drained soils, and one-third of poorly drained soils.

Soils that require no artificial drainage are those of the Aura, Brandywine, Chester, Chillum, Comus, Elioak, Elsinboro, Evesboro, Fairfax, Glenelg, Legore, Linganore, Manor, Montalto, Mt. Airy, Neshaminy, Relay, Rumford, Sassafras, and Sunnyside series. These soils make up about 85 percent of the total area of the county.

Soils that require moderate artificial drainage for farming are those of the Aldino, Beltsville, Codorus, Delanco, Glenville, Iuka, Kelly, Keyport, and Woodstown series. These soils make up about 10 percent of the county area.

Soils that require intensive artificial drainage for farming are those of the Baile, Elkton, Fallsington, Hatboro, Kinkora, Leonardtown, and Watchung series. These soils make up about 5 percent of the county area.

The kinds of drainage systems that can be used effectively in this county are explained in the 1960 "Drainage Guide for Maryland," which can be obtained from the Maryland Agricultural Extension Service or the Maryland Agricultural Experiment Station.

Codorus, Comus, and Hatboro soils and Mixed alluvial land are located on flood plains. The severity of the flood hazard varies from place to place. Records of flooding are the best guides to the need for protection.

Irrigation

Although generally the amount of rainfall is adequate and the distribution favorable for the growth of crops, there are dry years when irrigation could be the means of sustaining crop yields. Information concerning irrigation is given in the "Maryland Guide for Sprinkler Irrigation," which can be obtained from the Maryland Agricultural Extension Service or the Maryland Agricultural Experiment Station. Features that affect the suitability of individual soils for irrigation are given in table 7, "Engineering Interpretations," in the section "Engineering Uses of Soils."

Estimated Yields

Table 4 shows the estimated average acre yields of specified crops on most soils of the county under two levels of management. Yields are not given for Gravel pits and quarries, Made land, and Stony land, because crops are not grown on those areas. In columns A are shown the estimated average acre yields of specified crops under management commonly used in this county. In columns B are average acre yields of specified crops under improved management.

To obtain the yields shown in columns B, most, if not all, of the following practices have to be used:

1. Crop varieties suited to the soils are selected for planting.
2. Contour tillage, stripcropping, terracing, minimum tillage, and similar practices are used to help control erosion on soils that are suitable for cultivation but susceptible to erosion; the soils that need drainage are drained, and the drainage systems are well maintained; excess water is disposed of safely; and irrigation water is supplied to the areas that need it.
3. The rotations are of adequate length. They generally consist of a tilled crop to help control weeds; a deep-rooted crop to improve permeability in tight soils; legumes for 1 or more years to

TABLE 4.—*Estimated average yields of specified*

[Estimated yields in columns A are those obtained under present average management; estimated yields in columns B are those obtained considered suitable for the crop, or that no information is available upon which to base an estimate. Gravel pits and quarries (Gp), Made

Map symbol	Soil	Corn		Wheat	
		A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*
AdB2	Aldino silt loam, 3 to 8 percent slopes, moderately eroded	40	80	14	27
AdC2	Aldino silt loam, 8 to 15 percent slopes, moderately eroded	35	75	13	25
AgB2	Aura gravelly loam, 1 to 5 percent slopes, moderately eroded	30	75	11	29
AgC2	Aura gravelly loam, 5 to 10 percent slopes, moderately eroded	25	70	10	27
AgE3	Aura gravelly loam, 10 to 30 percent slopes, severely eroded				
Ba	Baile silt loam				
BeA	Beltsville silt loam, 0 to 1 percent slopes	40	75	14	27
BeB2	Beltsville silt loam, 1 to 5 percent slopes, moderately eroded	40	80	14	27
BeC2	Beltsville silt loam, 5 to 10 percent slopes, moderately eroded	35	70	13	25
BeC3	Beltsville silt loam, 5 to 10 percent slopes, severely eroded	30	65	11	22
BeD2	Beltsville silt loam, 10 to 15 percent slopes, moderately eroded	35	70	12	24
BrB2	Brandywine loam, 3 to 8 percent slopes, moderately eroded	25	75	14	26
BrC2	Brandywine loam, 8 to 15 percent slopes, moderately eroded	20	70	12	24
BrC3	Brandywine loam, 8 to 15 percent slopes, severely eroded	15	60	10	20
BrD2	Brandywine loam, 15 to 25 percent slopes, moderately eroded	20	65	11	21
BrD3	Brandywine loam, 15 to 25 percent slopes, severely eroded				
BrF	Brandywine loam, 25 to 60 percent slopes				
BwD	Brandywine very stony loam, 3 to 25 percent slopes				
ChA	Chester silt loam, 0 to 3 percent slopes	60	125	23	43
ChB2	Chester silt loam, 3 to 8 percent slopes, moderately eroded	60	120	22	42
ChC2	Chester silt loam, 8 to 15 percent slopes, moderately eroded	60	115	21	40
ChC3	Chester silt loam, 8 to 15 percent slopes, severely eroded	50	105	18	37
ChD2	Chester silt loam, 15 to 25 percent slopes, moderately eroded	55	110	20	38
CgB2	Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	60	120	22	42
CgC2	Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	60	115	21	40
CmB2	Chillum silt loam, 1 to 5 percent slopes, moderately eroded	45	115	17	40
CmC2	Chillum silt loam, 5 to 10 percent slopes, moderately eroded	45	105	16	40
ClC3	Chillum gravelly loam, 5 to 10 percent slopes, severely eroded	40	95	14	27
ClD2	Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded	40	95	15	35
ClE2	Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded				
CnB2	Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded	45	115	17	40
CnD3	Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded				
Co	Codorus silt loam	75	120	24	38
Cs	Comus silt loam	85	135	27	43
CuB	Comus silt loam, local alluvium, 3 to 8 percent slopes	85	135	27	43
DeA	Delanco silt loam, 0 to 3 percent slopes	60	120	21	39
DeB2	Delanco silt loam, 3 to 8 percent slopes, moderately eroded	60	125	21	40
EkA	Elioak silt loam, 0 to 3 percent slopes	60	125	23	43
EkB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded	60	120	22	42
EkC2	Elioak silt loam, 8 to 15 percent slopes, moderately eroded	60	115	21	40
EkD2	Elioak silt loam, 15 to 25 percent slopes, moderately eroded	55	110	20	38
ElC3	Elioak silty clay loam, 8 to 15 percent slopes, severely eroded	50	105	18	37
ElD3	Elioak silty clay loam, 15 to 25 percent slopes, severely eroded				
Em	Elkton silt loam	40	80		30
EnA	Elsinboro loam, 0 to 3 percent slopes	60	125	23	43
EnB2	Elsinboro loam, 3 to 8 percent slopes, moderately eroded	60	120	22	42
EnC2	Elsinboro loam, 8 to 15 percent slopes, moderately eroded	60	115	21	40
EvB	Evesboro loamy sand, 1 to 5 percent slopes	37	90	14	30
EvC	Evesboro loamy sand, 5 to 15 percent slopes				
Fa	Fallsington loam	45	90		35
GlA	Glenelg loam, 0 to 3 percent slopes	60	125	23	43
GlB2	Glenelg loam, 3 to 8 percent slopes, moderately eroded	60	120	22	42
GlC2	Glenelg loam, 8 to 15 percent slopes, moderately eroded	60	115	21	40
GlC3	Glenelg loam, 8 to 15 percent slopes, severely eroded	50	105	18	37
GlD2	Glenelg loam, 15 to 25 percent slopes, moderately eroded	55	110	20	38
GlD3	Glenelg loam, 15 to 25 percent slopes, severely eroded				
GnA	Glenville silt loam, 0 to 3 percent slopes	40	75	14	27
GnB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	40	80	14	27
GnC2	Glenville silt loam, 8 to 15 percent slopes, moderately eroded	35	75	13	25
Ha	Hatboro silt loam		100		33
IuB	Iuka loam, local alluvium, 1 to 5 percent slopes	70	105	25	40
KeB2	Kelly silt loam, 3 to 8 percent slopes, moderately eroded	35	80	16	31

See footnotes at end of table.

crops under two levels of management

under improved management. Absence of a yield figure indicates that the crop is not commonly planted on the soil, or that the soil is not land (Md), and Stony land (St) are not used for farming and, therefore, are not included in this table]

Oats or barley		Alfalfa and grass hay		Tall-grass and clover hay		Lespedeza		Bluegrass pasture		Tall-grass pasture	
						Hay	Seed				
A	B	A	B	A	B	B[1]	B[1]	A	B	A	B
Bu.	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Cow-acre-days*[2]	*Cow-acre-days*[2]	*Cow-acre-days*[2]	*Cow-acre-days*[2]
22	41	1.4	3.2	1.3	3.1	1.7	275	60	150	80	180
20	39	1.3	3.1	1.2	2.9	1.6	260	55	140	75	170
17	43	1.0	2.8	.9	2.9	1.5	240	40	130	55	150
16	41	1.0	2.7	.8	2.7	1.4	230	40	120	50	140
								30	100	35	110
					2.3			40	85	65	105
22	45	1.3	2.9	1.3	3.0	1.6	270	50	115	80	170
22	41	1.4	3.2	1.3	3.0	1.7	275	50	115	80	170
20	39	1.3	3.1	1.2	2.5	1.6	260	50	95	75	150
17	34	1.2	2.9	1.1	2.0	1.4	240	35	65	60	115
19	37	1.3	3.0	1.2	2.1	1.5	250	40	75	65	120
20	39	1.2	2.9	1.1	2.8	1.3	230	45	90	65	115
18	36	1.1	2.8	1.0	2.7	1.3	215	45	85	60	110
14	29	1.0	2.5	.9	2.5	1.1	195	30	60	45	90
15	32	1.0	2.6	1.0	2.6	1.2	200	30	60	50	95
		.9	2.4	.8	2.4	1.1	180	25	50	40	85
								25	50	40	85
					1.3	.3	60		45	25	45
33	62	2.5	4.8	1.8	3.3	2.4	380	70	140	100	270
31	60	2.4	4.7	1.7	3.2	2.4	370	70	140	95	270
30	57	2.3	4.6	1.7	3.1	2.3	360	65	140	95	260
26	53	2.1	4.3	1.5	3.0	2.2	340	60	130	85	240
27	54	2.2	4.4	1.6	3.0	2.2	350	65	140	90	250
31	60	2.4	4.7	1.7	3.2	2.4	370	70	140	95	270
30	57	2.3	4.6	1.7	3.1	2.3	360	65	140	95	260
25	60	2.0	4.4	1.4	3.5	1.9	310	55	120	85	250
23	60	1.9	4.2	1.3	3.4	1.8	295	50	120	80	240
20	50	1.7	3.9	1.2	3.2	1.6	270	45	115	75	230
22	50	1.8	4.0	1.3	3.3	1.7	275	50	120	80	235
		1.7	3.9	1.2	3.2	1.6	270	45	120	75	230
25	60	2.0	4.4	1.4	3.5	1.9	310	55	120	85	250
		1.6	3.7	1.1	3.0	1.5	250	45	110	70	220
35	56	2.6	4.1	1.9	3.1	2.3	360	75	140	115	260
39	62	3.0	4.8	2.1	3.3	2.4	380	80	140	120	270
39	62	3.0	4.8	2.1	3.3	2.4	380	80	140	120	270
29	56	2.2	4.1	1.7	3.1	2.3	350	70	140	95	260
29	57	2.3	4.5	1.7	3.2	2.4	360	70	140	95	265
33	62	2.5	4.8	1.8	3.3	2.4	380	70	140	100	270
31	60	2.4	4.7	1.7	3.2	2.4	370	70	140	95	270
30	57	2.3	4.6	1.7	3.1	2.3	360	65	140	95	260
27	54	2.2	4.4	1.6	3.0	2.2	350	65	140	90	250
26	53	2.1	4.3	1.5	3.0	2.2	340	60	130	85	240
		2.0	4.1	1.4	2.8	2.1	335	60	120	80	235
	45				3.0	1.4	230	45	115		170
33	62	2.5	4.8	1.8	3.3	2.4	380	70	140	100	270
31	60	2.4	4.7	1.7	3.2	2.4	370	70	140	95	270
30	57	2.3	4.6	1.7	3.1	2.3	360	65	140	95	260
21	45	1.2	2.5	.9	2.0	1.7	295	30	60	65	140
		1.1	2.3	.8	1.8	1.7	285	25	55	60	130
	50				3.0	1.9	295	50	115		170
33	62	2.5	4.8	1.8	3.3	2.4	380	70	140	100	270
31	60	2.4	4.7	1.7	3.2	2.4	370	70	140	95	270
30	57	2.3	4.6	1.7	3.1	2.3	360	65	140	95	260
26	53	2.1	4.3	1.5	3.0	2.2	340	60	130	85	240
27	54	2.2	4.4	1.6	3.0	2.2	350	65	140	90	250
		2.0	4.1	1.4	2.8	2.1	335	60	120	80	235
22	41	1.4	3.0	1.3	3.0	1.6	270	60	145	80	180
22	41	1.4	3.2	1.3	3.1	1.7	275	60	150	80	180
20	39	1.3	3.1	1.2	2.9	1.6	260	55	140	75	170
	47			1.8	2.8	2.1	325	70	115	95	155
37	59	2.7	4.0	1.9	3.0	2.4	380	60	115	110	230
24	47			1.3	2.6	1.8	290	50	110	75	140

TABLE 4.—*Estimated average yields of specified*

Map symbol	Soil	Corn		Wheat	
		A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*
KeC2	Kelly silt loam, 8 to 15 percent slopes, moderately eroded	35	75	15	29
KcE3	Kelly clay loam, 15 to 30 percent, severely eroded				
KhC2	Keyport silt loam, 3 to 10 percent slopes, moderately eroded	50	95	17	33
Kn	Kinkora silt loam				
LeB2	Legore silt loam, 3 to 8 percent slopes, moderately eroded	35	75	20	34
LeC2	Legore silt loam, 8 to 15 percent slopes, moderately eroded	35	70	19	32
LgC3	Legore silty clay loam, 8 to 15 percent slopes, severely eroded	30	65	16	29
Ll	Leonardtown silt loam		65		24
LnB2	Linganore channery loam, 3 to 8 percent slopes, moderately eroded	25	75	14	26
LnC2	Linganore channery loam, 8 to 15 percent slopes, moderately eroded	20	70	12	24
LnD2	Linganore channery loam, 15 to 25 percent slopes, moderately eroded				
LoE	Linganore channery silt loam, 25 to 45 percent slopes				
MlA	Manor loam, 0 to 3 percent slopes	50	125	21	43
MlB2	Manor loam, 3 to 8 percent slopes, moderately eroded	50	120	20	42
MlC2	Manor loam, 8 to 15 percent slopes, moderately eroded	50	115	19	40
MlC3	Manor loam, 8 to 15 percent slopes, severely eroded	40	105	16	37
MlD2	Manor loam, 15 to 25 percent slopes, moderately eroded	45	110	18	38
MlD3	Manor loam, 15 to 25 percent slopes, severely eroded				
MlE	Manor loam, 25 to 45 percent slopes				
MgB2	Manor gravelly loam, 3 to 8 percent slopes, moderately eroded	50	120	20	42
MgC2	Manor gravelly loam, 8 to 15 percent slopes, moderately eroded	50	115	19	40
MgC3	Manor gravelly loam, 8 to 15 percent slopes, severely eroded	40	105	16	37
MnD	Manor very stony loam, 3 to 25 percent slopes				
MnF	Manor very stony loam, 25 to 60 percent slopes				
Mo	Mixed alluvial land				
MpB2	Montalto silt loam, 3 to 8 percent slopes, moderately eroded	75	125	26	43
MpC2	Montalto silt loam, 8 to 15 percent slopes, moderately eroded	70	120	24	41
MqC3	Montalto silty clay loam, 8 to 15 percent slopes, severely eroded	60	110	22	38
MrE	Montalto and Relay soils, 15 to 45 percent slopes				
MsD	Montalto and Relay very stony silt loams, 3 to 25 percent slopes				
MsF	Montalto and Relay very stony silt loams, 25 to 60 percent slopes				
MtB2	Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded	25	75	15	28
MtC2	Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded	20	70	12	24
MtC3	Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded				
MtD2	Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded				
MtE	Mt. Airy channery loam, 25 to 45 percent slopes				
NeB2	Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	75	125	26	43
NeC2	Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	70	120	24	41
NsD3	Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded				
ReC2	Relay silt loam, 3 to 15 percent slopes, moderately eroded	65	105	22	38
RuB2	Rumford loamy sand, 1 to 5 percent slopes, moderately eroded	50	95	19	37
RuC2	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	45	90	18	35
RuD2	Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	45	85	17	33
ScB	Sandy and clayey land, gently sloping	25	75	10	30
ScD	Sandy and clayey land, moderately sloping				
ScE	Sandy and clayey land, moderately steep				
SfB2	Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded	55	110	21	40
SfC2	Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	55	105	20	38
SfD2	Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	50	100	19	36
SlB2	Sassafras loam, 1 to 5 percent slopes, moderately eroded	55	110	21	40
SlC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	55	105	20	38
SlD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded	50	100	19	36
SsE	Sassafras soils, 15 to 40 percent slopes				
SuB2	Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded	55	110	21	40
SuD2	Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded	50	100	19	36
WaA	Watchung silt loam, 0 to 3 percent slopes				
WaB	Watchung silt loam, 3 to 8 percent slopes				
WoB2	Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded	55	90	20	38

[1] Crop generally grown only under improved management.

[2] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of days the pasture can be grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows, for example, has a carrying capacity of 60 cow-acre-days.

crops under two levels of management—Continued

Oats or barley		Alfalfa and grass hay		Tall-grass and clover hay		Lespedeza		Bluegrass pasture		Tall-grass pasture	
						Hay	Seed				
A	B	A	B	A	B	B[1]	B[1]	A	B	A	B
Bu.	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Cow-acre-days*[2]	*Cow-acre-days*[2]	*Cow-acre-days*[2]	*Cow-acre-days*[2]
23	44			1.3	2.6	1.7	280	45	110	70	135
									90		120
25	48	1.7	3.5	1.7	3.0	2.1	325	55	115	90	200
				1.2	2.3	1.6	255	50	100	70	135
29	49	2.4	3.8	1.7	2.9	2.0	325	70	135	95	230
28	48	2.3	3.6	1.6	2.8	1.9	305	65	130	90	220
24	42	2.0	3.3	1.4	2.6	1.8	280	60	120	80	200
	36			1.0	1.8	1.3	205	30	55	60	110
20	39	1.2	2.9	1.1	2.8	1.3	230	45	90	65	115
18	36	1.1	2.8	1.0	2.7	1.3	215	45	85	60	110
		1.0	2.6	1.0	2.6	1.2	200	30	60	50	95
								25	50	40	85
31	62	2.3	4.8	1.6	3.3	2.4	380	60	140	90	270
29	60	2.2	4.7	1.5	3.2	2.4	370	60	140	85	270
28	57	2.1	4.6	1.5	3.1	2.3	360	55	140	85	260
24	53	1.9	4.3	1.3	3.0	2.2	340	50	130	75	240
25	54	2.0	4.4	1.4	3.0	2.2	350	55	140	80	250
		1.8	4.1	1.2	2.8	2.1	335	50	120	70	235
								40	100	60	200
29	60	2.2	4.7	1.5	3.2	2.4	370	60	140	85	270
28	57	2.1	4.6	1.5	3.1	2.3	360	55	140	85	260
24	53	1.9	4.3	1.3	3.0	2.2	340	50	130	75	240
			3.5		2.5	1.8		45	115	65	220
								30	100	50	200
				1.6	2.6	1.8	300	60	100	85	140
37	63	2.9	4.4	2.0	3.4	2.4	390	75	150	115	250
35	60	2.7	4.3	1.9	3.3	2.4	380	75	145	110	245
31	55	2.6	4.0	1.8	3.1	2.3	360	70	140	100	230
		2.5	3.9	1.7	3.0	2.2	340	65	130	95	220
		2.7	4.3	1.9	3.3	2.4	380	75	145	110	245
								60	120	90	220
22	42	1.3	2.9	1.2	2.8	1.3	230	50	120	70	150
18	36	1.1	2.8	1.0	2.7	1.3	215	45	110	60	130
		.9	2.4	.9	2.5	1.1	190	30	80	55	110
		1.0	2.6	1.0	2.6	1.2	200	30	85	50	115
								25	60	40	95
37	63	2.9	4.4	2.0	3.4	2.4	390	75	150	115	250
35	60	2.7	4.3	1.9	3.3	2.4	380	75	145	110	245
		2.5	3.9	1.7	3.0	2.2	340	65	130	95	220
31	55	2.6	4.0	1.8	3.1	2.3	360	70	140	100	230
29	55	1.9	3.7	1.5	2.8	1.8	310	50	115	85	230
27	52	1.8	3.6	1.4	2.7	1.8	300	50	110	85	220
26	50	1.8	3.5	1.4	2.6	1.7	290	45	100	80	210
15	45	1.0	3.0	.8	2.2	1.5	240	45	100	60	130
		.9	2.8	.7	2.0	1.3	220	40	90	50	115
								30	80	40	95
30	58	2.2	4.3	1.6	3.1	2.2	345	60	115	95	230
29	55	2.1	4.2	1.6	3.0	2.1	325	55	110	90	220
27	52	2.0	4.0	1.5	2.9	2.0	320	55	110	85	210
30	58	2.2	4.3	1.6	3.1	2.2	345	60	115	95	230
29	55	2.1	4.2	1.6	3.0	2.1	325	55	110	90	220
27	52	2.0	4.0	1.5	2.9	2.0	320	55	110	85	210
		1.9	3.7	1.4	2.6	1.9	310	45	95	75	180
30	58	2.2	4.3	1.6	3.1	2.2	345	60	115	95	230
27	52	2.0	4.0	1.5	2.9	2.0	320	55	110	85	210
					2.3			40	85	65	105
					2.5			50	100	80	130
29	50	2.1	4.1	1.6	3.0	2.2	345	55	115	90	230

help maintain or improve fertility; and a close-growing crop or a green-manure crop. The green-manure crop helps to improve the structure and tilth of the soil, supplies organic matter, and helps to control erosion.

4. Manure and crop residues are turned under to supply organic matter, as well as nitrogen and other plant nutrients. This also improves tilth and helps to reduce losses from erosion.
5. Fertilizer and lime are applied according to the needs indicated by the results of soil tests.
6. Suitable methods of plowing, preparing the seedbed, and cultivating are used, but tillage is kept to a minimum.
7. Planting, cultivating, and harvesting are done at the proper time and in the proper way.
8. Weeds, diseases, and insects are controlled by the most practical means.

The yields shown in columns B are not presumed to be the maximum attainable. Rather, they are goals that are practical for most farmers to reach. Of course, differences in the weather, in the varieties of crops that are grown, and in the numbers and kinds of insects, diseases, and weeds cause differences in yields on the same soil.

More information about management needs can be found in the section "Capability Groups of Soils." Methods of irrigating and draining the soils are described in the section "Engineering Uses of Soils."

Woodland [3]

Only about 15 percent of the acreage in Howard County was in forest in 1959. The wooded areas are of four main kinds: cutover woodland, forests of old-growth hardwoods, woodland in poorly drained areas, and woodland in abandoned areas.

Cutover woodland.—Most of the forested acreage in the county consists of cutover woodland. This includes farm woodlots, which vary greatly in composition and in management. In the cutover areas on the Piedmont Plateau, oak is dominant and the secondary species are hickory, elm, locust, maple, and dogwood. Virginia pine grows on some of the more eroded soils. It is the most common species growing on the Coastal Plain. Scrub oak is also abundant, and there are a few shortleaf pines and loblolly pines.

Cutover woodland protects the watershed, provides shelter for wildlife, and produces some timber. It receives little protection from fire or grazing.

Forests of old-growth hardwoods.—Nearly all of this kind of woodland is on large farms and estates. The dominant trees are white oak, red oak, some yellow-poplar, locust, hickory, and black walnut. The total acreage is small.

Because of the esthetic and sentimental values to the owners, this kind of woodland has not been exploited. Many of the trees are mature, and some are overmature. Under good woodland management, the older trees would be marketed to make room for the growth of younger trees.

Woodland in poorly drained spots.—This kind of woodland occupies poorly drained spots on uplands and on some terraces and flood plains. Nearly all of the acreage has been cut over, but the common species are different from those in the cutover forests of the drier areas. Pin oak, scarlet oak, and swamp maple are the most common, but the stands include other maples, hickories, elms, birches, and willows. Some areas are covered by a scrubby growth of trees or by an almost pure stand of alder. In some places holly is common.

This kind of woodland has little economic importance. It produces some fenceposts and fuel, and it generally provides good shelter for wildlife. Some spots have been made suitable for pasture by thinning of the trees. In such places only enough trees have been left to provide shade for livestock.

Woodland in abandoned areas.—This kind of woodland consists of areas that have become too severely eroded to support field crops or good pasture and have been allowed to revert to woodland. Where natural revegetation has taken place, the first plants that have become established are blackberry, sassafras, persimmon, hawthorn, locust, and other shrubby plants. These are usually followed by oak, hickory, dogwood, and other kinds of trees. In some of the most severely eroded spots, especially in the Coastal Plain part of the county, mixed or almost pure stands of Virginia pine have had time to become established. Those areas are worth managing as forest. The areas that are still covered by brush should be planted to seedlings, preferably of white pine, Virginia pine, shortleaf pine, or loblolly pine.

