SOIL SURVEY OF

Anne Arundel County, Maryland

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Maryland Agricultural Experiment Station

Issued February 1973

Major fieldwork for this soil survey was done in the period 1948–67. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1968. 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 Anne Arundel Soil Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and woodland groups.

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

Community planners and others interested in broad land use planning will find information about the use of soils for selected purposes in the section "Town and Country Planning."

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

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

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

Cover: **An area of Marr-Westphalia-Sassafras association in foreground. Wooded area in background is poorly drained Elkton soils.**

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Contents

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SOIL SURVEY OF ANNE ARUNDEL COUNTY, MARYLAND

BY ROBERT M. KIRBY AND EARL D. MATTHEWS, SOIL CONSERVATION SERVICE

SOILS SURVEYED BY RICHARD H. ANDERSEN, MOULTON A. BAILEY, ELVIN Z. W. COMPY, MERL F. HERSHBERGER, ROBERT M. KIRBY, AND ROBERT A. SIDNER, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH MARYLAND AGRICULTURAL EXPERIMENT STATION

ANNE ARUNDEL COUNTY is in the east-central part of Maryland (fig. 1). The county is bounded on the east by the Chesapeake Bay and on the north by the Patapsco River and Baltimore City. Howard County lies on the northwest. The Patuxent River separates the county from Prince Georges County on the west; and Calvert County lies on the south. The county occupies 266,880 acres, or about 417 square miles. Annapolis, the State capital and county seat, is on the Severn River in the east-central part of the county.

The waterfront of Anne Arundel County is probably its greatest industrial asset. There are 431 miles of varied shoreline along the Chesapeake Bay and many large and small rivers and creeks. The climate is uniformly humid and temperate. It is favorable for general farming and is highly attractive for summer recreation, particularly fishing, boating, and swimming. Tobacco is the most important farm crop.

More than 99,000 acres of the county is suitable for cultivation, and an additional 67,000 acres is suitable for pasture or limited cultivation. Most of the remaining acreage is so steep, so eroded, or so wet that it is probably most suitable as woodland, as wildlife habitat, or for recreational uses. A large part of the county is in nonfarm uses.

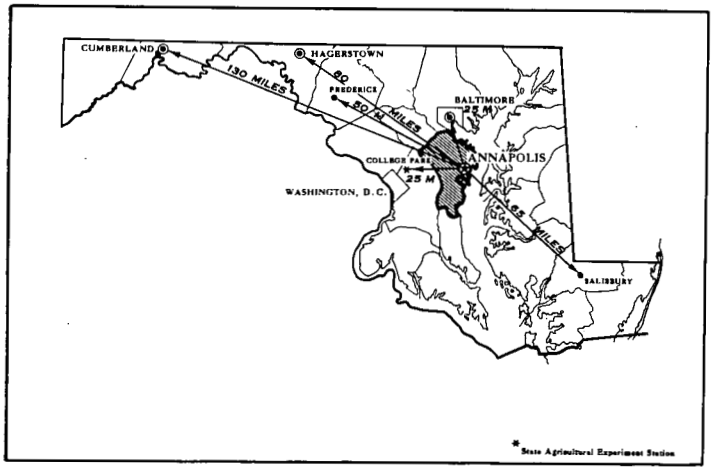

Figure 1.—Location of Anne Arundel County in Maryland.

The population of the county in 1960 was 206,634 and it was estimated to be 257,000 in 1965, an increase of nearly 20 percent. It is further estimated that in the year 1980 the population will have increased to 455,000, and at that time the county, for all practical purposes, will be an integral part of the Baltimore-Washington metropolitan complex.

General Nature of the County

This section provides general information about Anne Arundel County. It briefly describes the physiography, relief, and drainage; climate; vegetation; industries and transportation; and farming of the county.

Physiography, Relief, and Drainage

Anne Arundel County lies in the physiographic province known as the Atlantic Coastal Plain. The geological materials of the county consist of unconsolidated deposits of gravel, sand, silt, and clay that range in age from Cretaceous in the northern part of the county to Recent on the flood plains.

The topography ranges from nearly level to very steep. Nearly level or gently sloping soils are in large areas north of the Severn and Magothy Rivers on the Deale-Shadyside flats and in the southwestern part of the county adjoining the Patuxent River. The steepest soils are in a north-south section that runs through the central part of the county, where many small streams have cut deep V-shaped valleys into the soft unconsolidated materials of the Coastal Plain. Broad alluvial terraces border many of the large streams and rivers that flow into the Chesapeake Bay. Elevations in the county range from sea level along the shore of the Chesapeake Bay to more than 300 feet in the northwestern part of the county near Laurel.

About 76 percent of the county is occupied by well drained soils; about 8.5 percent by moderately well drained soils; and about 14 percent by poorly drained soils. There are 65 acres of swamp and 3,400 acres of tidal marsh. About 17,200 acres are on the flood plains of streams.