Woodland suitability groups

Just as soils are placed in capability classes, subclasses, and units according to their suitability for crops and pasture, they are also grouped according to their suitability for woodland use. Each woodland suitability group is made up of soils on which similar kinds of wood crops are produced, that require similar practices to conserve soil and moisture, and that have similar potential productivity for wood crops.

The potential productivity of soils for forest trees is measured by the site index. The site index is the average height, in feet, of the dominant trees in the stand at 50 years of age. If the site index for white oak, for example, is said to be 65 on a given soil, that means that the dominant trees in a stand of white oak on that soil have an average height of 65 feet when the trees are 50 years of age.

Site indexes have been determined only for loblolly pine growing in the easternmost part of Howard County, which is on the Coastal Plain. Loblolly pine is not common in this county, for the county is on the northernmost fringe of the natural area of distribution for that species. Nevertheless, loblolly pine is probably the most valuable kind of tree for woodland planting, at least on the Coastal Plain. Therefore, all comparisons of soils of the Coastal Plain are made on the basis of potential productivity for that species.

For the Piedmont Plateau, which includes the rest of the county, comparisons of soils are made on the

[3] A. R. BOND, assistant State forester, Maryland Department of Forests and Parks, and SILAS LITTLE, JR., forester, Northeastern Forest Experiment Station, U.S. Forest Service, helped prepare this section.

basis of estimated productivity for species of oaks that have economic value. Because the species of oak vary from place to place, these oaks are called mixed oaks in this publication. Estimated site indexes for mixed oaks have not been developed for this county. The figures used are based on information from other parts of Maryland, from Virginia, and from Pennsylvania.

All of the soils in one woodland suitability group have approximately the same site index for a given species, and they are similar in certain other respects. For all the soils of a group, species priority is about the same. Also, the ratings for seedling mortality, competition from other plants, and limitations on the use of equipment are all similar, and the hazards of windthrow and erosion are about the same.

In the discussions of woodland suitability groups, seedling mortality refers to the expected loss of naturally occurring or planted seedlings. Competition refers both to the degree of competition from less desirable plants in the existing stand and to the rate at which undesirable species invade when an opening is made in the canopy. In Howard County competition is generally more severe for pines than for hardwoods.

Limitations on the use of equipment depend on soil characteristics or topographic features that restrict or prohibit the use of equipment commonly used in tending a crop of trees or harvesting the trees. The hazard of windthrow depends on soil characteristics that control the development of tree roots. The hazard of erosion refers to erodibility when the soils are not fully protected by a woodland cover. The soils are not well protected during the seedling stages of tree growth, for example, or after more or less clean harvesting of woodland crops.

For these limitations and hazards, a rating of *slight* means that no special problems are recognized, and that the use of the soils for trees would not be affected, except as indicated, by that special hazard. A rating of *moderate* means that the use of the soils for trees would be affected by the stated hazard, but not to the extent of precluding such use, and that ordinary management practices give adequate control. A rating of *severe* means that the stated hazard makes impractical the management of the soils for trees, or that difficult or expensive practices are required for control.

In the following pages, the woodland suitability groups of Howard County are described. The woodland group classification of any given soil can be found by referring to the "Guide to Mapping Units" at the back of this publication. The group numbers are not consecutive, because the groups are part of a statewide system, and not all the groups of this system are represented in Howard County.

WOODLAND SUITABILITY GROUP 1

This woodland group consists of all the poorly drained upland soils of the county. The surface layer of these soils is loam or silt loam. Their subsoil is sandy clay loam to sticky clay. Some of these soils are in depressions and, unless drained, are sometimes ponded temporarily in wet seasons.

The soils of this group have a site index of 85 or more for loblolly pine and of 65 to 74 for mixed oaks. On soils that have a site index of 85, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is severe for conifers and moderate for most hardwoods. Wetness for long periods severely limits the use of equipment. There is practically no hazard of erosion. Windthrow is a slight hazard on the soils that have a subsoil of clay.

Oak, yellow-poplar, and white pine are the trees to favor in the present stands, though loblolly pine and sweetgum grow well in the eastern part of the county. Loblolly pine and white pine are the preferred trees for planting. Scotch pine and white pine are suitable for Christmas trees. Austrian pine produces good Christmas trees on the Fallsington soil, and Norway spruce is suitable for planting in the Piedmont areas of the county.

WOODLAND SUITABILITY GROUP 2

This woodland group consists of poorly drained soils on flood plains. The soils vary somewhat in texture, but they are silty in most places. Flooding generally occurs one or more times each year, but the floodwaters seldom remain for long periods and do not stagnate.

The soils of this group appear to be the most productive of wood crops of any soils in the county. The site index is 85 or more for loblolly pine and 95 or more for mixed oaks. On soils that have a site index of 85, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 500 board feet of timber or about one-half cord of pulpwood.

Because of periodic flooding, seedling mortality is moderate. Competition from other plants is severe for young conifers and moderate for most hardwoods. Wetness and seasonal flooding severely limit the use of equipment. Erosion is not much of a hazard except for some scouring during periods when the areas are flooded. Windthrow is a slight hazard on the soils that have a clayey subsoil not readily penetrated by roots.

White pine is probably the kind of tree most suitable for planting, but loblolly pine is about as good in the eastern part of the county. Sweetgum, white pine, and oaks are also suitable. Yellow-poplar is suitable for planting on natural levees and in other places where surface drainage is good. Both Scotch pine and white pine can be grown for Christmas trees.

WOODLAND SUITABILITY GROUP 3

This woodland group consists of moderately well drained, nearly level or gently sloping soils on uplands. These soils generally have a surface layer of silt loam and a subsoil of friable to firm clay loam or sandy clay loam.

These soils have a site index of 85 or more for loblolly pine and of 65 to 74 for mixed oaks. On soils that have a site index of 85, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly

pine is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is generally slight. Competition is moderate from other plants for seedlings of either conifers or hardwoods. In wet seasons excess moisture is a moderate limitation on the use of equipment, but this limitation tends to disappear in dry seasons. There is practically no hazard of erosion. The hazard of windthrow is slight to moderate.

Loblolly pine and white pine are the trees most suitable for planting. Valuable poplars, sweetgums, oaks, and Virginia pines in the present stands should be managed until they are ready for harvesting. After those trees are harvested, conifers can be planted. In order of priority, the trees suitable for planting for Christmas trees are Scotch pine, Norway spruce, Austrian pine, and white pine.

WOODLAND SUITABILITY GROUP 4

This woodland group consists of moderately well drained and well drained soils that have a friable subsoil. These soils are on flood plains and on accumulations of local alluvium. Some of them are flooded occasionally, but the floodwaters likely will not remain long enough to stagnate.

The soils of this group have a site index of 85 or more for loblolly pine and of 75 to 84 for mixed oaks. On soils that have a site index of 85, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 14,000 board feet of merchantable timber or about 65 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is severe for young conifers and moderate for most hardwoods. Seasonal wetness of some of the soils and occasional flooding of most of them are moderate limitations on the use of equipment. Erosion is only a slight hazard, except for some scouring during periods of flooding. The hazard of windthrow is slight.

These soils are well suited to hardwoods. Therefore, conifers ought to be planted only where there are no good stands of desirable hardwood trees. All valuable hardwoods in the present stands should be managed for the greatest economic returns. Loblolly pine or white pine should have first priority for planting in areas where good stands of desirable hardwood trees are lacking. Scotch pine, Norway spruce, Austrian pine, and white pine are suitable for Christmas trees. Douglas-fir should have a high priority for planting for Christmas trees on the Codorus and Comus soils on the Piedmont Plateau.

WOODLAND SUITABILITY GROUP 5

This woodland group consists of very deep, very sandy soils of the Coastal Plain. These soils are excessively drained.

The soils of this group have a site index of 75 to 84 for loblolly pine. Site indexes are not available for hardwoods. On soils that have a site index of 80, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is moderate because the soils are droughty. Competition from other plants is only slight for either hardwoods or conifers. Because these soils are sandy and loose, limitations on the use of equipment are moderate. Erosion and windthrow are slight hazards.

Loblolly pine should have first priority for planting. Virginia pine and shortleaf pine already growing should be managed until the trees are large enough to harvest, then loblolly pine should be planted. Most hardwoods grow very slowly on these soils. Scotch pine, white pine, and Virginia pine are suitable for Christmas trees.

WOODLAND SUITABILITY GROUP 7

This woodland group consists of well-drained, nearly level to gently sloping soils on uplands of the Coastal Plain. These soils have a surface layer that ranges from loamy sand to silt loam in texture and a subsoil that is finer textured than the surface layer.

The soils of this group have a site index of 75 to 84 for loblolly pine. Site indexes for hardwoods are not available. On soils that have a site index of 80, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is moderate for young conifers but slight for most hardwoods. Limitations on the use of equipment are generally slight. Also, the soils are slightly susceptible to erosion. Limitations on the depth to which roots can penetrate the Chillum soils make the hazard of windthrow moderate on those soils. Windthrow is a minor hazard on the other soils of the group.

Trees suitable for planting, in order of their priority, are loblolly pine, shortleaf pine, and Virginia pine. The soils of this group are generally not well suited to the commercial production of hardwoods. Scotch pine, Norway spruce, Austrian pine, and white pine are suggested for growing as Christmas trees.

WOODLAND SUITABILITY GROUP 8

This woodland group consists of soils that are moderately sloping to strongly sloping. Except for slope, the soils are similar to those of woodland group 7.

The soils of this group have a site index of 75 to 84 for loblolly pine. Site indexes for hardwoods are not available. On soils that have a site index of 80, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is moderate for young conifers but slight for most hardwoods. Limitations on the use of equipment are generally slight. The hazard of windthrow is moderate

on the Chillum soil of this group because of the limited depth to which roots can penetrate that soil. The hazard of windthrow is slight on the other soils of the group. The erosion hazard is moderate; erosion is most likely when trees are small and after woodland crops have been clean harvested.

Trees suitable for planting, in order of their priority, are loblolly pine, shortleaf pine, and Virginia pine. The soils of this group are generally not well suited to the commercial production of hardwoods. Scotch pine, Norway spruce, Austrian pine, and white pine are suggested for growing as Christmas trees.

WOODLAND SUITABILITY GROUP 9

This woodland group consists of steep or very steep, well-drained soils and moderately sloping to strongly sloping, moderately well drained soils of the Coastal Plain. In most places these soils are moderately eroded.

The soils of this group have a site index of 75 to 84 for loblolly pine. Site indexes for hardwoods are not available. On soils that have a site index of 80, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is moderate for young conifers but only slight for young hardwoods. Because of seasonal wetness, limitations on the use of equipment are moderate on the Keyport soil. They are severe on the other soils because of the steep slopes. Erosion is a severe hazard. Windthrow is a moderate hazard on the Sassafras soils. It is a severe hazard on the other soils because of the limited root depth.

Loblolly pine ought to have first priority for planting. Any good existing stands of hardwoods should be managed, though the soils of this group are generally not well suited to the commercial production of hardwoods. Also, stands of shortleaf pine or Virginia pine should be managed. Scotch pine, Norway spruce, and Austrian pine are suggested for growing as Christmas trees.

WOODLAND SUITABILITY GROUP 11

Leonardtown silt loam is the only soil in this woodland group. This soil is poorly drained. It has a dense fragipan that can generally not be penetrated to any extent by the roots of trees. It is on the Coastal Plain.

This soil has a site index of 72 to 84 for loblolly pine. Site indexes for hardwoods are not available. On soils that have a site index of 80, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 11,500 board feet of merchantable timber or about 60 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods but severe for conifers. Because the soil is wet for long periods, limitations on the use of equipment are severe. There is practically no hazard of erosion. Because roots cannot penetrate the fragipan, the risk of windthrow is moderate to severe.

Loblolly pine is the only kind of tree suitable for planting on this soil. Any hardwoods in the existing stands, that could be valuable for timber, especially oaks and sweetgums, ought to be managed until they are large enough to harvest, then they should be replaced with loblolly pine. Scotch pine is the species most suitable for growing as Christmas trees.

WOODLAND SUITABILITY GROUP 12

This woodland group consists of moderately well drained and well drained soils that have either a fragipan or a hard, compact subsoil. These soils are nearly level or gently sloping, and some of them are moderately eroded. They occur in practically all parts of the county.

The soils of this group have a site index of 65 to 74 both for loblolly pine and for oak. On soils that have a site index of 70, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 6,500 board feet of merchantable timber or about 50 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre should be about 300 board feet or about four-tenths of a cord of pulpwood.

Seedling mortality is slight. Competition from other plants is moderate for young pines but not more than slight for most hardwoods. Limitations on the use of equipment are moderate on the Aldino, Beltsville, and Glenville soils, which are moderately well drained. They are only slight on the Aura soil, which is well drained. Because of the slow rate at which moisture penetrates, and because runoff tends to be excessive, erosion is a moderate hazard. Windthrow is a moderate hazard, because the root zone is shallow.

Loblolly pine should have first priority for planting in areas on the Coastal Plain. White pine is suitable for the Piedmont. Virginia pine would be the second choice for planting, either on the Coastal Plain or in the Piedmont. In existing stands, poplar or valuable oaks should be managed until they are large enough to harvest; yellow-poplar generally grows especially well in the Piedmont part of the county. Scotch pine, Norway spruce, Austrian pine, and white pine are suitable for growing as Christmas trees.

WOODLAND SUITABILITY GROUP 16

This woodland group consists of moderately well drained and well drained soils that have either a fragipan or a hard, compact subsoil. These soils are moderately sloping to moderately steep.

The soils of this group have a site index of 55 to 64 for loblolly pine and a site index as much as 10 points higher for mixed oaks. On soils that have a site index of 60, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 1,500 board feet of merchantable timber or about 40 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is only about 200 board feet per acre. The increase in sizes suitable for pulpwood, however, may be at the rate of about four-tenths of a cord.

Seedling mortality is generally slight. Competition from other plants is only slight for young hardwoods

but moderate for young conifers. Limitations on the use of equipment are moderate where the slopes are about 15 percent and severe where the slopes are steeper. Erosion is a severe hazard. Windthrow is generally a moderate hazard, but it is a severe hazard in some places.

Loblolly pine is suitable for planting on the Coastal Plain, and white pine can be planted on the Piedmont Plateau. Virginia pine is suitable for either area. Growth of pines is so slow, however, that planting them, except possibly for pulpwood, is not likely to be profitable. Yellow-poplar and some kinds of oak grow well on the Piedmont; any of these trees in the existing stands should be managed until they are large enough to harvest. Scotch pine, Norway spruce, Austrian pine, white pine, and Virginia pine can be grown as Christmas trees, but they grow so slowly that commercial production is not likely to be profitable.

WOODLAND SUITABILITY GROUP 17

This woodland group consists of soils much like those of woodland group 16, except that they are severely eroded. These soils are moderately sloping and are moderately well drained or well drained. They have either a fragipan or a hard, compact subsoil.

The soils of this group have a site index of 55 to 64 for loblolly pine. The site index for oaks is apparently about the same as for loblolly pine, although figures are not available. On soils that have a site index of 60, the expected yield per acre from a well-stocked, unmanaged stand of 50-year-old loblolly pine is about 1,500 board feet of merchantable timber or about 40 cords of pulpwood. For the next 10 to 20 years, the expected yearly increase per acre is only about 200 board feet per acre. The increase in sizes suitable for pulpwood may be at the rate of about four-tenths of a cord. These figures show that, though a fair amount of pulpwood can be produced, growth is too slow for the economic production of sawtimber.

Seedling mortality is severe because these soils are droughty and make a poor seedbed. Also, frost heaving is a hazard in winter on the moderately well drained soils. For all seedlings, competition from other plants is slight. Limitations on the use of equipment are moderate because of the slopes and the wetness in some places. Erosion and windthrow are severe hazards.

Planting trees on these soils for the production of wood crops may not be worthwhile economically. Planting may be justified for stabilization and erosion control, for protecting the watershed, and for esthetic reasons. Either Virginia pine or loblolly pine is suitable for planting. Virginia pine and possibly Scotch pine are suitable for planting for Christmas trees.

WOODLAND SUITABILITY GROUP 21

This woodland group consists of miscellaneous land types that are not suitable for producing wood crops or that are always used for other purposes. Under certain circumstances trees or other plants can be grown on them. Generally, the purpose is esthetic improvement.

WOODLAND SUITABILITY GROUP 30

This woodland group, the most extensive in the county, consists of deep, well-drained, acid soils of the Piedmont Plateau. The slope is predominantly no more than 15 percent, and most of the acreage is only slightly or moderately eroded. Included, however, are some severely eroded areas that have slopes of between 8 and 15 percent and some very stony areas that have slopes of as much as 25 percent.

The soils of this group have a site index of 75 to 84 for mixed oaks. Site indexes are not available for pines or for other kinds of hardwoods. Also, generally accepted estimates of yields of timber or pulpwood are not available. These are considered to be the best upland soils in the county for the production of trees, especially hardwoods.

Seedling mortality is slight. Competition from other plants is moderate for young hardwoods and severe for young pines. There are no important limitations on the use of equipment. The hazards of erosion and windthrow are slight.

The soils of this group are suitable for oaks, yellow-poplar, white pine, Virginia pine, and shortleaf pine. Yellow-poplar is the most rapidly growing of the hardwood trees of commercial value. Pines are best for planting. Scotch pine, Norway spruce, Austrian pine, white pine, and blue spruce are suitable for Christmas trees.

WOODLAND SUITABILITY GROUP 31

This woodland group consists of soils that, except for slope, are similar to those of woodland group 30. Most of the soils have slopes of between 15 and 25 percent, but the slopes are as steep as 45 percent in some places. Some of the soils are severely eroded; little or no erosion has taken place, however, on the slopes of 45 percent or more.

The soils of this group have an estimated site index of 75 to 84 for mixed oaks. Site indexes are not available for pines or for other kinds of hardwoods. Also, no generally accepted estimates of yields of timber or pulpwood are available. The soils are considered to be well suited to the production of trees, especially hardwoods.

Seedling mortality is slight. Competition from other plants is moderate for young hardwoods and severe for young pines. The hazard of windthrow is slight. Limitations on the use of equipment are moderate because of the slope and a moderate hazard of erosion.

The soils of this group are suitable for yellow-poplar, white pine, Virginia pine, shortleaf pine, and oaks. Yellow-poplar is probably the most rapidly growing of the hardwood trees that have commercial value. Pines are best for planting. Scotch pine, Norway spruce, Austrian pine, white pine, and blue spruce are suitable for Christmas trees.

WOODLAND SUITABILITY GROUP 32

This woodland group consists of only one mapping unit, Montalto and Relay very stony silt loams, 25 to 60 percent slopes. These soils are on the Piedmont Plateau. They are not especially extensive in Howard County, but they are important as woodland.

The soils of this group have a site index of 75 to 84 for mixed oaks. Site indexes are not available for pines or for other kinds of hardwoods. Also, no generally accepted estimates of yields of timber or pulpwood are available. These soils are well suited to the production of wood crops, in spite of the strong slopes.

Seedling mortality is slight. Competition from other plants is moderate for young hardwoods and severe for pines. Because of the strong slopes and the stones, limitations on the use of equipment are severe. The hazard of erosion is also severe. Generally, the hazard of windthrow is slight.

Yellow-poplar is the most rapidly growing of the hardwood trees that have commercial value. Oak, white pine, shortleaf pine, and Virginia pine are suitable, also. The pines are best for planting. Suitable for Christmas trees are Scotch pine, Norway spruce, Austrian pine, white pine, and blue spruce.

WOODLAND SUITABILITY GROUP 33

This woodland group consists of gently sloping to moderately sloping, somewhat poorly drained or moderately well drained soils on the uplands of the Piedmont Plateau. These soils have a very slowly permeable, very sticky and very plastic subsoil.

The soils of this group have a site index of 75 to 84 for mixed oaks. Site indexes are not available for pines or for other kinds of hardwoods. Also, no generally accepted estimates of yields of timber or pulpwood are available.

Seedling mortality is slight. Competition from other plants is moderate for young hardwoods but more severe for pines. Limitations on the use of equipment are moderate because heavy equipment can cause damage when these plastic, unstable soils are wet. The slopes also impose some limitations on the use of equipment. Erosion and windthrow are both moderate hazards.

Yellow-poplar is the most rapidly growing of the commercial hardwoods, but oaks and hickories that tolerate wetness are generally dominant in the native woodlands. White pine is the kind of tree most suitable for planting. The only species suitable for Christmas trees are Scotch pine and Norway spruce.

WOODLAND SUITABILITY GROUP 34

The only soil in this woodland group is Kelly clay loam, 15 to 30 percent slopes, severely eroded. Except for slope, it is similar to the soils of woodland group 33. It is somewhat poorly drained or moderately well drained and has a very slowly permeable, very sticky and very plastic subsoil.

The strong slopes impose severe limitations on the use of heavy equipment, even when the soil is not wet. Seedling mortality is slight. Competition from other plants is moderate for young hardwoods but more severe for pines. Erosion and windthrow are both moderate hazards.

Although trees grow fairly well on this soil, harvesting them and other necessary work are difficult because of the slope. Yellow-poplar is the most rapidly growing of the commercial hardwoods, but oaks and hickories that tolerate wetness are generally dominant in the native stands. White pine is the kind of tree most suitable for planting for timber or pulpwood. The only species suitable for Christmas trees are Scotch pine and Norway spruce.

WOODLAND SUITABILITY GROUP 40

This woodland group consists of moderately sloping, well-drained or somewhat excessively drained, acid soils that are only moderately deep over bedrock. These soils are on the uplands of the Piedmont Plateau.

The soils of this group have a site index of 65 to 74 for mixed oaks. Site indexes are not available for other kinds of trees. Also, no generally accepted estimates of yields of timber or pulpwood are available. Yields are generally lower, however, than those on the deeper soils in woodland group 30.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. Limitations on the use of heavy equipment are slight, and there are slight hazards of erosion and windthrow.

Yellow-poplar, white pine, and Virginia pine, in addition to oaks, are suitable for the soils of this group. White pine is the kind of tree most suitable for planting for timber or pulpwood. Scotch pine, Norway spruce, and Austrian pine are the species most suitable for planting for Christmas trees, but white pine and Virginia pine can also be planted.

WOODLAND SUITABILITY GROUP 41

This woodland group consists of soils that, except for slope, are much like those of woodland group 40. These soils are well drained and are only moderately deep over bedrock. Except for Brandywine loam, 25 to 60 percent slopes, they generally have slopes of between about 15 and 25 percent. Only the north-facing slopes of Brandywine loam, 25 to 60 percent slopes, which occupy somewhat less than half of the total acreage of that soil, are included. Those slopes are shaded much of the time, and evaporation is less rapid than on slopes that are exposed to the sun. (North-facing slopes cannot be told from south-facing slopes on the soil map.)

The soils of this group have a site index of 65 to 74 for mixed oaks. Site indexes are not available for other kinds of trees, and generally accepted estimates of yields of timber or pulpwood are not available. Yields are generally lower, however, than on the deeper soils in woodland group 30.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. The hazard of windthrow is slight. The hazard of erosion and limitations on the use of equipment are generally moderate. They are severe in some places, however, especially on the north-facing slopes of the steep Brandywine soil.

WOODLAND SUITABILITY GROUP 43

This woodland group consists of nearly level to moderately sloping, deep, micaceous soils that are well drained or somewhat excessively drained. In most places these soils are already moderately eroded and they are highly susceptible to further erosion. The soils are on the Piedmont Plateau.

The soils of this group have a site index of 65 to 74 for mixed oaks. Site indexes are not available for other kinds of trees. Also, no generally accepted estimates of yields of timber or pulpwood are available. Yields are generally lower, however, than on deep soils that have higher available moisture capacity, such as the soils of woodland group 30.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. Generally, limitations on the use of equipment are not

Figure 10.—**Christmas trees planted on the contour on soils of woodland group 43 near Florence. Some trees have already been harvested from this plantation, and most of the rest will be harvested for the next Christmas season. Then the area will be replanted.**

significant. Although the slopes are not steep, the hazard of erosion is moderate because micaceous soils are easily eroded. The hazard of windthrow is slight because the roots of trees can penetrate deeply.

Yellow-poplar and oak are the most valuable hardwoods growing on these soils. White pine, Virginia pine, and shortleaf pine are suitable for planting. A number of species are suitable for planting for Christmas trees (fig. 10), including Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce, and Virginia pine.

WOODLAND SUITABILITY GROUP 44

This woodland group consists of soils that are similar to those of woodland group 43, except that they are more sloping and are stony or gravelly in places. The slopes are mainly between 15 and 45 percent but are less than 15 percent in some places.

The soils of this group have a site index of 65 to 74 for mixed oaks. Site indexes are not available for other kinds of trees, and generally accepted estimates of yields of timber or pulpwood are not available. Yields are generally lower, however, than on deep soils that have higher available moisture capacity, such as the soils of woodland group 30.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. Because of the strong slopes, limitations on the use of equipment are moderate. The hazard of erosion is severe, but the hazard of windthrow is only slight.

Yellow-poplar and oak are the most valuable hardwoods growing on these soils. White pine, Virginia pine, and shortleaf pine can be used for planting. A number of trees are suitable for Christmas trees. These include Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce, and Virginia pine.

WOODLAND SUITABILITY GROUP 45

Only one soil, Manor very stony loam, 25 to 60 percent slopes, is in this woodland group. This soil is similar to the soils of woodland groups 43 and 44, except for the stones and the steep or very steep slopes.

This soil has a site index of 65 to 74 for mixed oaks. Site indexes are not available for other kinds of trees. Also, generally accepted estimates of yields of timber or pulpwood are not available. Yields are generally lower, however, than on deep soils that have higher available moisture capacity, such as those of woodland group 30.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. Because of the stones and steep slopes, limitations on the use of equipment are very severe. The hazard of erosion is severe, but the hazard of windthrow is only slight.

Yellow-poplar and oak are the most valuable hardwoods growing on this soil. White pine, Virginia pine, and shortleaf pine are suitable for planting. A number of species are suitable for Christmas trees. Examples are Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce, and Virginia pine.

WOODLAND SUITABILITY GROUP 51

This woodland group consists of gently sloping to moderately sloping, well-drained or somewhat excessively drained channery soils. These soils are rather shallow over bedrock.

The soils of this group have a site index of 55 to 64 for mixed oaks. Site indexes are not available for other kinds of trees, and yield data are not available. Growth of trees is slower than on the soils of group 40, which are moderately deep, and considerably slower than on the soils of group 30, which are deep.

The soils of this group are seasonally droughty. As a result, seedling mortality is moderate. Competition from other plants is moderate for pines but only slight for hardwoods. Limitations on the use of equipment are slight, and the hazards of erosion and of windthrow are only slight.

Oaks are generally the most valuable of the native trees. White pine or Virginia pine should be used for planting. Scotch pine, white pine, and Virginia pine are suitable for Christmas trees.

WOODLAND SUITABILITY GROUP 52

This woodland group consists of soils that, except for slope, are much like those of woodland group 51. The slopes are generally between 15 and 25 percent, but the group includes the north-facing slopes of Linganore channery silt loam, 25 to 45 percent slopes, and of Mt. Airy channery loam, 25 to 45 percent slopes. These steep, north-facing slopes are shaded much of the time, and evaporation is less rapid than on slopes that are exposed to the sun.

The soils of this group have a site index of 55 to 64 for mixed oaks. Site indexes are not available for other kinds of trees, and yield data are not available. Growth of trees is slower than on moderately deep soils like those in woodland group 40 and on deep soils like those in group 30.

Seedling mortality is moderate. Competition from other plants is moderate for pines but only slight for hardwoods. Because of the strong slopes, the hazard of erosion and the limitations on the use of equipment are generally moderate. In some places, especially on the steep, north-facing slopes, these are severe. The hazard of windthrow is slight.

Oaks are generally the most valuable of the native

trees. White pine or Virginia pine should be used for planting. Scotch pine, white pine, and Virginia pine are suitable for Christmas trees.

WOODLAND SUITABILITY GROUP 56

This woodland group consists only of the south-facing slopes of Brandywine loam, 25 to 60 percent slopes. This soil is steep or very steep, acid, somewhat excessively drained, and only moderately deep over bedrock. In other respects it is similar to the soils of woodland groups 40 and 41.

The site index is 55 to 64 for mixed oaks and even lower for pines. Trees grow slowly on these south-facing slopes, principally because less moisture is available, especially in hot, sunny weather, than on similar slopes that face north.

Seedling mortality is slight. Competition from other plants is moderate for hardwoods and severe for pines. The hazard of windthrow is slight. The hazard of erosion and the limitations on the use of equipment are severe.

Growing trees for timber or pulpwood is likely to be impractical. Virginia pine and white pine can be planted for protection of the watershed or for esthetic value. Because of the steep slopes and the hazard of drought, growing Christmas trees for sale is generally impractical.

WOODLAND SUITABILITY GROUP 58

This woodland group consists of the south-facing slopes of two channery soils—Linganore channery silt loam, 25 to 45 percent slopes, and Mt. Airy channery loam, 25 to 45 percent slopes. These soils are well drained or somewhat excessively drained and are rather shallow over bedrock. The slopes are similar to the north-facing slopes of similar soils in woodland group 52. They are exposed to more direct sunlight during hot, dry weather, however, than are the north-facing slopes in woodland group 52 and consequently have a more limited supply of moisture.

Growth of trees is slow on these south-facing slopes; only certain upland oaks and Virginia pines make satisfactory growth in most places. The site index is 45 to 54 for mixed oaks. Yields are lower than on the soils of woodland group 52, although the soils are similar.

These soils are droughty, and trees grown on them are subject to sunscald. As a result, seedling mortality is moderate. Competition from other plants is moderate for pines but only slight for hardwoods. Limitations on the use of equipment are few, and the hazards of erosion and of windthrow are only slight.

Planting is generally for the protection of the watershed or for esthetic improvement. Virginia pine is probably the species most suitable. It is also the most suitable species for planting for Christmas trees.

WOODLAND SUITABILITY GROUP 59

Stony land makes up this woodland group. It is a miscellaneous land type consisting of areas that are extremely rough, stony, broken, and steep.

This land type is not suitable for crops or pasture, and trees normally make slow growth on it. It is better suited to Virginia pine and some upland oaks than to other kinds of trees.

Seedling mortality ranges from moderate on some of the more favorable sites to severe on the fully exposed south-facing slopes. In most places competition from other plants is not serious, but in some places it is moderate for pines. The hazards of erosion and windthrow are moderate. More important than those hazards, however, are the severe limitations on the use of equipment, which can make impractical the use of this land for timber. The same limitations are likely to preclude growing Christmas trees, though the areas are fairly well suited to Virginia pine and Scotch pine.

Wildlife

Many areas in Howard County are suitable habitats for several kinds of wildlife. Most of the county is suitable as a habitat for open-land wildlife, which includes rabbit, some deer, and quail and other upland birds. More than 99 percent of the land area is fair or good as a habitat for woodland wildlife, including deer, squirrels, and turkeys. About 3 to 4 percent of the land area is fair or good as a habitat for wetland wildlife, which includes raccoon, muskrat, and waterfowl.

In table 5 the soils of the county are rated according to their suitability for plants and water developments that are used by wildlife, and according to their suitability as habitats for open-land wildlife, woodland wildlife, and wetland wildlife.

The following paragraphs explain in a little more detail the elements of wildlife habitat for which the soils are rated in table 5. Suitability for each of the three categories of wildlife, as shown in table 5, is based on the suitability of the soils for the habitat elements essential to the birds and animals of the category.

Grain and seed crops.—These include corn, sorghum, millet, soybeans, buckwheat, cowpeas, wheat, oats, barley, and rye.

Grasses and legumes.—These include lespedeza, alfalfa, alsike clover, Ladino clover, red clover, tall fescue, bromegrass, bluegrass, and timothy, all of which are commonly planted for forage crops but also provide food and cover for wildlife.

Wild herbaceous upland plants.—These include panicgrass and other native grasses, partridgepea, beggarticks, and lespedeza and other native herbs.

Hardwood trees and shrubs.—This category consists of trees and shrubs that grow vigorously and produce good crops of fruit or seed. Included are dogwood, sumac, sassafras, persimmon, hazelnut, shrub lespedeza, wild cherry, autumn-olive, various species of oak and hickory, blueberry, bayberry, huckleberry, blackhaw, sweetgum, highbush cranberry, and holly.

Coniferous trees and shrubs.—This category includes Virginia pine, loblolly pine, shortleaf pine, Scotch pine, red pine, pond pine, Norway spruce, redcedar, juniper, and Atlantic white-cedar. The ratings reflect limitations on the rate of growth, which lead to the production of dense, low foliage and delayed closure of the canopy, and so are not indicative of potential timber production.

Wetland food and cover plants.—This category consists of plants that provide food and cover for waterfowl and furbearing animals. Included are wildrice, smartweed, bulrush, barnyard grass, duckweed, pondweed, arrow-arum, pickerelweed, cattail, and sedge.

TABLE 5.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*

[For the elements of wildlife habitat, 1 is well suited; 2, average; 3, poorly suited; 4, not suited]

Soil series and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Coniferous trees and shrubs	Wetland food and cover plants	Shallow water developments	Excavated ponds	Open-land	Woodland	Wetland
Aldino:											
AdB2, AdC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
Aura:											
AgB2, AgC2	3	2	2	2	2	4	4	4	Fair	Fair	Not suited.
AgE3	4	3	3	3	2	4	4	4	Poor	Fair	Not suited.
Baile:											
Ba	3	2	2	1	2	1	2	2	Fair	Good	Good.
Beltsville:											
BeA	2	1	1	1	3	3	3	3	Good	Good	Poor.
BeB2, BeC2	1	1	1	1	3	4	4	4	Good	Good	Not suited.
BeC3, BeD2	3	2	2	1	3	4	4	4	Fair	Good	Not suited.
Brandywine:											
BrB2, BrC2, BrC3, BrD2.	3	2	2	2	2	4	4	4	Fair	Fair	Not suited.
BrD3, BrF, BwD	4	3	2	2	2	4	4	4	Poor	Fair	Not suited.
Chester:											
ChA	1	1	1	1	3	4	4	4	Good	Good	Not suited.
CgB2, CgC2, ChB2, ChC2.	2	1	1	1	3	4	4	4	Good	Good	Not suited.
ChC3, ChD2	3	2	1	1	3	4	4	4	Fair	Fair	Not suited.
Chillum:											
ClC3, ClD2, CmB2, CmC2.	3	2	2	2	2	4	4	4	Fair	Fair	Not suited.
ClE2	4	3	3	3	2	4	4	4	Poor	Fair	Not suited.
CnB2	3	2	2	2	2	4	4	4	Fair	Fair	Not suited.
CnD3	4	3	3	3	2	4	4	4	Poor	Fair	Not suited.
Codorus:											
Co [1]	2	1	1	1	3	3	3	4	Good	Good	Poor.
Co [2]	4	3	3	1	1	1	3	4	Poor	Good	Fair.
Comus:											
Cs, CuB [1]	1	1	1	1	3	4	4	4	Good	Good	Not suited.
Cs [2]	4	3	3	1	1	4	4	4	Poor	Good	Not suited.
Delanco:											
DeA	2	1	1	1	3	3	3	3	Good	Good	Poor.
DeB2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
Elioak:											
EkA	1	1	1	1	3	4	4	4	Good	Good	Not suited.
EkB2, EkC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
EkD2, ElC3	3	2	1	1	3	4	4	4	Fair	Good	Not suited.
ElD3	4	3	1	1	3	4	4	4	Poor	Good	Not suited.
Elkton:											
Em	3	2	2	1	2	1	1	1	Fair	Good	Good.
Elsinboro:											
EnA	1	1	1	1	3	4	4	4	Good	Good	Not suited.
EnB2, EnC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
Evesboro:											
EvB, EvC	3	3	3	3	2	4	4	4	Poor	Poor	Not suited.
Fallsington:											
Fa	3	2	2	1	2	1	1	1	Fair	Good	Good.
Glenelg:											
GlA	1	1	1	1	3	4	4	4	Good	Good	Not suited.
GlB2, GlC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
GlC3, GlD2	3	2	1	1	3	4	4	4	Fair	Good	Not suited.
GlD3	4	3	1	1	3	4	4	4	Poor	Good	Not suited.
Glenville:											
GnA	2	1	1	1	3	3	3	3	Good	Good	Poor.
GnB2, GnC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
Gravel pits and quarries:											
Gp [3]											
Hatboro:											
Ha	3	2	2	1	2	2	3	4	Fair	Good	Poor.
Ha [2]	4	3	3	1	1	1	3	4	Poor	Good	Fair.
Iuka:											
IuB	2	1	1	1	3	3	3	3	Good	Good	Poor.

TABLE 5.— *Suitability of soils for elements of wildlife habitat and for kinds of wildlife*— Continued

Soil series and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Coniferous trees and shrubs	Wetland food and cover plants	Shallow water devolopments	Excavated ponds	Open-land	Woodland	Wetland
Kelly:											
KcE3	3	3	2	2	3	4	4	4	Poor	Fair	Not suited.
KeB2, KeC2	2	2	2	2	2	3	4	4	Fair	Fair	Not suited.
Keyport:											
KhC2	3	1	1	1	3	4	4	4	Fair	Good	Not suited.
Kinkora:											
Kn	3	2	2	1	2	1	1	1	Fair	Good	Good.
Legore:											
LeB2, LeC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
LgC3	3	2	1	1	3	4	4	4	Fair	Good	Not suited.
Leonardtown:											
Ll	2	2	2	2	3	2	2	2	Fair	Fair	Fair.
Linganore:											
LnB2, LnC2	3	3	3	3	1	4	4	4	Poor	Poor	Not suited.
LnD2	4	3	3	3	1	4	4	4	Not suited	Poor	Not suited.
LoE	4	4	3	3	1	4	4	4	Not suited	Poor	Not suited.
Made land:											
Md[3]											
Manor:											
MlA, MlB2, MlC2, MgB2, MgC2.	2	2	2	2	2	4	4	4	Fair	Fair	Not suited.
MgC3, MlC3, MlD2.	3	2	2	2	2	4	4	4	Fair	Fair	Not suited.
MlD3, MlE, MnD	4	3	2	2	2	4	4	4	Poor	Fair	Not suited.
MnF	4	4	2	2	2	4	4	4	Poor	Fair	Not suited.
Mixed alluvial land:											
Mo [1]	3	2	2	1	2	2	3	4	Fair	Good	Poor.
Mo [2]	4	3	3	1	1	1	4	4	Not suited	Good	Poor.
Montalto:											
MpB2, MpC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
MqC3	3	2	1	1	3	4	4	4	Fair	Fair	Not suited.
MrE	4	3	1	1	3	4	4	4	Poor	Fair	Not suited.
MsD	4	3	1	1	2	4	4	4	Poor	Good	Not suited.
MsF	4	4	1	1	2	4	4	4	Poor	Good	Not suited.
Mt. Airy:											
MtB2, MtC2	3	3	3	3	1	4	4	4	Poor	Poor	Not suited.
MtC3, MtD2	4	3	3	3	1	4	4	4	Not suited	Poor	Not suited.
MtE	4	4	3	3	1	4	4	4	Not suited	Poor	Not suited.
Neshaminy:											
NeB2, NeC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
NsD3	4	3	1	1	3	4	4	4	Poor	Fair	Not suited.
Relay:											
ReC2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
Rumford:											
RuB2, RuC2	2	2	2	2	3	4	4	4	Fair	Fair	Not suited.
RuD2	3	3	2	2	3	4	4	4	Poor	Fair	Not suited.
Sandy and clayey land:											
ScB	3	2	2	2	3	4	4	4	Fair	Fair	Not suited.
ScD, ScE	4	4	2	2	3	4	4	4	Poor	Fair	Not suited.
Sassafras:											
SfB2, SfC2, SlB2, SlC2.	2	1	1	1	3	4	4	4	Good	Good	Not suited.
SfD2, SlD2	3	2	1	1	3	4	4	4	Fair	Fair	Not suited.
SsE	4	3	1	1	3	4	4	4	Poor	Fair	Not suited.
Stony land:											
St	4	4	3	3	2	4	4	4	Not suited	Poor	Not sui ed.
Sunnyside:											
SuB2	2	1	1	1	3	4	4	4	Good	Good	Not suited.
SuD2	3	2	1	1	3	4	4	4	Fair	Good	Not suited.
Watchung:											
WaA	3	2	2	1	2	1	1	1	Fair	Good	Good.
WaB	3	2	1	1	2	3	4	4	Fair	Good	Not suited.
Woodstown:											
WoB2	2	1	1	1	3	4	4	4	Good	Good	Not suited.

[1] Occasional flooding. [2] Frequent to very frequent flooding. [3] Properties variable. Onsite investigation necessary.

Shallow water developments.—These are impoundments in which the water level is kept at or no more than 2 feet above the natural ground level. The ratings reflect the ease or difficulty of controlling the water level.

Excavated ponds.—These are excavated ponds that depend not on runoff but on ground water. The water level normally fluctuates as the level of the ground water fluctuates. Such ponds attract migrating waterfowl.

Engineering Uses of Soils

Some soil properties are of special interest to engineers because they affect the construction and maintenance of highways, airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to engineers are shear strength, drainage, grain size, plasticity, and permeability to water. Shrink-swell characteristics, depth to water table, depth to bedrock, topography, available water capacity, flood hazard, and degree of acidity or alkalinity are also important.

Information in this section can be used by engineers to—

1. Make studies that will aid in selecting and developing industrial, business, commercial, residential, and recreational sites.
2. Make preliminary estimates of soil properties that are significant in the planning of soil and water conservation systems, including surface and internal drainage, and of water storage and water supply systems.
3. Make preliminary evaluations that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning detailed investigations at selected locations.
4. Locate probable sources of sand and gravel for use in construction.
5. Locate suitable borrow material for road fill and for the construction of dams, levees, dikes, and other embankments.
6. Locate deposits of clay suitable for use, with other materials, for the fabrication of brick and other ceramic products.
7. Correlate performance of engineering structures with types of soil, to develop information that will be useful in planning the design and maintenance of engineering structures.
8. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
9. Supplement the information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used by engineers.
10. Develop other preliminary estimates for design or construction purposes pertinent to a particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Other parts of this survey, particularly the sections "Descriptions of Soils" and "Formation and Classification of Soils," contain information that is useful to engineers.

Some of the terms used by soil scientists may be unfamiliar to engineers, and some words have special meanings in soil science. Many of these terms are defined in the Glossary at the back of this publication.

Engineering classification systems

The engineering classification systems now most widely used are the American Association of State Highway Officials (AASHO) system (*1*) and the Unified system (*7*). Both classify soil material according to gradation and plasticity characteristics.

The AASHO system is used by most highway engineers. It places soil material in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clayey soils that have low strength when wet.

The Unified Soil Classification system is preferred by some engineers. This system classifies soil material as coarse grained (eight classes), fine grained (six classes), or highly organic (one class). Table 6 shows the estimated classification of all soils in the county according to both systems.

Engineering properties of soils

To make the best use of the soil map and the soil survey, engineers need to know certain properties of the soil materials and the in-place condition of soils. Table 6 gives estimates of some of the significant properties and of the engineering and agricultural classifications of soils in Howard County. Estimates are given for each significant layer of a typical profile.

Depth to bedrock, as used in table 6, refers to the depth to noncompressible material. Depth to water table refers to the highest level at which the ground water stands for a significant period of time.

Depth from surface indicates the thickness of significant layers of a typical profile. The thickness of the surface layer applies only to slightly or moderately eroded soils; severely eroded profiles have thinner surface layers, and, therefore, the underlying horizons are closer to the surface. The thickness of the horizons varies somewhat among mapping units of the same soil series.

Permeability refers to the rate at which water moves downward through the undisturbed soil; it depends largely upon the texture and structure of the soil.

Available water capacity is the difference between the amount of water in the soil at field capacity and the amount in the soil at the wilting point; it represents the maximum amount of water that plants can obtain from the given soil.

Reaction refers to the acidity or alkalinity of the soil, expressed in terms of pH. A pH of 7.0 is neutral; values

of less than 7.0 indicates acidity, and values of more than 7.0 indicate alkalinity.

Corrosion potential refers to the deterioration of concrete or untreated steel pipelines as a result of exposure to oxygen and moisture and of chemical and electrolytic reactions.

Shrink-swell potential is an indication of the volume changes that can be expected with changes in moisture content. It depends largely on the amount and type of clay in the soil. In general, soils classified as CH or A–7 have a high shrink-swell potential, and clean sands and gravels have a low shrink-swell potential.

Optimum moisture is the moisture content at which the soil can be compacted to maximum dry density. The estimated percentages in table 6, are averages, and for each soil horizon, the optimum moisture varies one or two percentage points.

Maximum dry density is the greatest amount of soil, by weight, that can be compacted into a given unit of volume, under controlled conditions and by standard procedures.

Engineering interpretations

Table 7 rates the soils in the county according to their suitability for earthwork when wet, susceptibility to frost action, and suitability as sources of topsoil, sand and gravel, and roadfill. It also indicates both the good and the undesirable soil features that will affect engineering practices and structures and, therefore, must be considered in planning, design, construction, and maintenance. The features listed are those that affect suitability of soils for pipelines, roads, and highways; ponds and reservoirs; dikes, levees, and embankments; drainage systems; irrigation; terraces and diversions; and waterways. The ratings and comments in the table are based on estimates given in table 6, on field observation of the soils, and on experience with the same kinds of soils in other counties.

Most of the headings in table 7 are self explanatory. The few that are not are further explained as follows.

The suitability of a soil for earthwork when wet depends on its texture and plasticity. Most plastic and clayey soils are unsuitable when wet, but very sandy soils are good when wet. Most soils that are difficult to work when wet are even more so when frozen.

Susceptibility to frost action refers to the expansion and contraction of the soil as it freezes and thaws.

The suitability of a soil for roadfill depends largely on its stability when used as subgrade fill for paved roads or as surfacing material for unpaved roads.

The interpretations in table 7 are not a substitute for onsite investigation.

Nonfarm Uses of Soils

Howard County, traditionally an agricultural area, is in the densely populated urban-suburban belt that extends from the vicinity of Richmond, Va., to Boston, Mass., and beyond. In most parts of this belt, population is growing and suburban areas are spreading rapidly. These developments have affected the eastern part of Howard County (fig. 11), which is directly between Baltimore, Md., and Washington, D.C. One result of this growth is the increasing demand for information about soil conditions that influence nonfarm uses. The most urgent need has been for information about the limitations of soils for disposing of sewage effluent from septic-tank systems. There is also a need for information about limitations of soils for use in building foundations, in landscaping, in streets and parking lots, in recreation areas, and the like.

Figure 11.—**Aerial view of residential area on U.S. Highway No. 29, near the Little Patuxent River. The dominant soils in this landscape are of the Glenelg and Manor series; the soils in depressions are mostly of the Glenville series.**

Table 8 rates each soil in the county as slightly, moderately, or severely limited for specific nonfarm uses. If a soil has more than one limiting characteristic, the rating reflects the most severe limitation. A rating of severe for a particular use does not mean that the soil cannot be put to that use. For example, a soil that is rated as severely limited for use in foundations because of a plastic, unstable subsoil or substratum can be used for foundations if it can be drained and stabilized at not too great expense.

The following paragraphs explain what properties limit suitability for each of the uses specified in table 8.

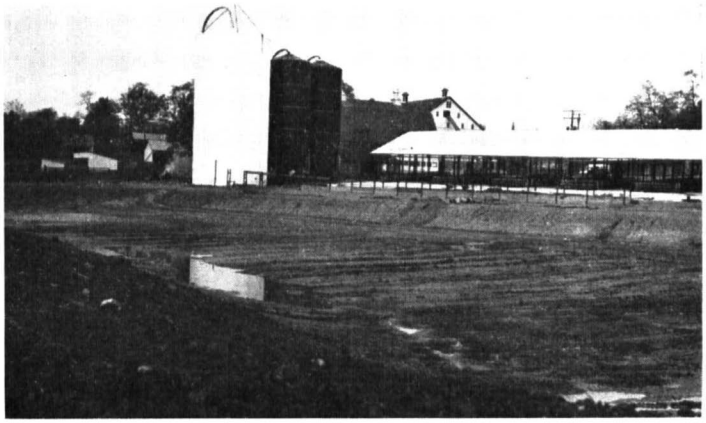

Figure 12.—**A sewage lagoon under construction, near Ellicott City, on Glenville silt loam, 0 to 3 percent slopes. This lagoon will be used chiefly for the treatment and disposal of dairy farm wastes.**

TABLE 6.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to water table	Depth from surface	Classification			Percentage passing sieve—
				USDA texture	Unified	AASHO	No. 4 (4.7 mm.)
	Feet	*Feet*	*Inches*				
Aldino (AdB2, AdC2)	4 to 6	1½ to 3	0 to 14	Silt loam	ML	A–4	90 to 100
			14 to 36	Silty clay loam	ML, CL	A–4, A–6	90 to 100
			36 to 60	Loam	MH, ML	A–4, A–5	85 to 95
Aura (AgB2, AgC2, AgE3)	(2)	20+	0 to 14	Gravelly loam	SM	A–2, A–4	80 to 95
			14 to 32	Gravelly sandy clay loam.	SC, CL	A–6	80 to 95
			32 to 48	Gravelly sandy loam.	GC	A–2	40 to 50
Baile (Ba)	6 to 9	0 to 1	0 to 9	Silt loam	ML	A–4	95 to 100
			9 to 30	Silty clay loam	CL, ML	A–6, A–7	95 to 100
			30 to 60	Loam	MH, ML	A–4, A–5	85 to 95
Beltsville (BeA, BeB2, BeC2, BeC3, BeD2).	(2)	1½ to 3	0 to 9	Silt loam	ML	A–4	95 to 100
			9 to 39	Silty clay loam	CL	A–6	95 to 100
			39 to 54	Gravelly clay loam.	CL	A–6	85 to 95
Brandywine (BrB2, BrC2, BrC3, BrD2, BrD3, BrF, BwD).	7	30+	0 to 12	Loam	SM	A–2	85 to 100
			12 to 48	Gravelly coarse sand.	SM, SP	A–1, A–3	85 to 95
Chester (CgB2, CgC2, ChA, ChB2, ChC2, ChC3, ChD2).	4 to 10	20+	0 to 12	Silt loam	ML	A–4	90 to 100
			12 to 34	Silty clay loam	ML, CL	A–6	85 to 100
			34 to 55	Loam	MH, ML	A–4, A–5	85 to 100
Chillum (ClC3, ClD2, ClE2, CmB2, CmC2, CnB2, CnD3).	(2)	5+	0 to 10	Gravelly loam or silt loam.	ML	A–4	90 to 100
			10 to 34	Silty clay loam	CL	A–4	90 to 100
			34 to 90	Gravelly sandy loam.	GM, GW, SM.	A–2 or A–1	40 to 60
Codorus (Co)	6 to 20	1½ to 3	0 to 38	Silty loam or loam	ML	A–4	95 to 100
			38 to 50	Silty clay loam	CL	A–6	95 to 100
Comus (Cs, CuB)	6 to 20	4+	0 to 36	Silt loam	ML	A–4	100
			36 to 50	Gravelly loamy sand.	SM or SP	A–2 or A–3	70 to 90
Delanco (DeA, DeB2)	5 to 20	1½ to 3	0 to 10	Silt loam	ML or CL	A–4 or A–6	90 to 100
			10 to 40	Clay loam	CL	A–6	90 to 100
			40 to 66	Sandy clay loam	SC	A–2 or A–4	90 to 100
Elioak (EkA, EkB2, EkC2, EkD2, ElC3, ElD3).	5 to 10	20+	0 to 13	Silt loam or silty clay loam.	ML, CL	A–4, A–6	85 to 95
			13 to 53	Clay or clay loam	MH or CH	A–7	85 to 95
			53 to 87	Silt loam or loam	SM or MH	A–4, A–5	70 to 90
Elkton (Em)	(2)	0 to 1	0 to 12	Silt loam	ML	A–4	100
			12 to 62	Clay	CL	A–6	95 to 100
Elsinboro (EnA, EnB2, EnC2)	6 to 20	6+	0 to 13	Loam	ML	A–4	85 to 95
			13 to 49	Silty clay loam	MH, CL	A–5, A–6	85 to 100
			49 to 60	Silt loam	MH	A–4, A–5	85 to 100
Evesboro (EvB, EvC)	(2)	10+	0 to 36	Loamy sand	SM	A–2	100
			36 to 56	Gravelly sand	SP, SM	A–3	85 to 95

See footnotes at end of table.

properties of the soils

Percentage passing sieve—continued		Permeability	Available water capacity	Reaction	Corrosion potential		Shrink-swell potential	Moisture-density data	
No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				Untreated steel pipes	Concrete pipes		Optimum moisture	Maximum dry density
		Inches per hour	*Inches per inch of soil*	*pH*				*Percent*	*Pounds per cubic foot*
85 to 95	65 to 80	0.63 to 2.0	0.21	4.5 to 5.0	High	High	Low	(1)	(1)
90 to 100	65 to 90	<.20	.21	4.5 to 5.0	High	High	Low	16	101 to 110
80 to 90	50 to 70	.63 to 2.0	.15	5.0 to 6.5	High	Moderate	Low to moderate.	16	101 to 110
60 to 85	20 to 50	.63 to 2.0	.12	4.5 to 5.0	Low	High	Low	12	111 to 120
65 to 85	45 to 65	.20 to .63	.14	4.0 to 4.5	Low	High	Low	12	105 to 120+
35 to 45	20 to 30	.20 to .63	.11	4.0 to 4.5	Low	High	Low	10	120+
90 to 100	60 to 75	.20 to .63	.22	4.5 to 5.5	Moderate	Moderate	Low	(1)	(1)
90 to 100	65 to 85	<.20	.21	4.5 to 5.5	Moderate	Moderate	Moderate	21	101 to 110
80 to 90	60 to 75	<.20	.21	4.5 to 5.5	Moderate	High	Moderate	16	101 to 110
95 to 100	75 to 90	.63 to 2.0	.21	4.5 to 5.0	Moderate	High	Low	(1)	(1)
95 to 100	75 to 90	<.20	.15	4.0 to 5.0	Moderate	High	Low to moderate.	13	111 to 120+
85 to 95	65 to 80	.20 to 2.0	.10	4.0 to 4.5	Moderate	High	Low to moderate.	16	111 to 120
75 to 90	15 to 30	.63 to 2.0	.12	5.0 to 6.0	Low	Moderate	Low	12	111 to 120
60 to 90	5 to 15	.20 to 6.3	.06	4.5 to 5.0	Low	High	Low	10	101 to 110
90 to 100	60 to 75	.63 to 2.0	.21	5.5 to 6.0	Moderate	Moderate	Low	(1)	(1)
85 to 95	55 to 80	.63 to 2.0	.15	4.5 to 5.5	Low	Moderate	Low to moderate.	16	101 to 110
85 to 100	50 to 65	.63 to 2.0	.10	4.5 to 5.5	Low	Moderate	Low	18	101 to 110
85 to 100	60 to 80	.63 to 2.0	.21	4.0 to 5.0	Low	High	Low	(1)	(1)
90 to 100	70 to 90	.20 to .63	.21	4.0 to 4.5	Moderate	High	Low	15	101 to 110
20 to 40	5 to 20	.63 to 6.3	.10	4.0 to 4.5	Moderate	High	Low	6	111 to 120+
90 to 100	75 to 90	.20 to .63	.21	4.0 to 5.0	Moderate	Low	Low	13	101 to 110
90 to 100	80 to 95	.20 to 2.0	.21	4.0 to 4.5	Moderate	Low	Moderate	13	101 to 110
100	60 to 80	.63 to 2.0	.21	5.1 to 5.5	Moderate	Moderate	Low	13	101 to 110
60 to 80	5 to 15	2.0 to 6.3	.08	5.1 to 5.5	Moderate	Moderate	Low	11	101 to 110
85 to 95	65 to 85	.63 to 2.0	.21	4.5 to 5.0	Low	High	Low	(1)	(1)
85 to 100	70 to 95	.20 to .63	.17	4.0 to 5.0	Moderate	High	Moderate	15	101 to 110
85 to 100	30 to 50	.20 to .63	.17	4.0 to 4.5	Moderate	High	Low	12	111 to 120
80 to 95	65 to 95	.20 to 2.0	.21	5.1 to 5.5	Moderate	Moderate	Low	(1)	(1)
80 to 95	70 to 95	.20 to .63	.18	5.1 to 5.5	Moderate	Moderate	Moderate	20	101 to 110
65 to 85	40 to 65	.63 to 2.0	.15	5.1 to 5.5	Moderate	Moderate	Low	20	101 to 110
100	50 to 80	.20 to 2.0	.22	4.0 to 5.0	High	High	Moderate	(1)	(1)
90 to 100	70 to 90	<.20	.21	4.0 to 4.5	High	High	Moderate	15	101 to 110
80 to 95	60 to 75	.63 to 2.0	.21	5.5 to 6.0	Moderate	Moderate	Low	(1)	(1)
85 to 95	55 to 80	.63 to 2.0	.15	4.5 to 5.5	Low	Moderate	Low	16	101 to 110
85 to 100	40 to 65	.63 to 2.0	.10	4.5 to 5.0	Low	Moderate	Low	18	101 to 110
95 to 100	10 to 25	>6.3	<.06	4.5 to 5.0	Low	High	Low	12	101 to 110
75 to 90	0 to 10	>6.3	<.06	4.0 to 4.5	Low	High	Low	12	101 to 110

TABLE 6.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to water table	Depth from surface	Classification			Percentage passing sieve—
				USDA texture	Unified	AASHO	No. 4 (4.7 mm.)
	Feet	*Feet*	*Inches*				
Fallsington (Fa)	(2)	0 to 1	0 to 16	Loam	ML, SM	A-4	95 to 100
			16 to 35	Sandy clay loam	ML, SM	A-4, A-2	95 to 100
			35 to 44	Sand	SP, SM	A-3, A-2	100
			44 to 96	Gravelly coarse sand.	GP, GM	A-1	40 to 50
			96 to 100	Clay	CH, CL	A-7	100
Glenelg (GlA, GlB2, GlC2, GlC3, GlD2, GlD3).	4 to 10	20+	0 to 15	Loam or silt loam	ML	A-4	75 to 85
			15 to 25	Silty clay loam	ML, CL	A-6	75 to 85
			25 to 60	Loam or silt loam	MH, ML	A-4, A-5	60 to 80
Glenville (GnA, GnB2, GnC2)	4 to 10	1½ to 3	0 to 9	Silt loam	ML	A-4	85 to 95
			9 to 37	Silty clay loam	ML, CL	A-4, A-6	85 to 95
			37 to 50	Loam or silt loam	MH, ML, SM.	A-4, A-5	75 to 90
Gravel pits and quarries (Gp). Properties variable. Onsite investigation necessary.							
Hatboro (Ha)	6 to 20	0 to 1	0 to 45	Silt loam	ML	A-4	95 to 100
			45 to 54	Gravelly clay loam.	CL	A-6	80 to 90
Iuka (IuB)	(2)	1½ to 3	0 to 29	Loam	ML	A-4	90 to 100
			29 to 50	Gravelly sandy loam.	SM, SP	A-2	70 to 90
Kelly (KcE3, KeB2, KeC2)	2½ to 6	1 to 3	0 to 7	Silt loam	ML, CL	A-4, A-6	100
			7 to 36	Clay or clay loam	CH	A-7	100
Keyport (KhC2)	(2)	1½ to 3	0 to 7	Silt loam	ML	A-4	100
			7 to 18	Silty clay loam	CL	A-6	95 to 100
			18 to 44	Clay or clay loam	CL, CH	A-6, A-7	95 to 100
			44 to 54	Sandy clay	SC	A-6, A-2	90 to 100
Kinkora (Kn)	5 to 20	0 to 1	0 to 12	Silt loam	ML	A-4	85 to 95
			12 to 50	Clay or silty clay	CH, CL	A-6, A-7	85 to 95
			50 to 60	Gravelly silty clay loam.	CL	A-6	80 to 90
Legore (LeB2, LeC2, LgC3)	4 to 10	20+	0 to 9	Silt loam or silty clay loam.	ML, CL	A-4, A-6	75 to 90
			9 to 28	Clay loam	CL	A-6	85 to 100
			28 to 60	Sandy loam or loam.	SM, ML	A-4	85 to 95
Leonardtown (Ll)	(2)	0 to 1	0 to 13	Silt loam	ML	A-4	95 to 100
			13 to 34	Silty clay loam	CL	A-6	95 to 100
			34 to 44	Silt loam	ML	A-4	95 to 100
Linganore (LnB2, LnC2, LnD2, LoE).	2 to 3	10+	0 to 8	Channery loam	ML, SM	A-4	60 to 70
			8 to 21	Very channery silty clay loam or silt loam.	GM, GP	A-2	20 to 50
			21 to 27		GP, GM	A-1	5 to 10
Made land (Md). Properties variable. Onsite investigation necessary.							

See footnotes at end of table.

properties of the soils—Continued

Percentage passing sieve—continued		Permeability	Available water capacity	Reaction	Corrosion potential		Shrink-swell potential	Moisture-density data	
No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				Untreated steel pipes	Concrete pipes		Optimum moisture	Maximum dry density
		Inches per hour	*Inches per inch of soil*	*pH*				*Percent*	*Pounds per cubic foot*
95 to 100	35 to 55	.63 to 2.0	.21	4.0 to 5.0	High	High	Low	(1)	(1)
95 to 100	30 to 55	.63 to 2.0	.21	4.0 to 4.5	High	High	Low	12	120 to 125
100	5 to 10	>6.3	<.06	4.0 to 4.5	High	High	Low	12	101 to 110
30 to 40	5 to 10	>6.3	<.06	4.0 to 4.5	High	High	Low	10	101 to 110
100	70 to 90	<.20	.22	4.0 to 4.5	High	High	Moderate	20	91 to 100
70 to 85	55 to 75	.63 to 2.0	.21	5.0 to 6.0	Moderate	Moderate	Low	(1)	(1)
70 to 85	60 to 80	.63 to 2.0	.15	5.0 to 5.5	Low	Moderate	Low to moderate.	16	101 to 110
55 to 75	50 to 65	.63 to 2.0	.10	4.5 to 5.5	Low	Moderate	Low	18	101 to 110
85 to 95	65 to 80	.63 to 2.0	.21	4.5 to 5.5	High	High	Moderate	(1)	(1)
85 to 95	65 to 90	.20 to .63	.21	4.0 to 5.0	High	High	Moderate	16	101 to 110
75 to 90	40 to 65	.63 to 2.0	.12	4.0 to 5.0	High	High	Low to moderate.	18	101 to 110
90 to 100	75 to 90	.20 to .63	.21	5.0 to 5.5	High	High	Low	13	101 to 110
80 to 90	65 to 85	<.20	.21	4.5 to 5.5	High	High	Moderate	13	101 to 110
90 to 100	55 to 80	.20 to .63	.18	4.5 to 5.5	Moderate	High	Low	13	101 to 110
50 to 80	10 to 20	2.0 to 6.3	.08	4.0 to 4.5	Moderate	High	Low	10	111 to 120
100	75 to 90	.20 to .63	.21	4.5 to 5.5	High	Moderate	Moderate	(1)	(1)
100	80 to 100	<.20	.18	4.5 to 6.5	High	Moderate	High	24	91 to 100
100	65 to 90	.20 to 2.0	.22	5.0 to 5.5	High	High	Low	(1)	(1)
95 to 100	80 to 90	<.20	.21	5.0 to 5.5	High	High	Moderate	13	101 to 110
95 to 100	80 to 90	<.20	.21	4.0 to 5.0	High	High	Moderate	13	101 to 110
80 to 100	30 to 50	.63 to 2.0	.21	4.0 to 4.5	High	High	Low	12	120+
85 to 95	60 to 80	.20 to .63	.21	5.1 to 5.5	High	High	Moderate	(1)	(1)
85 to 95	70 to 90	<.20	.18	5.1 to 5.5	High	High	Moderate	22	91 to 100
80 to 90	60 to 80	<.20	.21	5.1 to 5.5	High	High	Moderate	18	101 to 110
70 to 90	55 to 75	.63 to 2.0	.21	5.0 to 6.0	Moderate	Moderate	Low to moderate.	(1)	(1)
80 to 100	55 to 75	.63 to 2.0	.21	5.5 to 6.0	Moderate	Moderate	Moderate	20	91 to 100
80 to 90	40 to 65	.63 to 2.0	.15	6.0 to 6.5	Moderate	Moderate	Low	17	101 to 120
95 to 100	90 to 100	.20 to .63	.21	4.0 to 5.0	High	High	Low	(1)	(1)
95 to 100	90 to 100	<.20	.15	4.0 to 4.5	High	High	Moderate	12	111 to 120
95 to 100	70 to 100	<.20	.21	4.0 to 4.5	High	High	Low	13	101 to 110
50 to 60	40 to 55	.20 to .63	.15	4.5 to 5.0	Low	Moderate	Low	(1)	(1)
15 to 40	10 to 35	.20 to .63	.12	5.0 to 6.0	Low	Low	Low	12	120+
5 to 10	2 to 10	.63 to 2.0	.06	5.5 to 6.0	Low	Low	Low	10	120+

TABLE 6.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to water table	Depth from surface	Classification			Percentage passing sieve—
				USDA texture	Unified	AASHO	No. 4 (4.7 mm.)
	Feet	*Feet*	*Inches*				
Manor (MgB2, MgC2, MgC3, MlA, MlB2, MlC2, MlC3, MlD2, MlD3, MlE, MnD, MnF).	6 to 10	20+	0 to 60	Loam	ML, MH	A-4, A-5	85 to 100
Mixed alluvial land (Mo)[1] Properties variable. Onsite investigations necessary.							
Montalto (MpB2, MpC2, MrE, MsD, MsF, MqC3). (For Relay part of MrE, MsD, MsF units, see Relay series).	5 to 12	20+	0 to 10	Silt loam or silty clay loam.	ML, CL	A-4, A-6	80 to 100
			10 to 46	Silty clay loam to clay.	MH, CH	A-7	95 to 100
			46 to 60	Loam	ML, MH	A-5, A-7	90 to 100
Mt. Airy (MtB2, MtC2, MtC3, MtD2, MtE).	2 to 3	10+	0 to 10	Channery loam	ML	A-4	65 to 80
			10 to 30	Very channery loam.	GM, SM	A-2	10 to 40
Neshaminy (NeB2, NeC2, NsD3).	6 to 10	20+	0 to 11	Silt loam	ML, CL	A-4, A-6	90 to 100
			11 to 50	Silty clay loam	CL	A-6	90 to 100
			50 to 60	Silt loam or loam	ML, MH	A-5, A-7	80 to 95
Relay (ReC2)	5 to 10	20+	0 to 8	Silt loam	ML	A-4	85 to 95
			8 to 33	Silty clay loam or clay loam.	CL	A-6	85 to 95
			33 to 60	Silt loam or loam	ML, MH	A-5	85 to 95
Rumford (RuB2, RuC2, RuD2)	(2)	5+	0 to 16	Loamy sand	SM, SP	A-2, A-1	100
			16 to 31	Sandy loam	SM	A-2	100
			31 to 48	Loamy sand	SM, SP	A-2, A-3	75 to 100
Sandy and clayey land (ScB, ScD, ScE).	(3)	20+	(3)	Sandy loam to sand.	SM, SP	A-2, A-3	90 to 100
			(3)	Clay	CH	A-7	90 to 100
Sassafras (SfB2, SfC2, SfD2, SlB2, SlC2, SlD2, SsE).	(2)	5+	0 to 12	Loam or gravelly sandy loam.	SM, ML	A-2, A-3, A-4.	70 to 100
Stony land (St) Properties variable. On-site investigation necessary.	0 to 5	20+					
Sunnyside (SuB2, SuD2)	(2)	5+	0 to 10	Fine sandy loam	ML	A-4	90 to 100
			10 to 44	Fine sandy loam to fine sandy clay loam.	SC, CL	A-6	90 to 100
			44 to 60	Clay	CL, CH	A-6, A-7	100
Watchung (WaA, WaB)	5 to 10	0 to 1	0 to 9	Silt loam	ML	A-4	95 to 100
			9 to 36	Silty clay or clay	CH, CL	A-7, A-67	95 to 100
			36 to 60	Silt loam or silty clay loam.	ML, MH	A-5, A-	80 to 90
Woodstown (WoB2)	(2)	1½ to 3	0 to 11	Sandy loam	SM	A-2, A-4	95 to 100
			11 to 34	Sandy clay loam	SC, CL	A-2, A-4	95 to 100
			34 to 50	Gravelly coarse sand.	SM, SP	A-2, A-1	85 to 100

[1] This layer is not suitable for fill or foundation material.

[2] These soils developed in unconsolidated, stratified alluvium or Coastal Plain deposits of gravel, sand, silt, or other material. In the soils of the Coastal Plain, the depth to bedrock cannot be determined; in those of other areas it is undetermined but usually great.

[3] Variable.

properties of the soils—Continued

Percentage passing sieve—continued		Permeability	Available water capacity	Reaction	Corrosion potential		Shrink-swell potential	Moisture-density data	
No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				Untreated steel pipes	Concrete pipes		Optimum moisture	Maximum dry density
		Inches per hour	*Inches per inch of soil*	*pH*				*Percent*	*Pounds per cubic foot*
85 to 100	50 to 70	.63 to 2.0	.15	4.5 to 5.5	Low	Moderate	Low	18	101 to 110
80 to 100	70 to 90	.20 to 2.0	.21	6.0 to 6.5	Moderate	Moderate	Moderate	(1)	(1)
95 to 100	85 to 95	.20 to .63	.21	5.5 to 6.0	Moderate	Moderate	Moderate	27	91 to 100
80 to 95	50 to 65	.63 to 2.0	.15	6.1 to 6.5	Moderate	Moderate	Moderate	25	91 to 100
60 to 75	50 to 70	2.0 to 6.3	.15	4.5 to 5.5	Low	Moderate	Low	(1)	(1)
8 to 35	5 to 30	.63 to 2.0	.15	4.5 to 5.0	Low	Moderate	Low	16	111 to 120
90 to 100	65 to 85	.63 to 2.0	.21	5.5 to 6.5	Moderate	Moderate	Moderate	18	101 to 110
90 to 100	70 to 90	.20 to .63	.21	5.0 to 6.0	Moderate	Moderate	Moderate	20	101 to 110
75 to 90	60 to 80	.63 to 2.0	.15	5.5 to 6.5	Moderate	Moderate	Moderate	20	101 to 110
80 to 90	65 to 85	.63 to 2.0	.21	4.5 to 5.0	Moderate	Moderate	Low	(1)	(1)
80 to 90	70 to 85	.20 to .63	.21	4.5 to 5.5	Moderate	Moderate	Moderate	20	101 to 110
80 to 90	65 to 85	.63 to 2.0	.15	5.5 to 6.5	Moderate	Moderate	Moderate	20	101 to 110
100	10 to 20	2.0 to 6.3	.08	4.5 to 5.0	Low	High	Low	12	101 to 110
100	25 to 35	.63 to 2.0	.10	4.5 to 5.0	Low	High	Low	14	111 to 120+
100	5 to 20	2.0 to 6.3	.06	4.0 to 5.0	Low	High	Low	12	105 to 110
90 to 100	5 to 20	2.0 to 6.3	.08	4.0 to 5.0	Low	High	Low	12	101 to 110
90 to 100	85 to 100	<.20	.15	4.0 to 5.0	Moderate	High	High	20	91 to 100
65 to 100	30 to 60	2.0 to 6.3	.12	4.5 to 5.5	Low	High	Low	(1)	(1)
90 to 100	50 to 60	.63 to 2.0	.15	5.1 to 5.5	Low	High	Low	(1)	(1)
90 to 100	40 to 70	.63 to 2.0	.11	4.0 to 5.0	Low	High	Low	14	111 to 120+
100	80 to 100	<.20	.15	4.0 to 4.5	Moderate	High	Moderate	20	91 to 100
95 to 100	60 to 80	.20 to .63	.21	4.5 to 5.0	High	High	Low	(1)	(1)
95 to 100	90 to 100	<.20	.18	4.5 to 6.0	High	Moderate	High	22	91 to 100
80 to 90	60 to 80	.20 to .63	.17	6.1 to 7.0	High	Moderate	Moderate	20	101 to 110
95 to 100	30 to 50	.20 to 6.3	.12	5.0 to 5.5	Low	High	Low	(1)	(1)
95 to 100	30 to 65	.63 to 2.0	.12	4.0 to 5.0	Moderate	High	Low	14	111 to 120+
85 to 100	5 to 15	2.0 to 6.3	<.06	4.0 to 4.5	Moderate	High	Low	12	111 to 120

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability for earthwork when wet	Susceptibility to frost action	Kind of available rock	Suitability as a source of—		
				Topsoil	Sand and gravel	Roadfill
Aldino (AdB2, AdC2)	Poor	High	Serpentine	Fair	Unsuitable	Poor
Aura (AgB2, AgC2, AgE3)	Fair	Low	None	Fair	Unsuitable	Good
Baile (Ba)	Very poor	High	Mica schist [3]	Poor	Unsuitable	Very poor
Beltsville (BeA, BeB2, BeC2, BeC3, BeD2).	Very poor	High	None	Fair	Locally good for gravel.	Poor
Brandywine (BrB2, BrC2, BrC3, BrD2, BrD3, BrF, BwD). [4]	Fair to good	Low	Gneiss	Poor to fair	Unsuitable	Good
Chester (CgB2, CgC2, ChA, ChB2, ChC2, ChC3, ChD2).	Poor	Moderate	Mica schist [3]	Good	Unsuitable	Fair: elastic
Chillum (ClC3, ClD2, ClE2, CmB2, CmC2, CnB2, CnD3). (For Fairfax part of CnB2, CnD3 units, see Fairfax series.)	Fair	Moderate	None	Fair to good	Fair: gravel dirty.	Good
Codorus (Co)	Very poor	High	Variable	Fair to good	Locally fair for gravel.	Fair

See footnotes at end of table.

interpretations

Features that affect engineering practices

Pipelines [1] (construction and maintenance)	Road and highway location [2]	Pond and reservoir sites	Dikes, levees, and embankments	Drainage systems	Irrigation	Terraces and diversions	Waterways
Seasonal high water table; 4 to 6 feet to serpentine bedrock.	Seasonal high water table; fair stability; high susceptibility to frost action.	Slow subsoil seepage; moderate substratum seepage; 4 to 6 feet to bedrock.	Fair stability; high erodibility; medium density; difficult to compact.	Slow permeability; high erodibility; seasonal high water table.	Slow infiltration; impeded drainage.	High erodibility; fair stability; seasonal high water table.	Moderate fertility; erodibility.
No important problems.	Very good stability.	Moderate seepage.	Very good stability; erodibility; high to very high density.	Not needed---	Moderate available moisture capacity; medium infiltration.	Erodibility; very good stability.	Erodibility; low fertility.
High water table; 6 to more than 9 feet to mica schist bedrock.	High water table; poor stability; high susceptibility to frost action.	Slow seepage; 6 to more than 9 feet to bedrock.	Poor stability; erodibility; medium density; difficult to compact.	Slow permeability; erodibility; high water table.	Poor drainage.	High water table.	Moderate fertility; erodibility; high water table.
Seasonal high water table; slips in cuts.	Seasonal high water table; fair stability; high susceptibility to frost action; slips in cuts.	Slow subsoil seepage; moderate substratum seepage; no bedrock.	Variable stability; erodibility; high density.	Slow permeability; erodibility; seasonal high water table.	Moderate available moisture capacity; very slow infiltration; impeded drainage.	Erodibility; fair stability; seasonal high water table.	Moderate available moisture capacity; moderate fertility.
More than 7 feet to gneiss bedrock.	Fair subsoil stability; good substratum stability.	Rapid to excessive seepage; more than 7 feet to bedrock.	Fair to good stability; erodibility; medium density; pervious material.	Not needed---	Low available moisture capacity; rapid infiltration.	Erodibility; fair to good stability.	Low available moisture capacity; moderate fertility; erodibility.
4 to more than 10 feet to mica schist bedrock.	Good stability; moderate susceptibility to frost action; elastic material.	Moderate seepage; 4 to more than 10 feet to pervious bedrock.	Good stability; erodibility; medium density.	Not needed---	No problems--	Erodibility; good stability.	Moderate fertility; erodibility.
No important problems.	Good stability; moderate susceptibility to frost action.	Moderate subsoil seepage; high substratum seepage; no bedrock.	Good stability; erodibility; medium to high density.	Not needed---	Medium infiltration.	Erodibility; good stability.	Moderate fertility; erodibility.
Seasonal high water table; flood hazard; 6 to more than 20 feet to variable bedrock.	Seasonal high water table; poor stability; flood hazard; high susceptibility to frost action.	Slow seepage; 6 to more than 20 feet to bedrock; constant water source; pervious substratum.	Poor stability; erodibility; medium density.	Moderate permeability; high erodibility; seasonal high water table.	Medium infiltration; impeded drainage; seasonal high water table.	Erodibility; poor stability.	Moderate fertility; erodibility.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability for earthwork when wet	Susceptibility to frost action	Kind of available rock	Suitability as a source of—		
				Topsoil	Sand and gravel	Roadfill
Comus (Cs, CuB)	Poor	Moderate	Variable	Good	Locally fair	Fair
Delanco (DeA, DeB2)	Poor	High	Variable	Fair	Unsuitable	Fair
Elioak (EkA, EkB2, EkC2, EkD2, EIC3, EID3).	Poor	Moderate	Mica schist [3]	Good	Unsuitable	Fair: elastic
Elkton (Em)	Very poor	High	None	Poor to fair	Unsuitable	Poor
Elsinboro (EnA, EnB2, EnC2)	Poor	Moderate	Variable	Good	Unsuitable	Fair
Evesboro (EvB, EvC)	Good	Low	None	Fair	Locally good below a depth of 3 feet.	Fair to good
Fairfax	Poor	Moderate	Mica schist [3]	Fair to good	Unsuitable	Fair

See footnotes at end of table.

interpretations—Continued

Features that affect engineering practices							
Pipelines [1] (construction and maintenance)	Road and highway location [2]	Pond and reservoir sites	Dikes, levees, and embankments	Drainage systems	Irrigation	Terraces and diversions	Waterways
More than 4 feet to water table; 6 to more than 20 feet to variable bedrock; poor stability; Cs subject to flooding.	Seasonal high water table; flood hazard; poor stability; moderate susceptibility to frost action.	Moderate subsoil seepage; moderately rapid substratum seepage; 6 to more than 20 feet to bedrock; Cs has constant water source.	Poor stability; erodibility; medium density.	Not needed---	Medium infiltration.	Not needed---	Moderate fertility; flood hazard; erodibility.
Seasonal high water table; 5 to more than 20 feet to variable bedrock.	Seasonal high water table; fair stability; high susceptibility to frost action.	Moderately slow seepage; 6 to more than 20 feet to bedrock.	Fair stability; erodibility; medium to high density.	Moderately slow permeability; moderate erodibility; seasonal high water table.	Medium infiltration; impeded drainage.	Erodibility; fair stability.	Moderate fertility; erodibility.
4 to more than 10 feet to mica schist bedrock.	Fair subsoil stability; good substratum stability; moderate susceptibility to frost action; elastic.	Moderate seepage; 4 to more than 10 feet to bedrock; pervious substratum.	Fair to good stability; moderate erodibility; medium density; difficult to compact; subject to piping.	Not needed---	Medium infiltration.	Erodibility; fair to good stability.	Moderate fertility; moderate erodibility.
High water table.	High water table; poor stability; high susceptibility to frost action.	Very slow seepage; no bedrock; high water table.	Poor stability; high erodibility; medium density; difficult to compact.	Slow permeability; high water table.	Very slow infiltration; poor drainage.	Not applicable.	Not needed.
6 to more than 20 feet to variable bedrock.	Fair subsoil stability; good substratum stability; moderate susceptibility to frost action.	Moderate seepage; 6 to more than 20 feet to bedrock.	Fair stability; erodibility; medium density.	Not needed---	Medium infiltration.	Erodibility; fair stability.	Moderate fertility; erodibility.
Loose sand----	Fair stability; loose sand; erodibility.	Excessive seepage; no bedrock; ponds need to be sealed to prevent excessive seepage.	Fair stability; erodibility; medium density; high permeability.	Not needed---	Low available moisture capacity; rapid infiltration.	Erodibility; fair stability.	Low available moisture capacity; low fertility; erodibility.
4 to more than 6 feet to mica schist bedrock.	Fair subsoil stability; good substratum stability; moderate susceptibility to frost action.	Pervious substratum; moderate seepage; 4 to more than 6 feet to bedrock.	Fair to good stability; erodibility; medium density.	Not needed---	Medium infiltration.	Erodibility; fair to good stability.	Moderate fertility.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability for earthwork when wet	Susceptibility to frost action	Kind of available rock	Suitability as a source of—		
				Topsoil	Sand and gravel	Roadfill
Fallsington (Fa)	Poor	High	None	Fair	Unsuitable	Fair: wet
Glenelg (GIA, GIB2, GIC2, GIC3, GID2, GID3).	Poor	Moderate	Mica schist [3]	Good	Unsuitable	Fair: elastic
Glenville (GnA, GnB2, GnC2)	Poor	Moderate	Mica schist [3]	Fair	Unsuitable	Fair: elastic
Gravel pits and quarries (Gp) (Properties variable. Onsite investigation necessary.)						
Hatboro (Ha)	Poor	High	Variable	Fair	Unsuitable	Poor
Iuka (IuB)	Poor	High	None	Fair	Fair to good	Fair
Kelly (KcE3, KeB2, KeC2)	Unsuitable	High	Gabbro or diabase.	Poor	Unsuitable	Unsuitable
Keyport (KhC2)	Poor	High	None	Fair	Unsuitable	Good

See footnotes at end of table.

interpretations—Continued

Features that affect engineering practices							
Pipelines [1] (construction and maintenance)	Road and highway location [2]	Pond and reservoir sites	Dikes, levees, and embankments	Drainage systems	Irrigation	Terraces and diversions	Waterways
High water table; running sand.	High water table; high susceptibility to frost action.	Moderate subsoil seepage; high substratum seepage; no bedrock; high water table.	Fair to good stability; erodibility; medium density; difficult to compact.	Rapid permeability; erodibility; running sand.	Not needed	Not applicable.	Not applicable.
4 to more than 10 feet to schist bedrock.	Fair subsoil stability; good substratum stability; moderate susceptibility to frost action; elastic.	Moderate seepage; 4 to more than 10 feet to bedrock.	Fair to good stability; erodibility; medium density; difficult to compact; piping.	Not needed	Medium infiltration.	Erodibility; fair to good stability.	Moderate fertility; erodibility.
Seasonal high water table; 4 to 10 feet to mica schist bedrock.	Seasonal high water table; fair stability; moderate susceptibility to frost action.	Moderate subsoil seepage; slow substratum seepage; 4 to 10 feet to bedrock.	Fair stability; erodibility; medium density; difficult to compact; subject to piping.	Moderately slow permeability; erodibility.	Moderately slow infiltration; impeded drainage.	Erodibility; fair stability; seasonal high water table.	Moderate available moisture capacity; moderate fertility; erodibility.
High water table; flood hazard.	High water table; flood hazard; very poor stability; high susceptibility to frost action.	Moderate subsoil seepage; slow substratum seepage; constant water source; high water table.	Very poor stability; erodibility; medium density; difficult to compact.	Moderately slow permeability; high water table.	Medium infiltration; poor drainage.	Not applicable.	Not applicable.
Seasonal high water table.	Seasonal high water table; poor stability; high susceptibility to frost action.	Moderately slow seepage; pervious substratum.	Poor stability; erodibility; medium to high density.	Moderate permeability; high erodibility.	Medium infiltration; impeded drainage.	High erodibility; poor stability; seepage.	Moderate fertility; erodibility.
Seasonally wet; 2½ to 6 feet to gabbro or diabase bedrock.	Wetness; very poor stability; high susceptibility to frost action.	Very slow seepage; 2½ to 6 feet to bedrock.	Poor stability; erodibility; low density.	Slow permeability; erodibility.	Slow infiltration; impeded drainage.	Erodibility; very poor stability.	Moderate fertility; high erodibility.
Seasonal high water table.	Seasonal high water table; poor subsoil stability; fair substratum stability; high susceptibility to frost action.	Slow seepage; no bedrock.	Fair stability; erodibility; medium to high density; fair compaction.	Slow permeability; erodibility; seepage.	Slow infiltration; impeded drainage.	Erodibility; fair stability.	Moderate fertility; erodibility.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability for earthwork when wet	Susceptibility to frost action	Kind of available rock	Suitability as a source of—		
				Topsoil	Sand and gravel	Roadfill
Kinkora (Kn)	Poor	High	Variable	Fair	Unsuitable	Poor
Legore (LeB2, LeC2, LgC3)	Fair	Moderate	Diabase	Good	Unsuitable	Poor
Leonardtown (Ll)	Poor	High	None	Fair	Locally fair for gravel.	Poor to fair
Linganore (LnB2, LnC2, LnD2, LoE)	Fair	Moderate	Hard slaty schist.[3]	Fair	Unsuitable	Fair
Made land (Md) (Properties variable. Onsite investigation necessary.)						
Manor (MgB2, MgC2, MgC3, MlA, MlB2, MlC2, MlC3, MlD2, MlD3, MlE, MnD, MnF).[4]	Poor	Moderate	Mica schist [3]	Fair	Unsuitable	Poor: elastic
Mixed alluvial land (Mo) (Properties variable. Onsite investigation necessary.)						
Montalto (MpB2, MpC2, MrE, MsD, MsF, MqC3).[4] (For Relay part of MrE, MsD and MsF units, see Relay series.)	Fair	Moderate	Diabase	Good	Unsuitable	Poor
Mt. Airy (MtB2, MtC2, MtC3, MtD2, MtE).	Fair	Moderate	Mica schist [3]	Fair	Unsuitable	Fair

See footnote at end of table.

interpretations—Continued

Features that affect engineering practices							
Pipelines[1] (construction and maintenance)	Road and highway location[2]	Pond and reservoir sites	Dikes, levees, and embankments	Drainage systems	Irrigation	Terraces and diversions	Waterways
High water table; 5 to more than 20 feet to variable bedrock.	High water table; poor stability; high susceptibility to frost action.	Slow seepage; 5 to more than 20 feet to bedrock.	Poor stability; erodibility; variable density.	Slow permeability; erodibility.	Slow infiltration; impeded drainage.	Erodibility; poor stability.	Moderate fertility; erodibility.
4 to 10 feet to diabase bedrock.	Fair subsoil stability; good substratum stability; hard rock in deep cuts.	Pervious bedrock; 5 to 10 feet to bedrock.	Fair stability; erodibility; variable density.	Not needed---	Moderate permeability.	Erodibility; fair stability.	High fertility.
High water table; subject to caving.	High water table; poor stability; high susceptibility to frost action.	High water table.	Poor stability; erodibility; medium to high density; difficult to compact when wet.	Slow permeability; high erodibility; seepage.	Not needed---	Not needed---	Not needed.
2 to 3 feet to hard slaty schist bedrock.	Good stability; moderate susceptibility to frost action; 2 to 3 feet to hard rock.	2 to 3 feet to pervious bedrock; ponds need to be sealed to prevent excessive seepage.	Good stability; erodibility; high density.	Not needed---	Low available moisture capacity; pervious bedrock.	2 to 3 feet to bedrock.	Moderate fertility; 2 to 3 feet to bedrock.
6 to more than 10 feet to soft mica schist bedrock.	Fair stability; moderate susceptibility to frost action.	6 to more than 10 feet to pervious bedrock; ponds need to be sealed to prevent excessive seepage.	Fair stability; erodibility; medium density.	Not needed---	No problems--	Erodibility; fair stability.	Moderate fertility; erodibility.
4 to 12 feet to diabase bedrock.	Good stability; hard rock in deep cuts.	4 to 12 feet to pervious bedrock.	Fair stability; erodibility; variable density.	Not needed---	Moderate permeability.	Erodibility; good stability.	High fertility.
2 to 3 feet to mica schist bedrock.	Good stability; moderate susceptibility to frost action; 2 to 3 feet to bedrock.	2 to 3 feet to pervious bedrock; ponds need to be sealed to prevent excessive seepage.	Fair stability; erodibility; high density.	Not needed---	Low available moisture capacity; pervious bedrock.	Erodibility; fair stability; 2 to 3 feet to bedrock.	Moderate fertility; 2 to 3 feet to bedrock.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability for earthwork when wet	Susceptibility to frost action	Kind of available rock	Suitability as a source of—		
				Topsoil	Sand and gravel	Roadfill
Neshaminy (NeB2, NeC2, NsD3)	Fair	Moderate	Mixed	Good	Unsuitable	Fair
Relay (ReC2)	Fair	Moderate	Gabbro and other basic rock.	Good	Unsuitable	Fair
Rumford (RuB2, RuC2, RuD2)	Good	Low	None	Fair	Locally good for sand below 30 inches.	Fair to good
Sandy and clayey land (ScB, ScD, ScE).	Sandy material good; clayey material unsuitable.	Low for sandy material; high for clayey material.	None	Poor	Unsuitable	Sandy material poor; clayey material unsuitable.
Sassafras (SfB2, SfC2, SfD2, SlB2, SlC2, SlD2, SsE).	Good	Moderate	None	Good	Locally fair below 36 inches.	Good
Stony land (St)	Mostly poor	Mostly moderate.	Mostly mica schist.[3]	Unsuitable	Unsuitable	Poor
Sunnyside (SuB2, SuD2)	Good	Moderate	None	Good	Unsuitable	Fair
Watchung (WaA, WaB)	Poor	High	Diabase	Fair	Unsuitable	Poor
Woodstown (WoB2)	Poor	Moderate	None	Good	Unsuitable: dirty.	Good

[1] Other than corrosion potential; see table 6 for estimates of corrosion potential.

[2] Other than slope and topography; effects of these features increase with increase in gradient and complexity.

interpretations—Continued

Features that affect engineering practices							
Pipelines[1] (construction and maintenance)	Road and highway location[2]	Pond and reservoir sites	Dikes, levees, and embankments	Drainage systems	Irrigation	Terraces and diversions	Waterways
5 to 10 feet to mixed bedrock.	No problems	5 to 10 feet to pervious bedrock.	Fair stability; erodibility; variable density.	Not needed	Medium infiltration; moderate permeability.	Erodibility; good stability.	High fertility.
5 to 10 feet to gabbro bedrock.	No problems	Pervious bedrock.	Fair stability; erodibility; variable density.	Not needed	Medium infiltration; moderate permeability.	Erodibility; good stability.	High fertility.
Loose sand	Fair stability; erodibility.	Excessive seepage; no bedrock; ponds need to be sealed to prevent excessive seepage.	Fair stability; erodibility; high to medium density.	Not needed	Low available moisture capacity; rapid infiltration.	Erodibility; fair stability.	Low available moisture capacity; low fertility; erodibility.
Extremely poor stability.	Extremely poor stability; low to high susceptibility to frost action.	Slow seepage; no bedrock.	Extremely poor stability; erodibility; medium to low density.	Not needed	Variable available moisture capacity; variable infiltration rate.	Erodibility; extremely poor stability.	Variable available moisture capacity; low fertility.
No important problems.	Good stability; moderate susceptibility to frost action.	No bedrock; pervious substratum.	Good stability; erodibility; high to medium density.	Not needed	Moderate available moisture capacity; medium to rapid infiltration.	Erodibility; good stability.	Moderate available moisture capacity; moderate fertility; erodibility.
Shallow to mica schist bedrock.	Stones, boulders, ledges.	Stones, boulders, ledges; shallow to bedrock.	Material too stony.	Not needed	Not feasible	Stones, boulders, ledges.	Stones, boulders, ledges.
No important problems.	Good stability; moderate susceptibility to frost action.	Slow substratum seepage; no bedrock.	Fair stability; erodibility; variable density.	Not needed	Moderate available moisture capacity; medium infiltration.	Erodibility; good stability.	Moderate available moisture capacity; moderate fertility; erodibility.
High water table; 5 to 10 feet to diabase bedrock.	High water table; poor stability; high susceptibility to frost action.	Pervious bedrock.	Poor stability; erodibility; low density.	Slowly permeable; erodible.	Slow infiltration; poor drainage.	Erodibility; very poor stability; high water table.	High fertility; erodibility; high water table.
Seasonal high water table; running sand in substratum.	Seasonal high water table; good stability; moderate susceptibility to frost action.	Moderate to rapid substratum seepage; no bedrock.	Good stability; erodibility; high to medium density; pervious.	Permeable; erodibility; running sand in substratum.	Moderate available moisture capacity; medium to rapid infiltration.	Erodibility; good stability.	Erodibility.

[3] Mica schist varies in hardness and utility; it may or may not be associated with other kinds of rock, mainly quartzite.

[4] Stony phases have additional limitations.

TABLE 8.—*Limitations for*

Mapping units	Sewage disposal fields	Sewage lagoons	Homes with basements	
			Open areas	Dense areas [1]
Aldino silt loam, 3 to 8 percent slopes, moderately eroded (AdB2).	Severe: seasonal high water table; slow permeability.	Moderate: slopes.	Moderate: 4 to 6 feet to bedrock; impeded drainage.	Moderate: 4 to 6 feet to bedrock; impeded drainage.
Aldino silt loam, 8 to 15 percent slopes, moderately eroded (AdC2).	Severe: seasonal high water table; slow permeability.	Severe: slopes.	Moderate: 4 to 6 feet to bedrock; impeded drainage; slopes.	Moderate: 4 to 6 feet to bedrock; impeded drainage; slopes.
Aura gravelly loam, 1 to 5 percent slopes, moderately eroded (AgB2).	Severe: moderately slow permeability.	Moderate: gravel; slopes.	Slight.	Slight.
Aura gravelly loam, 5 to 10 percent slopes, moderately eroded (AgC2).	Severe: moderately slow permeability.	Severe: slopes.	Slight.	Slight.
Aura gravelly loam, 10 to 30 percent slopes, severely eroded (AgE3).	Severe: slopes.	Severe: slopes.	Moderate: slopes.	Severe: slopes.
Baile silt loam (Ba).	Severe: high water table; slow permeability.	Slight [4].	Severe: high water table.	Severe: high water table.
Beltsville silt loam, 0 to 1 percent slopes (BeA).	Severe: seasonal high water table; slow permeability.	Slight.	Moderate: impeded drainage.	Moderate: impeded drainage.
Beltsville silt loam, 1 to 5 percent slopes, moderately eroded (BeB2).	Severe: seasonal high water table; slow permeability.	Moderate: slopes.	Moderate: impeded drainage.	Moderate: impeded drainage.
Beltsville silt loam, 5 to 10 percent slopes, moderately eroded (BeC2).	Severe: seasonal high water table; slow permeability.	Severe: slopes.	Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.
Beltsville silt loam, 5 to 10 percent slopes, severely eroded (BeC3).	Severe: seasonal high water table; slow permeability.	Severe: slopes.	Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.
Beltsville silt loam, 10 to 15 percent slopes, moderately eroded (BeD2).	Severe: seasonal high water table; slow permeability.	Severe: slopes.	Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.
Brandywine loam, 3 to 8 percent slopes, moderately eroded (BrB2).	Slight [5].	Severe: moderately rapid permeability.	Slight.	Slight.
Brandywine loam, 8 to 15 percent slopes, moderately eroded (BrC2).	Moderate: slopes [5].	Severe: moderately rapid permeability.	Moderate: slopes.	Moderate: slopes.
Brandywine loam, 8 to 15 percent slopes, severely eroded (BrC3).	Moderate: slopes [5].	Severe: moderately rapid permeability.	Moderate: slopes.	Moderate: slopes.
Brandywine loam, 15 to 25 percent slopes, moderately eroded (BrD2).	Severe: slopes [5].	Severe: moderately rapid permeability.	Moderate: slopes.	Severe: slopes.
Brandywine loam, 15 to 25 percent slopes, severely eroded (BrD3).	Severe: slopes [5].	Severe: moderately rapid permeability.	Moderate: slopes.	Severe: slopes.
Brandywine loam, 25 to 60 percent slopes (BrF).	Severe: slopes [5].	Severe: slopes.	Severe: slopes.	Severe: slopes.
Brandywine very stony loam, 3 to 25 percent slopes (BwD).	Slight to severe: slopes. [5]	Severe: moderately rapid permeability.	Moderate: slopes; stones.	Moderate to severe: slopes; stones.
Chester silt loam, 0 to 3 percent slopes (ChA).	Slight.	Moderate: moderate permeability.	Slight.	Slight.
Chester silt loam, 3 to 8 percent slopes, moderately eroded (ChB2).	Slight.	Moderate: slopes; moderate permeability.	Slight.	Slight.
Chester silt loam, 8 to 15 percent slopes, moderately eroded (ChC2).	Moderate: slopes.	Severe: slopes.	Moderate: slopes.	Moderate: slopes.
Chester silt loam, 8 to 15 percent slopes, severely eroded (ChC3).	Moderate: slopes.	Severe: slopes.	Moderate: slopes.	Moderate: slopes.
Chester silt loam, 15 to 25 percent slopes, moderately eroded (ChD2).	Severe: slopes.	Severe: slopes.	Moderate: slopes.	Severe: slopes.
Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded (CgB2).	Slight.	Moderate: slopes; moderate permeability.	Slight.	Slight.
Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded (CgC2).	Moderate: slopes.	Severe: slopes.	Moderate: slopes.	Moderate: slopes.
Chillum silt loam, 1 to 5 percent slopes, moderately eroded (CmB2).	Severe: moderately slow permeability.	Moderate: slopes.	Slight.	Slight.

See footnotes at end of table.

specified nonfarm uses

Streets in dense areas [2]	Parking lots	Sanitary land fill [3] (trench method)	Home gardens
Moderate: 4 to 6 feet to bedrock; impeded drainage; slopes.	Moderate: 4 to 6 feet to bedrock; impeded drainage; slopes.	Severe: slow permeability	Moderate: seasonal wetness; erosion hazard.
Severe: slopes	Severe: slopes	Severe: slow permeability	Severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability.	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Very severe: drainage not feasible.
Moderate: impeded drainage	Moderate: impeded drainage	Severe: slow permeability	Moderate: seasonal wetness.
Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Severe: slow permeability	Moderate: seasonal wetness; erosion hazard.
Severe: slopes	Severe: slopes	Severe: slow permeability	Severe to very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slow permeability	Severe to very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slow permeability	Severe to very severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate to severe: slopes	Moderate to severe: slopes	Moderate to severe: slopes; stones.	Severe: stones; erosion hazard.
Slight	Slight	Slight	Slight.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.

TABLE 8.—*Limitations for*

Mapping units	Sewage disposal fields	Sewage lagoons	Homes with basements	
			Open areas	Dense areas [1]
Chillum silt loam, 5 to 10 percent slopes, moderately eroded (CmC2).	Severe: moderately slow permeability.	Severe: slopes	Slight	Slight
Chillum gravelly loam, 5 to 10 percent slopes, severely eroded (ClC3).	Severe: moderately slow permeability.	Severe: slopes	Slight	Slight
Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded (ClD2).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded (ClE2).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded (CnB2).	Severe: moderately slow permeability.	Moderate: slopes.	Slight	Slight
Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded (CnD3).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Codorus silt loam (Co)	Severe: flood hazard.[6]	Severe: flood hazard.[6]	Severe: flood hazard.[6]	Severe: flood hazard.[6]
Comus silt loam (Cs)	Severe: flood hazard.[6]	Severe: flood hazard.[6]	Severe: flood hazard.[6]	Severe: flood hazard.[6]
Comus silt loam, local alluvium, 3 to 8 percent slopes (CuB).	Slight [5]	Severe: moderately rapid permeability.	Slight	Slight
Delanco silt loam, 0 to 3 percent slopes (DeA).	Severe: moderately slow permeability; impeded drainage.	Slight	Moderate: impeded drainage.	Moderate: impeded drainage.
Delanco silt loam, 3 to 8 percent slopes, moderately eroded (DeB2).	Severe: moderately slow permeability; impeded drainage.	Moderate: slopes.	Moderate: impeded drainage.	Moderate: impeded drainage.
Elioak silt loam, 0 to 3 percent slopes (EkA).	Severe: moderately slow permeability.	Slight	Slight	Slight
Elioak silt loam, 3 to 8 percent slopes, moderately eroded (EkB2).	Severe: moderately slow permeability.	Moderate: slopes.	Slight	Slight
Elioak silt loam, 8 to 15 percent slopes, moderately eroded (EkC2).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Elioak silt loam, 15 to 25 percent slopes, moderately eroded (EkD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Elioak silty clay loam, 8 to 15 percent slopes, severely eroded (ElC3).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Elioak silty clay loam, 15 to 25 percent slopes, severely eroded (ElD3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Elkton silt loam (Em)	Severe: high water table; slow permeability.	Slight [4]	Severe: high water table.	Severe: high water table.
Elsinboro loam, 0 to 3 percent slopes (EnA).	Slight	Moderate: moderate permeability.	Slight	Slight
Elsinboro loam, 3 to 8 percent slopes, moderately eroded (EnB2).	Slight	Moderate: moderate permeability; slopes.	Slight	Slight
Elsinboro loam, 8 to 15 percent slopes, moderately eroded (EnC2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Evesboro loamy sand, 1 to 5 percent slopes (EvB).	Slight [5]	Severe: rapid permeability.	Slight	Slight
Evesboro loamy sand, 5 to 15 percent slopes (EvC).	Moderate: slopes [5]	Severe: rapid permeability.	Moderate: slopes	Moderate: slopes
Fallsington loam (Fa)	Severe: high water table.	Severe: rapid permeability.	Severe: high water table.	Severe: high water table.
Glenelg loam, 0 to 3 percent slopes (GlA).	Slight	Moderate: moderate permeability.	Slight	Slight
Glenelg loam, 3 to 8 percent slopes, moderately eroded (GlB2).	Slight	Moderate: moderate permeability; slopes.	Slight	Slight
Glenelg loam, 8 to 15 percent slopes, moderately eroded (GlC2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Glenelg loam, 8 to 15 percent slopes, severely eroded (GlC3).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Glenelg loam, 15 to 25 percent slopes, moderately eroded (GlD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Glenelg loam, 15 to 25 percent slopes, severely eroded (GlD3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes

See footnotes at end of table.

specified nonfarm uses—Continued

Streets in dense areas [2]	Parking lots	Sanitary land fill [3] (trench method)	Home gardens
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability.	Severe to very severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability.	Severe to very severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: flood hazard [6]	Severe: flood hazard [6]	Severe: flood hazard [6]	Moderate: impeded drainage.[7]
Severe: flood hazard [6]	Severe: flood hazard [6]	Severe: flood hazard [6]	Slight.[7]
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Moderate: impeded drainage.	Moderate: impeded drainage.	Moderate: moderately slow permeability; impeded drainage.	Moderate: seasonal wetness.
Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Moderate: moderately slow permeability; impeded drainage.	Moderate: seasonal wetness; erosion hazard.
Slight	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability; slopes.	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: silty clay loam surface texture.	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Severe: seasonal wetness.
Slight	Slight	Slight	Slight.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Slight	Very severe: droughty.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: droughty.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: seasonal wetness.
Slight	Slight	Slight	Slight.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.

TABLE 8.—*Limitations for*

Mapping units	Sewage disposal fields	Sewage lagoons	Homes with basements	
			Open areas	Dense areas [1]
Glenville silt loam, 0 to 3 percent slopes (GnA).	Severe: moderately slow permeability; impeded drainage.	Slight	Moderate: impeded drainage.	Moderate: impeded drainage.
Glenville silt loam, 3 to 8 percent slopes, moderately eroded (GnB2).	Severe: moderately slow permeability; impeded drainage.	Moderate: slopes	Moderate: impeded drainage.	Moderate: impeded drainage.
Glenville silt loam, 8 to 15 percent slopes, moderately eroded (GnC2).	Severe: moderately slow permeability; impeded drainage.	Severe: slopes	Moderate: slopes; impeded drainage.	Moderate: slopes; impeded drainage.
Gravel pits and quarries (Gp). Properties variable. Onsite investigation necessary.				
Hatboro silt loam (Ha)	Severe: flood hazard [6]	Severe: flood hazard.[6]	Severe: flood hazard [6]	Severe: flood hazard [6]
Iuka loam, local alluvium, 1 to 5 percent slopes (IuB).	Moderate: impeded drainage.	Severe: moderately rapid permeability.	Moderate: impeded drainage.	Moderate: impeded drainage.
Kelly silt loam, 3 to 8 percent slopes, moderately eroded (KeB2).	Severe: slow permeability.	Moderate: slopes.	Severe: high water table; instability.	Severe: high water table; instability.
Kelly silt loam, 8 to 15 percent slopes, moderately eroded (KeC2).	Severe: slow permeability.	Severe: slopes	Severe: high water table; instability.	Severe: high water table; instability.
Kelly clay loam, 15 to 30 percent slopes, severely eroded (KcE3).	Severe: slow permeability; slopes.	Severe: slopes	Severe: high water table; instability.	Severe: high water table; instability; slopes.
Keyport silt loam, 3 to 10 percent slopes, moderately eroded (KhC2).	Severe: slow permeability.	Severe: slopes	Moderate: impeded drainage.	Moderate: impeded drainage.
Kinkora silt loam (Kn)	Severe: high water table; slow permeability.	Slight [4]	Severe: high water table.	Severe: high water table.
Legore silt loam, 3 to 8 percent slopes, moderately eroded (LeB2).	Slight	Moderate: moderate permeability; slopes.	Slight	Slight
Legore silt loam, 8 to 15 percent slopes, moderately eroded (LeC2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Legore silty clay loam, 8 to 15 percent slopes, severely eroded (LgC3).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Leonardtown silt loam (Ll)	Severe: high water table; slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Linganore channery loam, 3 to 8 percent slopes, moderately eroded (LnB2).	Severe: less than 3 feet to bedrock.	Severe: less than 3 feet to bedrock.	Moderate: less than 3 feet to rippable bedrock.	Moderate: less than 3 feet to rippable bedrock.
Linganore channery loam, 8 to 15 percent slopes, moderately eroded (LnC2).	Severe: less than 3 feet to bedrock.	Severe: less than 3 feet to bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.
Linganore channery loam, 15 to 25 percent slopes, moderately eroded (LnD2).	Severe: less than 3 feet to bedrock; slopes.	Severe: less than 3 feet to bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Severe: less than 3 feet to rippable bedrock; slopes.
Linganore channery silt loam, 25 to 45 percent slopes (LoE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Made land (Md). Properties variable. Onsite investigation necessary.				
Manor loam, 0 to 3 percent slopes (MlA).	Slight	Moderate: moderate permeability.	Slight	Slight
Manor loam, 3 to 8 percent slopes, moderately eroded (MlB2).	Slight	Moderate: moderate permeability; slopes.	Slight	Slight
Manor loam, 8 to 15 percent slopes, moderately eroded (MlC2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Manor loam, 8 to 15 percent slopes, severely eroded (MlC3).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Manor loam, 15 to 25 percent slopes, moderately eroded (MlD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Manor loam, 15 to 25 percent slopes, severely eroded (MlD3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Manor loam, 25 to 45 percent slopes (MlE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes

See footnotes at end of table.

specified nonfarm uses—Continued

Streets in dense areas [2]	Parking lots	Sanitary land fill [3] (trench method)	Home gardens
Moderate: impeded drainage	Moderate: impeded drainage	Moderate: moderately slow permeability; impeded drainage.	Moderate: seasonal wetness.
Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Moderate: moderately slow permeability; impeded drainage.	Moderate: seasonal wetness; erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes; impeded drainage.	Severe: erosion hazard.
Severe: flood hazard [6]	Severe: flood hazard [6]	Severe: flood hazard [6]	Severe: seasonal wetness.[7]
Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Moderate: impeded drainage	Moderate: seasonal wetness; erosion hazard.
Severe: high water table; instability.	Severe: high water table; instability.	Severe: slow permeability; instability.	Very severe: seasonal wetness; erosion hazard.
Severe: high water table; instability; slopes.	Severe: high water table; instability; slopes.	Severe: slow permeability; instability.	Very severe; seasonal wetness; erosion hazard.
Severe: high water table; instability; slopes.	Severe: high water table; instability; slopes.	Severe: slow permeability; instability; slopes.	Very severe: seasonal wetness; erosion hazard.
Moderate: impeded drainage; 3 to 10 percent slopes.	Moderate: impeded drainage; 3 to 10 percent slopes.	Severe: slow permeability	Severe: seasonal wetness; erosion hazard.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Very severe: drainage not feasible.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Very severe: high water table.
Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: 1½ to 3 feet to rippable bedrock.	Severe: erosion hazard; droughtiness.
Severe: less than 3 feet to rippable bedrock; slopes.	Severe: less than 3 feet to rippable bedrock; slopes.	Moderate: 1½ to 3 feet to rippable bedrock; slopes.	Very severe: erosion hazard; droughty.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; droughty.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; droughty.
Slight	Slight	Slight	Moderate: slightly droughty.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.

TABLE 8.—*Limitations for*

Mapping units	Sewage disposal fields	Sewage lagoons	Homes with basements	
			Open areas	Dense areas [1]
Manor gravelly loam, 3 to 8 percent slopes, moderately eroded (MgB2).	Slight	Moderate: moderate permeability; slopes.	Slight	Slight
Manor gravelly loam, 8 to 15 percent slopes, moderately eroded (MgC2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Manor gravelly loam, 8 to 15 percent slopes, severely eroded (MgC3).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Manor very stony loam, 3 to 25 percent slopes (MnD).	Slight to severe: slopes.	Moderate to severe: slopes.	Moderate: slopes; very stony.	Moderate to severe: slopes; stones.
Manor very stony loam, 25 to 60 percent slopes (MnF).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Mixed alluvial land (Mo)	Properties variable. Onsite investigation necessary.			
Montalto silt loam, 3 to 8 percent slopes. moderately eroded (MpB2).	Severe: moderately slow permeability.	Moderate: slopes.	Slight	Slight
Montalto silt loam, 8 to 15 percent slopes, moderately eroded (MpC2).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Montalto silty clay loam, 8 to 15 percent slopes, severely eroded (MqC3).	Severe: moderately slow permeability.	Severe: slopes	Moderate: slopes	Moderate: slopes
Montalto and Relay soils, 15 to 45 percent slopes (MrE).	Severe: slopes	Severe: slopes	Moderate to severe: slopes.	Severe: slopes
Montalto and Relay very stony silt loams, 3 to 25 percent slopes (MsD).	Severe: moderately slow permeability; slopes.	Moderate to severe: slopes.	Moderate: slopes; stones.	Moderate to severe: slopes; stones.
Montalto and Relay very stony silt loams, 25 to 60 percent slopes (MsF).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded (MtB2).	Severe: less than 3 feet to bedrock.	Severe: less than 3 feet to bedrock.	Moderate: less than 3 feet to rippable bedrock.	Moderate: less than 3 feet to rippable bedrock.
Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded (MtC2).	Severe: less than 3 feet to bedrock.	Severe: less than 3 feet to bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.
Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded (MtC3).	Severe: less than 3 feet to bedrock.	Severe: less than 3 feet to bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.
Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded (MtD2).	Severe: less than 3 feet to bedrock; slopes.	Severe: less than 3 feet to bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Severe: less than 3 feet to rippable bedrock; slopes.
Mt. Airy channery loam, 25 to 45 percent slopes (MtE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded (NeB2).	Severe: moderately slow permeability.	Moderate: slopes	Slight	Slight
Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded (NeC2).	Severe: moderately slow permeability; slopes.	Severe: slope	Moderate: slopes	Moderate: slopes
Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded (NsD3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes
Relay silt loam, 3 to 15 percent slopes, moderately eroded (ReC2).	Severe: moderately slow permeability.	Moderate to severe: slopes.	Slight to moderate: slopes.	Slight to moderate: slopes.
Rumford loamy sand, 1 to 5 percent slopes, moderately eroded (RuB2).	Slight	Severe: rapid permeability.	Slight	Slight
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RuC2).	Slight	Severe: rapid permeability.	Slight	Slight
Rumford loamy sand, 10 to 15 percent slopes, moderately eroded (RuD2).	Moderate: slopes	Severe: rapid permeability.	Moderate: slopes	Moderate: slopes
Sandy and clayey land, gently sloping (ScB).	Severe: slow permeability.	Moderate: slopes	Severe: unstable subsoil.	Severe: unstable subsoil.
Sandy and clayey land, moderately sloping (ScD).	Severe: slow permeability; slopes.	Severe: slopes	Severe: unstable subsoil; slopes.	Severe: unstable subsoil; slopes.
Sandy and clayey land, moderately steep (ScE).	Severe: slow permeability; slopes.	Severe: slopes	Severe: unstable subsoil; slopes.	Severe: unstable subsoil; slopes.
Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded (SfB2).	Slight	Moderate: slopes; moderate permeability.	Slight	Slight
Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (SfC2).	Slight	Severe: slopes	Slight	Slight

See footnotes at end of table.

specified nonfarm uses—Continued

Streets in dense areas [2]	Parking lots	Sanitary land fill [3] (trench method)	Home gardens
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Moderate to severe: slopes	Moderate to severe: slopes	Moderate to severe: slopes; very stony.	Very severe: erosion hazard; stones.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; stones.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability; slopes.	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability; slopes.	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate to severe: slopes	Moderate to severe: slopes	Moderate to severe: slopes; very stony.	Very severe: erosion hazard; stones.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; stones.
Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: less than 3 feet to rippable bedrock; slopes.	Moderate: 1½ to 3 feet to rippable bedrock.	Severe: erosion hazard; droughtiness.
Severe: less than 3 feet to rippable bedrock; slopes.	Severe: less than 3 feet to rippable bedrock; slopes.	Moderate: 1½ to 3 feet to rippable bedrock; slopes.	Very severe: erosion hazard; droughtiness.
Severe: less than 3 feet to rippable bedrock; slopes.	Severe: less than 3 feet to rippable bedrock; slopes.	Moderate: 1½ to 3 feet to rippable bedrock; slopes.	Very severe: erosion hazard; droughtiness.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; droughtiness.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard; droughtiness.
Moderate: slopes	Moderate: slopes	Moderate: moderately slow permeability.	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: moderately slow permeability; slopes.	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate to severe: slopes	Moderate to severe: slopes	Moderate: moderately slow permeability; slopes.	Moderate to severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Slight	Moderate: droughtiness.
Severe: slopes	Severe: slopes	Slight	Severe: erosion hazard; droughtiness.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard; droughty.
Severe: unstable subsoil	Severe: unstable subsoil	Severe: slow permeability; unstable subsoil.	Severe: erosion hazard; very low fertility.
Severe: unstable subsoil; slopes.	Severe: unstable subsoil; slopes.	Severe: slow permeability; unstable subsoil; slopes.	Very severe: erosion hazard; very low fertility.
Severe: unstable subsoil; slopes.	Severe: unstable subsoil; slopes.	Severe: slow permeability; unstable subsoil; slopes.	Very severe: erosion hazard; very low fertility.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Slight	Severe: erosion hazard.

TABLE 8.—*Limitations for*

Mapping units	Sewage disposal fields	Sewage lagoons	Homes with basements	
			Open areas	Dense areas [1]
Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded (SfD2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Sassafras loam, 1 to 5 percent slopes, moderately eroded (SlB2).	Slight	Moderate: slopes; moderate permeability.	Slight	Slight
Sassafras loam, 5 to 10 percent slopes, moderately eroded (SlC2).	Slight	Severe: slopes	Slight	Slight
Sassafras loam, 10 to 15 percent slopes, moderately eroded (SlD2).	Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Sassafras soils, 15 to 40 percent slopes (SsE).	Severe: slopes	Severe: slopes	Moderate to severe: slopes.	Severe: slopes
Stony land (St)	Severe: stones	Moderate to severe: stones.	Severe: stones	Severe: stones
Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded (SuB2).	Slight	Moderate: slopes.	Slight	Slight
Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded (SuD2).	Slight to moderate: slopes.	Severe: slopes	Slight to moderate: slopes.	Slight to moderate: slopes.
Watchung silt loam, 0 to 3 percent slopes (WaA).	Severe: high water table; slow permeability.	Slight [4]	Severe: high water table.	Severe: high water table.
Watchung silt loam, 3 to 8 percent slopes (WaB).	Severe: high water table; slow permeability	Moderate: slopes.[4]	Severe: high water table.	Severe: high water table.
Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded (WoB2).	Moderate: impeded drainage.	Moderate: moderate permeability; slopes.	Moderate: impeded drainage.	Moderate: impeded drainage.

[1] Dense areas are defined as areas "in subdivisions," which means areas crisscrossed at short intervals by paved streets; street grades are kept to a minimum and individual lots are usually considerably less than 1 acre in size.

[2] For roads in open areas, limitations are moderate on slopes of 8 to 15 percent and severe on slopes of more than 15 percent. Limitations are moderate if depth to bedrock is less than 3 feet.

[3] Limitations for cemeteries are generally similar to those for sanitary land fill but are severe if soils are severely eroded, or very stony, or of loamy sand texture.

Sewage disposal fields: Permeability; depth to seasonal high water table; depth to bedrock; steepness of slope; and hazard of flooding.

Sewage lagoons: Permeability; depth to bedrock or other impervious layer; slope; hazard of flooding; and texture (See figure 12, page 65).

Homes with basements: Depth to water table; permeability; slope; depth to bedrock if basement is 6 feet or more below the surface; hazard of flooding; and gravel content. (For buildings of more than 2 stories, investigation should be made on the site.)

Streets and parking lots: Depth to water table; slope; depth to bedrock if it is to be removed; and hazard of flooding.

Sanitary land fill: Permeability; texture; stability; gravel content; depth to bedrock; depth to water table; and slope.

Home gardens: Hazard of erosion; gravel content; fertility; and wetness or droughtiness.

Recreational Uses of Soils

Table 9 rates each soil in the county as slightly, moderately, or severely limited for specified recreational uses. Such uses include trailer sites, for camping and outdoor living; athletic fields and intensive play areas, such as baseball diamonds, football fields, badminton and volleyball areas, and the like; parks, extensive play areas, and picnic areas that are not subject to heavy foot traffic; lawns and golf fairways; and paths and trails for hiking, studying nature, or enjoying the scenery.

The significant properties include depth to water table, hazard of flooding, permeability, stability, gravel content, and slope. Not all of these properties are limiting for all of the specified uses, but most of them are limiting for most uses, and some of them for all. In addition, any one property may not restrict all types of recreation equally. For example, slope severely limits use for picnic areas only if it exceeds 15 percent, if there are no other limitations, but a slope of more than 5 percent severely limits use for baseball diamonds.

Formation and Classification of Soils

This section consists of four parts. In the first part, the factors of soil formation are discussed as they relate to the formation of soils in Howard County. The second part explains the interrelationships of soil series in the county, and the third part discusses the genetic processes of soil formation and the morphology of the soils. In

specified nonfarm uses—Continued

Streets in dense areas [2]	Parking lots	Sanitary land fill [3] (trench method)	Home gardens
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Slight	Severe: erosion hazard.
Severe: slopes	Severe: slopes	Moderate: slopes	Very severe: erosion hazard.
Severe: slopes	Severe: slopes	Severe: slopes	Very severe: erosion hazard.
Moderate to severe: stones	Moderate to severe: stones	Severe: stones	Very severe: stones.
Moderate: slopes	Moderate: slopes	Slight	Moderate: erosion hazard.
Severe: slopes	Severe: slopes	Slight to moderate: slopes	Severe to very severe: erosion hazard.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Very severe: drainage not feasible.
Severe: high water table	Severe: high water table	Severe: high water table; slow permeability.	Very severe: drainage not feasible.
Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Moderate: impeded drainage	Moderate: seasonal wetness; erosion hazard.

[4] It is assumed that any surface layers high in organic matter will be removed; these layers are usually less than 18 inches thick.
[5] Possibility of polluting nearby springs, wells, or other bodies of water.
[6] Some degree of flooding nearly every year. Flooding once in 5 to 10 years constitutes a severe limitation.
[7] Planting may have to be delayed because of flooding nearly every year, but floods usually subside early enough for mid-spring or late planting and seldom do serious damage to forage plants or pastures.

the fourth part, each soil series represented in the county is placed in its respective family, subgroup, and order of the current system for classifying soils and also in the appropriate great soil group of the classification system established in 1938.

Factors in Soil Formation

Soils are natural, three-dimensional bodies on the earth's surface, capable of supporting plants and, in fact, practically all forms of life. Each soil has a distinct morphology or measurable set of properties. Each set of properties is dependent upon a specific combination of the processes and factors that influence the environment of the soil.

The five most important factors in the formation of soils are climate, plant and animal life, parent material, relief, and time. Climate and vegetation are the active forces of soil formation. Their effect on the parent material is modified by relief and by the length of time the parent material has been in place. The relative importance of each factor differs from place to place. In some places one factor is dominant and fixes most of the properties of the soil. Normally, however, the interaction of all five factors determines the kind of soil that develops in any given place. In the following paragraphs, these five factors and their influence on the development of the soil profile are discussed.

Climate

The climate of Howard County is temperate and moderately humid. All through the year, the atmosphere is alternately relatively cool and dry and warm and moist. Because there are no critical differences in elevation and so no major obstructions to the movement of air masses, the climate is fairly uniform throughout the county. The rolling terrain causes local differences in microclimate that can affect some cropping practices, but these local differences have not caused any observable differences in the processes of soil formation or in the characteristics of the soils that have formed.

The moderately humid, temperate climate has caused strong weathering and leaching of the soils. In most places the soil material has weathered to a comparatively great depth, because it has been exposed to climatic forces for a fairly long period of geologic time. The only material that is not deeply and strongly weathered is material that is either highly resistant to weathering or that has been in its present position for only a short time.

Most of the bases have been leached out, and the soils contain no free carbonates. All of the soils are acid, and most of them are strongly acid to extremely acid.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Aldino silt loam, 3 to 8 percent slopes, moderately eroded (AdB2).	Severe: slow permeability.	Severe: slow permeability.	Slight	Slight	Slight.
Aldino silt loam, 8 to 15 percent slopes, moderately eroded (AdC2).	Severe: slow permeability; slopes.	Severe: slopes; slow permeability.	Moderate: slopes.	Moderate: slopes.	Slight.
Aura gravelly loam, 1 to 5 percent slopes, moderately eroded (AgB2).	Moderate: gravel; moderately slow permeability.	Moderate: slopes; gravel; moderate permeability.	Slight	Slight	Slight.
Aura gravelly loam, 5 to 10 percent slopes, moderately eroded (AgC2).	Severe: slopes	Severe: slopes	Slight	Slight	Slight.
Aura gravelly loam, 10 to 30 percent slopes, severely eroded (AgE3).	Severe: slopes	Severe: slopes	Moderate to severe: slopes.	Severe: slopes; severe erosion.	Moderate to severe: slopes.
Baile silt loam (Ba)	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Beltsville silt loam, 0 to 1 percent slopes (BeA).	Severe: slow permeability.	Severe: slow permeability.	Slight	Slight	Slight.
Beltsville silt loam, 1 to 5 percent slopes, moderately eroded (BeB2).	Severe: slow permeability.	Severe: slow permeability.	Slight	Slight	Slight.
Beltsville silt loam, 5 to 10 percent slopes, moderately eroded (BeC2).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Slight	Slight	Slight.
Beltsville silt loam, 5 to 10 percent slopes, severely eroded (BeC3).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Slight	Moderate: severe erosion.	Moderate: sticky surface.
Beltsville silt loam, 10 to 15 percent slopes, moderately eroded (BeD2).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Moderate: slopes.	Moderate: slopes.	Slight.
Brandywine loam, 3 to 8 percent slopes, moderately eroded (BrB2).	Moderate: slopes.	Moderate: slopes.	Slight	Slight	Slight.
Brandywine loam, 8 to 15 percent slopes, moderately eroded (BrC2).	Severe: slopes	Severe: slopes	Moderate: slopes.	Moderate: slopes.	Slight.
Brandywine loam, 8 to 15 percent slopes, severely eroded (BrC3).	Severe: slopes	Severe: slopes	Moderate: slopes.	Severe: slopes; severe erosion.	Slight.
Brandywine loam, 15 to 25 percent slopes, moderately eroded (BrD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Brandywine loam, 15 to 25 percent slopes, severely eroded (BrD3).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Brandywine loam, 25 to 60 percent slopes (BrF).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Brandywine very stony loam, 3 to 25 percent slopes (BwD).	Moderate to severe: slopes; stones.	Severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate: slopes; stones.
Chester silt loam, 0 to 3 percent slopes (ChA).	Slight	Slight	Slight	Slight	Slight.
Chester silt loam, 3 to 8 percent slopes, moderately eroded (ChB2).	Moderate: slopes.	Moderate: slopes.	Slight	Slight	Slight.
Chester silt loam, 8 to 15 percent slopes, moderately eroded (ChC2).	Severe: slopes	Severe: slopes	Moderate: slopes.	Moderate: slopes.	Slight.
Chester silt loam, 8 to 15 percent slopes, severely eroded (ChC3).	Severe: slopes	Severe: slopes	Moderate: slopes.	Moderate: slopes.	Slight.
Chester silt loam, 15 to 25 percent slopes, moderately eroded (ChD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded (CgB2).	Moderate: slopes; gravel.	Moderate: slopes; gravel.	Slight	Slight	Slight.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*—Continued

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded (CgC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Chillum silt loam, 1 to 5 percent slopes, moderately eroded (CmB2).	Moderate: moderately slow permeability; slopes.	Moderate: moderately slow permeability; slopes.	Slight	Slight	Slight.
Chillum silt loam, 5 to 10 percent slopes, moderately eroded (CmC2).	Severe: slopes	Severe: slopes	Slight	Slight	Slight.
Chillum gravelly loam, 5 to 10 percent slopes, severely eroded (ClC3).	Severe: slopes	Severe: slopes	Slight	Moderate: severe erosion.	Slight.
Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded (ClD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded (ClE2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded (CnB2).	Slight	Moderate: moderately slow permeability; slopes.	Slight	Slight	Slight.
Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded (CnD3).	Severe: slopes	Severe: slopes	Slight to moderate: slopes.	Severe: slopes; severe erosion.	Slight.
Codorus silt loam (Co)	Moderate: flood hazard.	Moderate: flood hazard.[1]	Moderate: flood hazard.[1]	Moderate: flood hazard.[1]	Severe: flood hazard.[2]
Comus silt loam (Cs)	Slight [3]	Slight [3]	Slight [3]	Slight [3]	Severe: flood hazard.[2]
Comus silt loam, local alluvium, 3 to 8 percent slopes (CuB).	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.
Delanco silt loam, 0 to 3 percent slopes (DeA).	Moderate: moderately slow permeability; impeded drainage.	Moderate: moderately slow permeability; impeded drainage.	Slight	Slight	Slight.
Delanco silt loam, 3 to 8 percent slopes, moderately eroded (DeB2).	Moderate: moderately slow permeability; impeded drainage; slopes.	Moderate: moderately slow permeability; impeded drainage; slopes.	Slight	Slight	Slight.
Elioak silt loam, 0 to 3 percent slopes (EkA).	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Slight	Slight.
Elioak silt loam, 3 to 8 percent slopes, moderately eroded (EkB2).	Moderate: moderately slow permeability; slopes.	Moderate: moderately slow permeability; slopes.	Slight	Slight	Slight.
Elioak silt loam, 8 to 15 percent slopes, moderately eroded (EkC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Elioak silt loam, 15 to 25 percent slopes, moderately eroded (EkD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Elioak silty clay loam, 8 to 15 percent slopes, severely eroded (ElC3).	Severe: slopes	Severe: slopes	Moderate: slopes; sticky surface.	Severe: slopes; severe erosion.	Moderate: sticky surface.
Elioak silty clay loam, 15 to 25 percent slopes, severely eroded (ElD3).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; sticky surface.
Elkton silt loam (Em)	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Elsinboro loam, 0 to 3 percent slopes (EnA).	Slight	Slight	Slight	Slight	Slight.
Elsinboro loam, 3 to 8 percent slopes, moderately eroded (EnB2).	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.

See footnotes at end of table.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*—Continued

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Elsinboro loam, 8 to 15 percent slopes, moderately eroded (EnC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Evesboro loamy sand, 1 to 5 percent slopes (EvB).	Moderate: slopes; loose consistence.	Moderate: slopes; loose consistence.	Moderate: loose consistence.	Severe: loose consistence.	Moderate: loose consistence.
Evesboro loamy sand, 5 to 15 percent slopes (EvC).	Severe: slopes; loose consistence.	Severe: slopes; loose consistence.	Moderate: loose consistence.	Severe: loose consistence.	Moderate: loose consistence.
Fallsington loam (Fa)	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Glenelg loam, 0 to 3 percent slopes (GlA).	Slight	Slight	Slight	Slight	Slight.
Glenelg loam, 3 to 8 percent slopes, moderately eroded (GlB2).	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.
Glenelg loam, 8 to 15 percent slopes, moderately eroded (GlC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Glenelg loam, 8 to 15 percent slopes, severely eroded (GlC3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes; severely eroded.	Slight.
Glenelg loam, 15 to 25 percent slopes, moderately eroded (GlD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Glenelg loam, 15 to 25 percent slopes, severely eroded (GlD3).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Glenville silt loam, 0 to 3 percent slopes (GnA).	Moderate: moderately slow permeability; impeded drainage.	Moderate: moderately slow permeability; impeded drainage.	Slight	Slight	Slight.
Glenville silt loam, 3 to 8 percent slopes, moderately eroded (GnB2).	Moderate: moderately slow permeability; impeded drainage; slopes.	Moderate: moderately slow permeability; slopes; impeded drainage.	Slight	Slight	Slight.
Glenville silt loam, 8 to 15 percent slopes, moderately eroded (GnC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Gravel pits and quarries (Gp). Properties variable. On-site investigation necessary.					
Hatboro silt loam (Ha)	Severe: flood hazard.[4]	Severe: flood hazard.[4]	Severe: flood hazard.[4]	Severe: flood hazard.[4]	Severe: flood hazard.[4]
Iuka loam, local alluvium, 1 to 5 percent slopes (IuB).	Moderate: impeded drainage; slopes.	Moderate: impeded drainage; slopes.	Slight	Slight	Slight.
Kelly silt loam, 3 to 8 percent slopes, moderately eroded (KeB2).	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
Kelly silt loam, 8 to 15 percent slopes, moderately eroded (KeC2).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Moderate: somewhat poor drainage; slopes.	Moderate: somewhat poor drainage; slopes.	Moderate: somewhat poor drainage; sticky surface.
Kelly clay loam, 15 to 30 percent slopes, severely eroded (KcE3).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Severe: slopes	Severe: slopes; severely eroded.	Severe: very sticky surface; slopes.
Keyport silt loam, 3 to 10 percent slopes, moderately eroded (KhC2).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Slight	Slight	Slight.
Kinkora silt loam (Kn)	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Legore silt loam, 3 to 8 percent slopes, moderately eroded (LeB2).	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.

See footnotes at end of table.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*—Continued

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Legore silt loam, 8 to 15 percent slopes, moderately eroded (LeC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Legore silty clay loam, 8 to 15 percent slopes, severely eroded (LgC3).	Severe: slopes	Severe: slopes	Moderate: slopes; sticky surface.	Moderate: slopes; severely eroded.	Moderate: sticky surface.
Leonardtown silt loam (Ll)	Severe: high water table; slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Linganore channery loam, 3 to 8 percent slopes, moderately eroded (LnB2).	Moderate: slopes; moderately slow permeability; 30 to 40 percent fragments.	Moderate: slopes; moderately slow permeability; 30 to 40 percent fragments.	Slight	Moderate: less than 3 feet to rippable bedrock.	Slight.
Linganore channery loam, 8 to 15 percent slopes, moderately eroded (LnC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes; less than 3 feet to rippable bedrock.	Slight.
Linganore channery loam, 15 to 25 percent slopes, moderately eroded (LnD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Linganore channery silt loam, 25 to 45 percent slopes (LoE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Made land (Md) Properties variable. Onsite investigation necessary.					
Manor loam, 0 to 3 percent slopes (MlA).	Slight	Slight	Slight	Slight	Slight.
Manor loam, 3 to 8 percent slopes, moderately eroded (MlB2).	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.
Manor loam, 8 to 15 percent slopes, moderately eroded (MlC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes; severely eroded.	Slight.
Manor loam, 8 to 15 percent slopes, severely eroded (MlC3).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Manor loam, 15 to 25 percent slopes, moderately eroded (MlD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Manor loam, 15 to 25 percent slopes, severely eroded (MlD3).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Manor loam, 25 to 45 percent slopes (MlE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Manor gravelly loam, 3 to 8 percent slopes, moderately eroded (MgB2).	Moderate: slopes; 15 to 20 percent fragments.	Moderate: slopes; 15 to 20 percent fragments.	Slight	Slight	Slight.
Manor gravelly loam, 8 to 15 percent slopes, moderately eroded (MgC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Manor gravelly loam, 8 to 15 percent slopes, severely eroded (MgC3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes; severely eroded.	Slight.
Manor very stony loam, 3 to 25 percent slopes (MnD).	Moderate to severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate to severe: slopes; very stony.	Moderate to severe: slopes; very stony.	Moderate: slopes; very stony.
Manor very stony loam, 25 to 60 percent slopes (MnF).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Mixed alluvial land (Mo)	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.
Montalto silt loam, 3 to 8 percent slopes, moderately eroded (MpB2).	Moderate: slopes; moderately slow permeability.	Moderate: slopes; moderately slow permeability.	Slight	Slight	Slight.
Montalto silt loam, 8 to 15 percent slopes, moderately eroded (MpC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*—Continued

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Montalto silty clay loam, 8 to 15 percent slopes, severely eroded (MqC3).	Severe: slopes	Severe: slopes	Moderate: slopes; sticky surface.	Severe: slopes; severely eroded.	Moderate: sticky surface.
Montalto and Relay soils, 15 to 45 percent slopes (MrE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate to severe: slopes.
Montalto and Relay very stony silt loams, 3 to 25 percent slopes (MsD).	Moderate to severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate to severe: slopes; stones.	Moderate: slopes; stones.
Montalto and Relay very stony silt loams, 25 to 60 percent slopes (MsF).	Severe: slopes; stones.	Severe: slopes; stones.	Severe: slopes; stones.	Severe: slopes; stones.	Severe: slopes; stones.
Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded (MtB2).	Moderate: slopes; 15 to 35 percent fragments.	Moderate: slopes; 15 to 35 percent fragments.	Slight	Moderate: less than 3 feet to rippable bedrock.	Slight.
Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded (MtC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes; less than 3 feet to rippable bedrock.	Slight.
Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded (MtC3).	Severe: slopes	Severe: slopes	Moderate: slopes	Severe: slopes; severe erosion.	Slight.
Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded (MtD2).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes.
Mt. Airy channery loam, 25 to 45 percent slopes (MtE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded (NeB2).	Moderate: slopes; moderately slow permeability.	Moderate: slopes; moderately slow permeability.	Slight	Slight	Slight.
Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded (NeC2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded (NsD3).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; sticky surface.
Relay silt loam, 3 to 15 percent slopes, moderately eroded (ReC2).	Moderate to severe: slopes; moderately slow permeability.	Moderate to severe: slopes; moderately slow permeability.	Slight to moderate: slopes.	Slight to moderate: slopes.	Slight.
Rumford loamy sand, 1 to 5 percent slopes, moderately eroded (RuB2).	Moderate: slopes	Moderate: slopes	Slight	Moderate: loamy sand surface.	Moderate: loamy sand surface.
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RuC2).	Severe: slopes	Severe: slopes	Slight	Moderate: loamy sand surface.	Moderate: loamy sand surface.
Rumford loamy sand, 10 to 15 percent slopes, moderately eroded (RuD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes; loamy sand surface.	Moderate: loamy sand surface.
Sandy and clayey land, gently sloping (ScB).	Severe: slow permeability.	Severe: slow permeability.	Slight	Severe: very low fertility.	Slight.
Sandy and clayey land, moderately sloping (ScD).	Severe: slow permeability; slopes.	Severe: slow permeability; slopes.	Slight to moderate: slopes.	Severe: very low fertility.	Slight.
Sandy and clayey land, moderately steep (ScE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: very low fertility; slopes.	Moderate to severe: slopes.
Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded (SfB2).	Moderate: gravel; slopes.	Moderate: gravel; slopes.	Slight	Slight	Slight.
Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (SfC2).	Severe: slopes	Severe: slopes	Slight	Slight	Slight.
Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded (SfD2).	Severe: slopes	Severe: slopes	Moderate: slopes.	Moderate: slopes.	Slight.
Sassafras loam, 1 to 5 percent slopes, moderately eroded (SlB2).	Moderate: slopes.	Moderate: slopes.	Slight	Slight	Slight.

TABLE 9.—*Degree and kind of limitations for specified recreational uses*—Continued

Mapping unit	Trailer sites	Athletic fields and intensive play areas	Parks, extensive play areas, and picnic areas	Lawns and golf fairways	Paths and trails
Sassafras loam, 5 to 10 percent slopes, moderately eroded (SlC2).	Severe: slopes	Severe: slopes	Slight	Slight	Slight.
Sassafras loam, 10 to 15 percent slopes, moderately eroded (SlD2).	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Slight.
Sassafras soils, 15 to 40 percent slopes (SsE).	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate to severe: slopes.
Stony land (St)	Severe: stones	Severe: stones	Severe: stones	Severe: stones	Severe: stones.
Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded (SuB2).	Severe: slopes	Severe: slopes	Slight	Slight	Slight.
Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded (SuD2).	Severe: slopes	Severe: slopes	Slight to moderate: slopes.	Slight to moderate: slopes.	Slight.
Watchung silt loam, 0 to 3 percent slopes (WaA).	Severe: slow permeability; high water table.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Watchung silt loam, 3 to 8 percent slopes (WaB).	Severe: slow permeability; high water table.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded (WoB2).	Moderate: impeded drainage.	Moderate: impeded drainage.	Slight	Slight	Slight.

[1] Flooded during season of use about once in 5 years.
[2] Flooded during season of use about once in 2 years.
[3] Flooded during season of use about once in 10 years.
[4] Probability of flooding during season of use every year.

Weathering and leaching have left the natural supply of plant nutrients rather low, though some of the soils contain a moderate residual supply.

Additional facts about the climate are given in the section "Climate" at the beginning of this publication.

Plant and animal life

Native vegetation has been a major influence in the development of soils. The activities of micro-organisms, earthworms, larvae, and other forms of animal life were, in turn, important in the cycle of decay and regeneration of plants.

The native vegetation consisted mostly of a forest that was made up mainly of mixed hardwoods but included a few conifers. Oak was the dominant species, but hickory, beech, maple, elm, dogwood, birch, and other kinds of deciduous hardwoods also made up a part of the forests. The evergreens were mainly Virginia pine, shortleaf pine, and holly.

Most hardwoods use a large amount of calcium and other bases if those elements are available. They, as well as other plants, take up such plant nutrients from the soil and store them in their roots, stems, and leaves. When deciduous trees shed their leaves or when the plants die and decay, the plant nutrients are returned to the soil and are used by other plants. Thus, in areas where the soils are naturally well supplied with bases, a never ending cycle takes place. The soils of Howard County, however, have never been high in calcium. Furthermore, only a few of the soils—those developed in material weathered from igneous rocks—contain appreciable amounts of other bases. Consequently, the soils are acid, even under a cover of hardwoods.

Soils that are strongly acid and low in fertility are better suited to pines than to most hardwoods. Pines do not require large amounts of calcium and other bases, and their needles return only a small amount of organic matter and plant nutrients to the soil. This fact probably explains why such trees as Virginia pines, which require only a minimum amount of calcium and other bases, have invaded some areas that were formerly in hardwoods.

Man has modified the environment and thus has influenced the formation of soils since agriculture was developed in this county. As a result of man's activities, forests have been cleared and new kinds of plants have been introduced. Cultivation and artificial drainage have changed some characteristics of the soils.

The most important changes brought about by man are the mixing of the upper horizons of the soils to form a plow layer; accelerated erosion caused by tillage of sloping soils; changes in the content of plant nutrients, especially in the upper horizons, brought about by applying lime and fertilizer; acceleration of the movement of water out of the soil by drainage; lowering of the water table by intensive pumping and use of ground water; and changes brought about by using the soils for commercial, industrial, residential, or other uses that generally do not involve the growth of plants. The most obvious change in the vegetation has been the loss of the natural forest cover in most parts of the county. Also, since man's activities were enlarged and accelerated about

three centuries ago, some increase has taken place in the proportions of pines to hardwoods in the remaining forests.

Parent material

The soils of Howard County have formed in two general kinds of parent material. One of these is material derived from the weathering of rocks in place, and the other is material, consisting of sand, silt, clay, and fragments of rock, that has been transported by water, wind, or gravity, or by a combination of those forces. The material weathered in place is the more extensive of these two kinds of material. It was derived from several kinds of igneous and metamorphic rocks on the Piedmont Plateau.

The unaltered igneous rocks in this county are diorite, diabase, granodiorite, serpentine, and gabbro. Montalto, Legore, Neshaminy, Relay, Aldino, Kelly, and Watchung soils formed in material weathered from those rocks.

The metamorphic rocks are schists, granite gneiss, and gneiss. In this county the schists are of at least four kinds—soft, micaceous, muscovitic schist, which underlies a large part of the county; harder micaceous and chloritic schist; granitized schist; and dark-colored, talcose, sericitic schist or phyllite. Material weathered from soft, micaceous schist has contributed part of the parent material for the Chester, Elioak, Manor, Fairfax, Glenelg, Glenville, and Baile soils. Harder chloritic schist was the source of the parent material of the Mt. Airy soils, and it contributed part of the parent material for the Glenelg, Glenville, and Baile soils. Material weathered from granitized schist and granite gneiss contributed some of the material from which parts of the Neshaminy and Glenelg soils formed. Weathered talcose sericitic schist or phyllite provided the parent material of the Linganore soils. Material weathered from gneiss was the parent material of the Brandywine soils.

The transported material in which some of the soils formed consisted of alluvium deposited on flood plains and stream terraces; of unconsolidated fluvial sediments, of Cretaceous to Pleistocene age, deposited on the Coastal Plain uplands; and of loessal material of silt to fine sand texture that was deposited at some time after the Cretaceous period, probably late in the Pleistocene age.

The most recently deposited alluvium was the parent material of the Comus, Codorus, Hatboro, and Iuka soils, which formed on flood plains and in accumulations of local alluvium. Much older alluvium was the parent material of the Delanco, Kinkora, and Elsinboro soils, on terraces. Unconsolidated sediments of the Coastal Plain were the parent material of the Aura, Elkton, Fallsington, Keyport, Evesboro, Sassafras, Sunnyside, and Woodstown soils.

Chillum, Beltsville, and Leonardtown soils formed in a rather thin mantle of loess that was deposited over unconsolidated sediments of the Coastal Plain. The upper part of the solum of the Fairfax soils developed in a mantle of loessal silt, even thinner than the mantle of silt that contributed parent material to the Chillum, Beltsville, and Leonardtown soils. Also, loess may have influenced the formation of the Elioak, Chester, and Neshaminy soils in some places, though evidence to that effect is not positive.

The most sandy soils of the Coastal Plain, the Evesboro, were derived mainly from silica sand. Their parent material also contained a small amount of clay and, in places, a very small amount of silt. Some evidence shows that the sand in which the Evesboro soils formed was reworked by wind or water, or by both wind and water, between the time it was deposited and the present stage of soil development.

In the areas where the soils formed in material weathered in place, the chemical or mineralogical characteristics of the underlying rocks have had the greatest influence on the soils. Also, the physical characteristics of the rocks have perhaps had some influence. On the Coastal Plain uplands, however, the texture of the parent sediments has had the most pronounced influence on the characteristics of the soils, though the effects have been modified by drainage and by dissection of the areas. The sediments that made up the parent material of the soils throughout much of the Coastal Plain consisted mainly of sand but contained significant, though variable, amounts of silt or clay or of both silt and clay.

In places on the Coastal Plain are stratified materials of different texture. Soils of the Sassafras, Sunnyside, Woodstown, and Fallsington series have formed in such material. The Aura soils formed in material that ranged from sand to silt or clay in texture and that contained a large amount of gravel.

The finest textured parent material in the county consisted mainly of clay or silty clay. Elkton and Keyport soils formed in this kind of material, but their parent material also contained some fine sand and very fine sand.

The parent material of the soils of this county ranges from very old to very young. The alluvium deposited on the flood plains during our present, or Holocene, geologic epoch is the youngest of the materials. New material may be added annually to that deposited by floodwaters. Somewhat older material is that on terraces along the major streams, deposited during the Pleistocene epoch. The mantles of silty loess probably date from late in the Pleistocene epoch. The unconsolidated sediments of the Coastal Plain uplands range from Cretaceous to Pliocene or early Pleistocene in age. The rocks of the Piedmont Plateau, from which the soils that occupy the largest acreage in the county were derived, are very old. Their exact age is uncertain, but all are probably of Precambrian age. Baltimore gneiss, which underlies the Brandywine soils, is the oldest known exposed rock in the Middle Atlantic States.

Relief

Much of Howard County is on a very old, strongly weathered, eroded peneplain that is generally known as the Piedmont Plateau. The eastern part is on the Coastal Plain. The Piedmont Plateau is composed entirely of igneous and metamorphic rocks.

The Piedmont Plateau is generally rolling and is strongly dissected. A large part of the Coastal Plain is also rolling and is well dissected, but some parts consist of smooth, nearly level to gently sloping interfluves that are only slightly dissected. Also, there are a few small sandy spots that resemble dunes.

The county slopes mainly from the west and north toward the east and south, but the slopes are modified by dissection and by the entrenchment of streams. The

highest place in the county, slightly more than 860 feet above sea level, is at a point about a half mile east of the intersection of Long Corner Road and Penn Shop Road. The lowest place, approximately 20 feet above sea level, is east and somewhat south of Elkridge, on the south bank of the Patapsco River, where Howard County adjoins Anne Arundel County. Most of the county is 300 to 600 feet above sea level.

Differences in elevation and shape of the land surface account for some of the differences among soils formed in the same kind of parent material. The degree of dissection and the amount of slope, have, for example, influenced drainage and some other characteristics of the Beltsville, Chillum, and Leonardtown soils. All of these soils formed in a mantle of silty loess over old deposits laid down by water.

Chillum soils are well drained. They formed in areas where dissection and subsequent geologic erosion have been extensive enough for good drainage to develop. In about 40 percent of the acreage of Chillum soils, the slope is less than 5 percent, and the slope is no more than 10 percent in about 76 percent of the acreage. The individual areas of Chillum soils are generally small.

Beltsville soils are moderately well drained. They formed on broad, gently sloping interfluves. In those areas downcutting has not been extensive enough for the development of really good drainage. In about 52 percent of the acreage of Beltsville soils, the slope is less than 5 percent. In about 89 percent of the acreage, the slope is no more than 10 percent. Individual areas of Beltsville soils are fairly large, especially those on long, almost uninterrupted interfluves.

Leonardtown soils are somewhat poorly drained or poorly drained. They are in depressions and on some interfluvial flats. They have practically no drainage channels, and drainage that is even adequate has not developed to any extent. These soils are nearly level; in none of the areas is the slope more than 5 percent. The individual areas range from rather small, where the soils are in depressions, to large, where the soils are on continuous upland flats.

Time

The length of time the parent material has been in place and exposed to the active forces of climate and vegetation is an important factor in the formation of soils. The age of a soil, however, is influenced by other factors as well as by time. Two soils that have been developing for about the same length of time will not necessarily have reached the same stage of profile development, because of differences in relief and in parent material. If the parent material weathered from rocks that are resistant and that weather slowly, for example, the development of a profile is slow. Also, the development of a profile is slow in areas of steep slopes because soil material is removed almost as soon as it forms or is deposited. Development of a distinct profile is prevented in soils of the flood plains, because fresh alluvial material is deposited frequently.

A soil in which well-defined, genetically related horizons have had time to develop is said to be mature; a soil that shows little or no horizonation is said to be immature. The Montalto soils are examples of mature soils. In these soils the rate of weathering has substantially exceeded the rate of geologic erosion, and well-defined horizons have had time to develop. The Brandywine soils are considered to be immature because they lack well-defined horizons. In those soils the rate of weathering of the resistant parent rock is slow. It is exceeded by the rate of geologic erosion, at least partly as a result of the steep slopes. The Comus soils, on flood plains, are examples of other soils that are immature. Their parent material is continually renewed before development of horizons can take place.

Interrelationships of Soil Series

In table 10 the soil series of the county are grouped to show relationships between the soils with respect to position, parent material, and drainage. Most of the soils are on uplands or terraces, but some are on flood plains or bottom lands. The parent material varies widely in characteristics. Most of the soils are at least moderately well drained.

Soils of uplands and terraces.—The soils of uplands formed in material weathered from the underlying rocks. The soils of terraces formed in old alluvium. About 93 percent of the acreage in the county is occupied by soils of uplands, and 1 percent by soils of terraces. The difference in topographic position does not affect the use and suitability of the soils, nor does it necessarily affect the characteristics of the soil. For example, soils of some series, such as the Evesboro and Sassafras, are on both uplands and terraces.

Soils of flood plains.—Flood plains are areas where soil material has been deposited fairly recently when streams overflowed their banks. The areas are still subject to flooding. Some of them are flooded only occasionally, but others are flooded every year or several times a year.

Floodwaters have left deposits of silt and sand, and they have also left deposits of clay or gravel in places. In most areas the deposits are of nearly uniform texture. In others they are of many different textures and are generally stratified. Soils formed in this material do not show much evidence of profile development but generally have a discernible A horizon. Also, some alteration has taken place in areas that lack good drainage, or the soil material below the surface layer is mottled to some extent. No development of horizons that contain a significant accumulation of clay has taken place.

The soils of flood plains occupy about 6 percent of the county. This figure includes areas of Mixed alluvial land, which is not shown in table 10, because it is a miscellaneous land type and not a true soil.

Genetic Processes and Soil Morphology

In most of the soils of this county, morphology is expressed by strong differentiated horizons. The young soils that formed in alluvium show little horizonation. Also, strongly differentiated horizons are not evident in soils that consist mainly of almost pure quartz sand or in soils that are shallow over hard bedrock.

The differentiation of horizons in the soils is the result of one or more of the following soil-forming, or genetic, processes: (1) Accumulation of organic matter; (2) leaching of carbonates and of salts more soluble than

TABLE 10.—*Soil series arranged to show relationships in position, parent material, and drainage*

SOILS OF UPLANDS AND TERRACES

Parent material	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained
Soft muscovitic schist and granitized schist.		Manor	Chester, Elioak, Glenelg, Manor	Glenville		Baile.
Hard chloritic schist and granitized schist.		Mt. Airy	Glenelg	Glenville		Baile.
Hard talcose schist and phyllite		Linganore	Linganore			
Gneiss	Brandywine					
Diabase and other dark-colored, basic, igneous rocks.			Legore, Montalto	Kelly	Kelly	Watchung.
Serpentine				Aldino		Watchung.
Gabbro and other mafic rocks			Relay			
Mixed basic and acidic rocks			Neshaminy			Watchung.
Old crystalline alluvium			Elsinboro	Delanco		Kinkora.
Loess over crystalline residuum			Fairfax			
Loess over old gravelly and sandy sediments.			Chillum	Beltsville		Leonardtown.
Old highly gravelly sediments		Aura	Aura			
Old very sandy sediments	Evesboro	Evesboro				
Old sediments of sand, silt, and clay		Rumford	Sassafras, Sunnyside	Woodstown		Fallsington.
Old sediments of clay or silty clay				Keyport		Elkton.
SOILS OF FLOOD PLAINS AND LOCAL ALLUVIAL ACCUMULATIONS						
Recent crystalline alluvium			Comus	Codorus		Hatboro.
Recent alluvium from old sediments				Iuka		

calcium carbonate; (3) chemical weathering of the primary minerals of rocks and parent materials to form silicate clay minerals; (4) translocation of silicate clay minerals, and probably of some silt-sized particles, from one horizon to another; and (5) chemical changes and transfer of iron. These processes have taken place in all the soils of the county. The degree to which each process has acted varies from soil to soil, and the results of each process vary.

Some organic matter has accumulated in all the soils to form an A1 horizon. In many places the A1 horizon has lost its identity as a result of cultivation and is now an Ap horizon or part of an Ap horizon. In others erosion has removed all of the A1 horizon. The content of organic matter ranges from very low to moderate or moderately high. In areas that have not been disturbed, sandy soils, such as the Evesboro, have a weakly defined A1 horizon that contains little organic matter. The Kinkora, Watchung, and Baile soils, on the other hand, have a fairly prominent A1 horizon in undisturbed areas. For those soils, the content of organic matter in the A1 horizon is as high as 3 or 4 percent. The content of organic matter in the A1 horizon of other soils in the county is somewhere between these two extremes.

Leaching of carbonates and salts has occurred in all the soils of the county, but it has been of little importance in the differentiation of horizons. The effects have been indirect; the leaching permitted translocation of silicate clay minerals in most of the soils. All the soils have been leached of carbonates and salts. This is indicated by the fact that the soils are naturally acid, and many of them are very strongly acid or extremely acid.

The main result of weathering of primary minerals to silicate clay minerals, largely by the process of hydrolysis, is the production of kaolinitic clays. Kaolinite is the most common and most characteristic clay mineral in mature soils of the county, but many of the soils contain smaller amounts of such clay minerals as halloysite, illite, vermiculite, and montmorillonite. This shows that the weathering processes have not yet had their full effect in most of the soils, though the soils have been exposed to weathering for a long time. Some of the soils, however, have reached a point where they are at least temporarily in equilibrium with their environment.

The translocation and development in place of silicate clay minerals have strongly influenced the kinds of horizons that have developed in most of the soils of the county. Clay has been removed, in part, from the A1 and A2 horizons and has accumulated and become immobilized, or nearly so, in the B horizon. This has occurred in all the soils that have a textural, or B2, horizon and probably in some soils that do not have a distinct B2t horizon. It is most evident in such soils as the Elioak, Montalto, Kinkora, Keyport, and Elkton soils, which have a prominent B2t horizon.

The reduction and transfer of iron has occurred, to some degree, in all the soils that have impeded drainage. In the many naturally wet soils of Howard County, this process, known as gleying, has been of great importance. It has especially affected the soils of the Elkton, Falls-

ington, Leonardtown, Kinkora, Hatboro, Watchung, and Baile series.

In some soils accumulations of clay minerals and of some silt in the lower part of the subsoil result in the formation of a compact layer, commonly called a fragipan. This fragipan is a part of the B horizon and is designated by the symbol Bx. It is one of the causes of impeded drainage, which, in turn, brings about reduction and transfer of iron, or gleying.

Because a fragipan is generally slowly permeable, a temporary perched water table can form above it, although the deeper layers remain relatively dry. In this county the Aldino, Beltsville, Glenville, and Leonardtown soils all contain a fragipan and are somewhat gleyed.

In areas where the soil is poorly aerated, iron that has been reduced generally has become mobile and may have been removed from the soil. In the soils of this county, however, the iron has moved only a short distance. In some soils it stopped either in the horizon where it originated or in a nearby horizon. Part of this iron may be reoxidized and segregated to form the red, yellowish-red, strong-brown, or yellowish-brown mottles that are common in some horizons of soils that have impeded drainage.

Where silicate clay forms from primary material, some iron generally is freed as hydrated oxide. Depending upon the degree of hydration, such oxides normally have a strong red color. Only a small amount of hydrated oxide is required to color the soil material. Hydrated oxide is especially likely to color the soil if silicate clay minerals are not abundant and if the material in which the soil formed is fairly coarse textured. Then, a strongly colored subsoil, or "color B" horizon, forms, even though not enough clay has accumulated to form a textural, or B2t, horizon. The Brandywine, Manor, and Mt. Airy soils of Howard County lack a Bt horizon but do have a color B horizon.

Where well-developed and freely aerated soils contain a textural, or B2t, horizon, that horizon is generally as strongly colored as a simple color B horizon. Prominent examples of soils of this county that contain a strongly colored B2t horizon are the Aura, Elioak, Montalto, and Sunnyside soils.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison of large areas, such as countries and continents.

Two systems of classifying soils are used in the United States. The older of these systems was adopted in 1938 (*5*) and was later revised and expanded, most extensively in 1949 (*4*). The other (*6*) has been in general use by the National Cooperative Soil Survey since January 1965, though it is undergoing continual study. The criteria for classification under the current system are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Readers interested in the development of this system should search for the latest available literature (*3*). Table 11, page 102, shows the classification of the soil series of Howard County according to the current system and also shows their classification by great soil groups according to the 1938 system.

Under the current system of classification, six categories are used. Beginning with the broadest and most inclusive, these are the order, the suborder, the great group, the subgroup, the family, and the series. Ten soil orders are recognized in the current system. In contrast, probably more than 8,000 soil series have been mapped in the United States alone. Only four of the orders—Entisols, Inceptisols, Alfisols, and Ultisols—are represented in this county.

Entisols are recent mineral soils that do not have genetic horizons or have only the beginnings of such horizons.

Inceptisols are mineral soils in which horizons have definitely started to develop. They generally occur on young, but not recent, land surfaces. In Howard County the Manor soils are examples of Inceptisols. They have a brightly colored B horizon but lack other horizons typical of soils of the higher orders.

Alfisols are soils containing a clay-enriched B horizon that has high base saturation, that is, a base saturation of more than 35 percent. As a result, those soils have a greater natural supply of plant nutrients, especially calcium, than the soils of the other orders represented in this county.

Ultisols are mineral soils that contain a clay-enriched B horizon that has less than 35 percent base saturation. The base saturation decreases with increasing depth.

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TABLE 11.—*Soil series classified according to the current classification system and the revised 1938 system*

Series	Current classification system			Great soil group, 1938 classification
	Family	Subgroup	Order	
Aldino	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Aura	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Baile	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Beltsville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Gray-Brown Podzolic soils.
Brandywine	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Lithosols intergrading toward Sols Bruns Acides.
Chester	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Chillum	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Codorus	Fine-loamy, mixed, mesic	Aquic Fluventic Dystrochrepts.	Inceptisols	Alluvial soils.
Comus	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Delanco	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	[1].
Elioak	Clayey, kaolinitic, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Elsinboro	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Evesboro	Siliceous, coated, mesic	Typic Quarzipsamments	Entisols	Regosols.
Fairfax	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Fallsington	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Glenelg	Fine-loamy, micaceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Glenville	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Hatboro	Fine-loamy, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Iuka	Coarse-loamy, siliceous, acid, thermic.	Aquic Fluventic Dystrochrepts.	Inceptisols	Alluvial soils.
Kelly	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols	[1].
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Kinkora	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	[1].
Legore	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Leonardtown	Fine-silty, mixed, mesic	Typic Fragiaquults	Ultisols	Planosols.
Linganore	Loamy-skeletal, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Lithosols.
Manor	Coarse-loamy, micaceous, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Montalto	Fine, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Mt. Airy	Loamy-skeletal, micaceous, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Neshaminy	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Relay	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	[1].
Rumford	Coarse-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Sassafras	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Sunnyside	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Watchung	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Woodstown	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

[1] Unclassified.

Glossary

Acidity. See Reaction, soil.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Soil material, such as sand, silt or clay, that has been deposited on land by streams.

Available moisture capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch of soil depth, but sometimes expressed as inches of water per foot of soil.

Base (chemistry). Any of the positive, generally metallic elements or combinations of elements that make up the nonacid plant nutrients. The most important of these in plant nutrition are calcium (Ca), potassium (K), magnesium (Mg), and ammonium (NH).

Chroma. See Color, Munsell notation.

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.

Color, Munsell notation. A system for designating color by degrees of three simple variables—hue, value, and chroma. For example, the color notation 10YR 6/4 stands for a color with hue of 10YR, a value of 6, and a chroma of 4. Hue is the dominant spectral color; value relates to the relative lightness or darkness of color; and chroma is the relative purity or strength of color and increases as grayness decreases.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Control section. A part of a soil profile that strongly influences the placement of a soil in the current system of classification. If a soil is 14 inches or less in thickness, the control section is the entire soil. If a soil is more than 14 inches deep and it makes contact with underlying rock at a depth of 40 inches or less, the control section is that part of the profile from a depth of 10 inches down to the point of contact with rock. If a soil is more than 40 inches deep, the control section extends from a depth of 10 inches down to some depth that exceeds 40 inches but does not exceed 6 feet.

Cover crop. A close-growing crop grown primarily to improve the soil and to protect it between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Cropland. Land regularly used for crops, except forest crops and permanent pasture. It includes rotation pasture, cultivated summer fallow, orchards, and other land ordinarily used for crops but temporarily idle.

Diversion. A broad-bottomed ditch that serves to divert runoff water so that it will flow around the slope to a safe outlet.

Drainage. As a farm management operation, the removal of excess water from the soil. As a soil condition, the relative rapidity and extent of the removal of water from the soil, under natural conditions.

Erosion, soil. The wearing away of the land surface by wind, running water, and other geological agents. Accelerated erosion refers to the loss of soil material brought about by the activities of man. *Wind erosion* is the removal of soil material, generally sand, from dry, unprotected areas. The three classes of erosion by water are *sheet erosion* (the removal of soil material without the development of conspicuous channels), *rill erosion* (accelerated erosion by water that produces small channels), and *gully erosion* (accelerated erosion that produces large channels).

First bottom. The normal flood plain of a stream; subject to occasional or frequent flooding.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The base of a slope, where there is a significant change in the grade or angle toward more nearly level land.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. It is generally mottled, is slowly or very slowly permeable to water, and has a few to many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur 15 to 40 inches below the surface.

Gleization, or gleying. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the subsoil or substratum, as a result of drainage and poor aeration; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Gravelly soil material. Material that is 15 to 50 percent rounded or angular fragments of rock that are not prominently flattened and are up to 3 inches in diameter. A single piece is a *pebble. Gravel* is a mass of pebbles.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Hue. See Color, Munsell notation.

Interceptor. A drainage ditch or tile line, generally at or near the base of a slope, to protect areas downslope from the effects of seepage water.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal soil drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching. The removal of soluble materials from soils or other materials by percolating water.

Morphology, soil. The physical constitution of the soil, including the texture, structure, consistence, color, porosity, and other physical, chemical, mineralogical, and biological properties of the various horizons that make up the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in making food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and other elements obtained from the soil, and carbon, hydrogen, and oxygen, obtained largely from the air and water, are plant nutrients.

Parent material. The weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Permeability, soil. The quality that enables water or air to move through a soil. Terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH value. A numerical means for designating acidity and alkalinity in soils and on other biological systems. See Reaction, soil.

Productivity, soil. The present capability of a soil for producing a specified plant or sequence of plants under a specified system of management.

Profile, soil. A vertical section of a soil through all its horizons and extending into the parent material. See Parent material and Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values or in words as follows:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. See Topography.

Runoff. The removal of water by flow over the surface of the soil.

Sand. As a soil separate, individual rock or mineral fragments 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but they may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Sediments. Rock, mineral, or soil particles of any size, transported and deposited by water, wind, ice, or gravity.

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 textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (agricultural). An embankment, or low ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that the water soaks into the soil or flows slowly to a prepared outlet without harm. Terraces are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, 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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topography, or relief. Elevations or inequalities of the land surface, considered collectively.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Value. See Color, Munsell notation.

Water table. The highest part of the soil or underlying material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 3, page 7, for approximate acreage and proportionate extent of the soils. See table 4, page 50, for estimated yields per acre of the principal crops. For facts about the engineering properties of the soils, see the section beginning on page 64]

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
AdB2	Aldino silt loam, 3 to 8 percent slopes, moderately eroded	8	IIe-13	42	12	57
AdC2	Aldino silt loam, 8 to 15 percent slopes, moderately eroded	9	IIIe-13	45	16	57
AgB2	Aura gravelly loam, 1 to 5 percent slopes, moderately eroded	9	IIs-7	44	12	57
AgC2	Aura gravelly loam, 5 to 10 percent slopes, moderately eroded	9	IIIe-7	44	16	57
AgE3	Aura gravelly loam, 10 to 30 percent slopes, severely eroded	9	VIIe-2	48	17	58
Ba	Baile silt loam	10	Vw-1	47	1	55
BeA	Beltsville silt loam, 0 to 1 percent slopes	11	IIw-8	43	12	57
BeB2	Beltsville silt loam, 1 to 5 percent slopes, moderately eroded	11	IIe-13	42	12	57
BeC2	Beltsville silt loam, 5 to 10 percent slopes, moderately eroded	11	IIIe-13	45	16	57
BeC3	Beltsville silt loam, 5 to 10 percent slopes, severely eroded	12	IVe-9	46	17	58
BeD2	Beltsville silt loam, 10 to 15 percent slopes, moderately eroded	12	IVe-9	46	16	57
BrB2	Brandywine loam, 3 to 8 percent slopes, moderately eroded	12	IIe-10	42	40	59
BrC2	Brandywine loam, 8 to 15 percent slopes, moderately eroded	12	IIIe-10	44	40	59
BrC3	Brandywine loam, 8 to 15 percent slopes, severely eroded	12	IVe-10	46	40	59
BrD2	Brandywine loam, 15 to 25 percent slopes, moderately eroded	12	IVe-10	46	41	59
BrD3	Brandywine loam, 15 to 25 percent slopes, severely eroded	12	VIe-3	47	41	59
BrF	Brandywine loam, 25 to 60 percent slopes	13	---	--	--	--
	North aspect	--	VIIe-3	48	41	59
	South aspect	--	VIIe-3	48	56	61
BwD	Brandywine very stony loam, 3 to 25 percent slopes	13	VIs-3	48	41	59
CgB2	Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	14	IIe-4	42	30	58
CgC2	Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	14	IIIe-4	44	30	58
ChA	Chester silt loam, 0 to 3 percent slopes	13	I-4	42	30	58
ChB2	Chester silt loam, 3 to 8 percent slopes, moderately eroded	14	IIe-4	42	30	58
ChC2	Chester silt loam, 8 to 15 percent slopes, moderately eroded	14	IIIe-4	44	30	58
ChC3	Chester silt loam, 8 to 15 percent slopes, severely eroded	14	IVe-3	46	30	58
ChD2	Chester silt loam, 15 to 25 percent slopes, moderately eroded	14	IVe-3	46	31	58
ClC3	Chillum gravelly loam, 5 to 10 percent slopes, severely eroded	15	IVe-7	46	17	58
ClD2	Chillum gravelly loam, 10 to 15 percent slopes, moderately eroded	15	IVe-7	46	8	56
ClE2	Chillum gravelly loam, 15 to 30 percent slopes, moderately eroded	15	VIe-2	47	9	57
CmB2	Chillum silt loam, 1 to 5 percent slopes, moderately eroded	15	IIs-7	44	7	56
CmC2	Chillum silt loam, 5 to 10 percent slopes, moderately eroded	15	IIIe-7	44	8	56
CnB2	Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded	15	IIs-7	44	7	56
CnD3	Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded	15	VIe-2	47	17	58
Co	Codorus silt loam	16	IIw-7	43	4	56
Cs	Comus silt loam	16	I-6	42	4	56
CuB	Comus silt loam, local alluvium, 3 to 8 percent slopes	16	IIe-6	42	4	56
DeA	Delanco silt loam, 0 to 3 percent slopes	17	IIw-1	43	3	55
DeB2	Delanco silt loam, 3 to 8 percent slopes, moderately eroded	17	IIe-16	43	3	55
EkA	Elioak silt loam, 0 to 3 percent slopes	18	I-4	42	30	58
EkB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded	18	IIe-4	42	30	58
EkC2	Elioak silt loam, 8 to 15 percent slopes, moderately eroded	18	IIIe-4	44	30	58
EkD2	Elioak silt loam, 15 to 25 percent slopes, moderately eroded	18	IVe-3	46	31	58

GUIDE TO MAPPING UNITS--CONTINUED

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
ElC3	Elioak silty clay loam, 8 to 15 percent slopes, severely eroded	18	IVe-3	46	30	58
ElD3	Elioak silty clay loam, 15 to 25 percent slopes, severely eroded	18	VIe-2	47	31	58
Em	Elkton silt loam	19	IIIw-9	46	1	55
EnA	Elsinboro loam, 0 to 3 percent slopes	20	I-4	42	30	58
EnB2	Elsinboro loam, 3 to 8 percent slopes, moderately eroded	20	IIe-4	42	30	58
EnC2	Elsinboro loam, 8 to 15 percent slopes, moderately eroded	20	IIIe-4	44	30	58
EvB	Evesboro loamy sand, 1 to 5 percent slopes	21	IVs-1	47	5	56
EvC	Evesboro loamy sand, 5 to 15 percent slopes	21	VIIs-1	48	5	56
Fa	Fallsington loam	22	IIIw-7	45	1	55
GlA	Glenelg loam, 0 to 3 percent slopes	23	I-4	42	30	58
GlB2	Glenelg loam, 3 to 8 percent slopes, moderately eroded	23	IIe-4	42	30	58
GlC2	Glenelg loam, 8 to 15 percent slopes, moderately eroded	23	IIIe-4	44	30	58
GlC3	Glenelg loam, 8 to 15 percent slopes, severely eroded	23	IVe-3	46	30	58
GlD2	Glenelg loam, 15 to 25 percent slopes, moderately eroded	23	IVe-3	46	31	58
GlD3	Glenelg loam, 15 to 25 percent slopes, severely eroded	23	VIe-2	47	31	58
GnA	Glenville silt loam, 0 to 3 percent slopes	24	IIw-8	43	12	57
GnB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	24	IIe-13	42	12	57
GnC2	Glenville silt loam, 8 to 15 percent slopes, moderately eroded	24	IIIe-13	45	16	57
Gp	Gravel pits and quarries	24	VIIIs-4	48	21	58
Ha	Hatboro silt loam	25	IIIw-7	45	2	55
IuB	Iuka loam, local alluvium, 1 to 5 percent slopes	26	IIe-16	43	4	56
KcE3	Kelly clay loam, 15 to 30 percent slopes, severely eroded	27	VIIe-2	48	34	59
KeB2	Kelly silt loam, 3 to 8 percent slopes, moderately eroded	27	IVw-3	47	33	59
KeC2	Kelly silt loam, 8 to 15 percent slopes, moderately eroded	27	IVw-3	47	33	59
KhC2	Keyport silt loam, 3 to 10 percent slopes, moderately eroded	27	IIIe-13	45	9	57
Kn	Kinkora silt loam	28	Vw-1	47	1	55
LeB2	Legore silt loam, 3 to 8 percent slopes, moderately eroded	29	IIe-10	42	40	59
LeC2	Legore silt loam, 8 to 15 percent slopes, moderately eroded	29	IIIe-10	44	40	59
LgC3	Legore silty clay loam, 8 to 15 percent slopes, severely eroded	29	IVe-10	46	40	59
Ll	Leonardtown silt loam	30	IVw-3	47	11	57
LnB2	Linganore channery loam, 3 to 8 percent slopes, moderately eroded	31	IIIe-10	44	51	60
LnC2	Linganore channery loam, 8 to 15 percent slopes, moderately eroded	31	IVe-10	46	51	60
LnD2	Linganore channery loam, 15 to 25 percent slopes, moderately eroded	31	VIe-3	47	52	60
LoE	Linganore channery silt loam, 25 to 45 percent slopes	31	---	--	--	--
	North aspect	--	VIIe-3	48	52	60
	South aspect	--	VIIe-3	48	58	61
Md	Made land	31	---	--	21	58
MgB2	Manor gravelly loam, 3 to 8 percent slopes, moderately eroded	32	IIe-25	43	43	59
MgC2	Manor gravelly loam, 8 to 15 percent slopes, moderately eroded	32	IIIe-25	45	43	59
MgC3	Manor gravelly loam, 8 to 15 percent slopes, severely eroded	32	IVe-25	46	43	59
MlA	Manor loam, 0 to 3 percent slopes	32	IIs-25	44	43	59
MlB2	Manor loam, 3 to 8 percent slopes, moderately eroded	32	IIe-25	43	43	59
MlC2	Manor loam, 8 to 15 percent slopes, moderately eroded	32	IIIe-25	45	43	59
MlC3	Manor loam, 8 to 15 percent slopes, severely eroded	32	IVe-25	46	43	59
MlD2	Manor loam, 15 to 25 percent slopes, moderately eroded	32	IVe-25	46	44	60
MlD3	Manor loam, 15 to 25 percent slopes, severely eroded	32	VIe-3	47	44	60
MlE	Manor loam, 25 to 45 percent slopes	32	VIIe-3	48	44	60
MnD	Manor very stony loam, 3 to 25 percent slopes	32	VIs-3	48	44	60
MnF	Manor very stony loam, 25 to 60 percent slopes	32	VIIs-3	48	45	60
Mo	Mixed alluvial land	32	VIw-1	48	2	55
MpB2	Montalto silt loam, 3 to 8 percent slopes, moderately eroded	33	IIe-4	42	30	58
MpC2	Montalto silt loam, 8 to 15 percent slopes, moderately eroded	33	IIIe-4	44	30	58

GUIDE TO MAPPING UNITS--CONTINUED

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
MqC3	Montalto silty clay loam, 8 to 15 percent slopes, severely eroded	33	IVe-3	46	30	58
MrE	Montalto and Relay soils, 15 to 45 percent slopes	33	VIe-2	47	31	58
MsD	Montalto and Relay very stony silt loams, 3 to 25 percent slopes	33	VIs-3	48	30	58
MsF	Montalto and Relay very stony silt loams, 25 to 60 percent slopes	33	VIIs-3	48	32	58
MtB2	Mt. Airy channery loam, 3 to 8 percent slopes, moderately eroded	34	IIIe-10	44	51	60
MtC2	Mt. Airy channery loam, 8 to 15 percent slopes, moderately eroded	34	IVe-10	46	51	60
MtC3	Mt. Airy channery loam, 8 to 15 percent slopes, severely eroded	34	VIe-3	47	51	60
MtD2	Mt. Airy channery loam, 15 to 25 percent slopes, moderately eroded	34	VIe-3	47	52	60
MtE	Mt. Airy channery loam, 25 to 45 percent slopes	34	---	--	--	--
	North aspect	--	VIIe-3	48	52	60
	South aspect	--	VIIe-3	48	58	61
NeB2	Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	35	IIe-4	42	30	58
NeC2	Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	35	IIIe-4	44	30	58
NsD3	Neshaminy silty clay loam, 15 to 25 percent slopes, severely eroded	35	VIe-2	47	31	58
ReC2	Relay silt loam, 3 to 15 percent slopes, moderately eroded	36	IIIe-10	44	40	59
RuB2	Rumford loamy sand, 1 to 5 percent slopes, moderately eroded	37	IIs-4	44	7	56
RuC2	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	37	IIIe-33	45	8	56
RuD2	Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	37	IVe-5	46	8	56
ScB	Sandy and clayey land, gently sloping	37	IIIe-41	45	16	57
ScD	Sandy and clayey land, moderately sloping	37	VIe-2	47	16	57
ScE	Sandy and clayey land, moderately steep	37	VIIe-2	48	16	57
SfB2	Sassafras gravelly sandy loam, 1 to 5 percent slopes, moderately eroded	38	IIe-5	42	7	56
SfC2	Sassafras gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	38	IIIe-5	44	8	56
SfD2	Sassafras gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	38	IVe-5	46	8	56
SlB2	Sassafras loam, 1 to 5 percent slopes, moderately eroded	38	IIe-4	42	7	56
SlC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	38	IIIe-4	44	8	56
SlD2	Sassafras loam, 10 to 15 percent slopes, moderately eroded	38	IVe-3	46	8	56
SsE	Sassafras soils, 15 to 40 percent slopes	38	VIe-2	47	9	57
St	Stony land	38	VIIIs-1	48	59	61
SuB2	Sunnyside fine sandy loam, 1 to 5 percent slopes, moderately eroded	39	IIe-5	42	7	56
SuD2	Sunnyside fine sandy loam, 5 to 15 percent slopes, moderately eroded	39	IVe-5	46	8	56
WaA	Watchung silt loam, 0 to 3 percent slopes	40	Vw-1	47	1	55
WaB	Watchung silt loam, 3 to 8 percent slopes	40	VIw-2	48	1	55
WoB2	Woodstown sandy loam, 1 to 5 percent slopes, moderately eroded	41	IIe-36	43	3	55

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