Seven major drainage basins in the county provide drainage directly into Chesapeake Bay. Nearly two-thirds

of the county is drained through the Patapsco River on the north and the Magothy, Severn, Rhode, South, and West Rivers, and Herring Bay on the east. The Patuxent River on the west drains the remainder of the county. Many large streams are tributaries to the rivers of the county. In the north, draining into the Patapsco, are Stony Run, Furnace Creek, Marley Creek, and other creeks. The Magothy, Severn, South, Rhode, and West Rivers are tidal estuaries fed by many large streams, such as Severn Run, Deep Creek, North River, Ridge Branch, Bell Branch, Beards Creek, and Muddy Creek. The major tributaries of the Patuxent River are the Little Patuxent River, Lyons Creek, Stocketts Run, Kings Branch, and Rock Branch.

All of the major streams in the county are normally sluggish, and many have large accumulations of silt. Streams in the northern and eastern parts of the county are tidal where they flow into the larger estuaries.

Climate [1]

Because of its position in the middle latitudes where the general atmospheric flow of air is from west to east across the North American Continent, Anne Arundel County has a continental type of climate and well-defined seasons. However, the Chesapeake Bay exerts a considerable modifying control on the climate, especially in that part of the county immediately adjacent to the bay.

Temperature and precipitation data given in table 1 are based on the climatic record of the National Weather Station at Friendship International Airport in the northwestern part of the county. This location is representative of the county, except for those areas bordering the Chesapeake Bay. In the following discussion, reference is also made to the climatic record at Annapolis (U.S. Naval Academy) to show the effect of the Chesapeake Bay, especially on temperature.

The warmest part of the year is the last half of July, when the maximum afternoon temperatures average about 89° F. Temperatures of 90° F. or higher occur on an average of 31 days per year at the airport, while at Annapolis the average is 14 days. The coldest period of the year is the last of January and the beginning of February when the early morning minimum temperatures average about 24° F. Minimum temperatures of 32° F. or lower occur on an average of 103 days per year at the airport, while at Annapolis the average is only 70 days.

Table 2 shows the probability of freezing temperatures on or after given dates in spring and on or before given dates in fall. The data given are for the weather station at Friendship International Airport and for the U.S. Naval Academy at Annapolis. The average period between the last frost in spring and the first in fall, commonly defined as the growing season, is 194 days at the airport and 232 days at Annapolis.

The average annual precipitation is 40 to 44 inches over the county. The monthly distribution is fairly uniform during the year. The greatest monthly precipitation is in August. Most precipitation in the colder half of the year is the result of low-pressure systems moving northeastward along the coast. In the summer, precipitation occurs in showers and thunderstorms.

[1] By W. J. Moyer, State climatologist for Maryland and Delaware, National Weather Service, U.S. Department of Commerce.

TABLE 1.—*Temperature and precipitation data*

[All data from weather station at Friendship International Airport, elevation 148 feet, for the period 1950 through 1967]

Month	Temperature				Precipitation				
	Average daily maximum [1]	Average daily minimum [1]	2 years in 10 will have at least 4 days with—		Average total [1]	1 year in 10 will have [2]—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	44.2	25.3	62	9	3.43	1.5	5.5	6	2
February	45.5	25.8	61	11	2.89	1.6	4.1	5	2
March	53.6	32.5	71	21	3.82	1.9	5.8	2	2
April	65.8	42.6	84	30	3.60	1.6	5.6	----------	----------
May	75.9	52.8	89	40	3.98	2.0	6.5	----------	----------
June	83.5	61.4	95	51	3.29	1.9	5.9	----------	----------
July	87.2	66.4	97	58	4.22	2.1	7.0	----------	----------
August	85.0	65.0	93	56	5.19	2.0	8.7	----------	----------
September	78.6	57.6	91	44	3.33	1.2	7.0	----------	----------
October	68.4	45.6	82	34	3.18	1.2	5.5	----------	----------
November	56.5	34.4	70	24	3.13	1.1	5.5	[3]	1
December	45.7	25.9	61	13	2.99	1.2	5.1	4	2
Year	65.8	44.6	[4] 99	[5] 3	43.05	34.9	52.1	17	2

[1] Climatological standard normals (1931–1960).
[2] Based on collective data of stations in Prince Georges and Anne Arundel Counties.
[3] Less than one-half day.
[4] Average annual maximum.
[5] Average annual minimum.

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

[All data from weather stations at Friendship International Airport, for the period 1950 through 1967, and at U.S. Naval Academy, Annapolis, for the period 1931 through 1960]

Probability	Dates for given probability and temperature					
	32° F. or lower		24° F. or lower		16° F. or lower	
	Friendship International Airport	Annapolis	Friendship International Airport	Annapolis	Friendship International Airport	Annapolis
Spring:						
9 years in 10 later than	April 2	March 12	March 5	February 13	January 29	(1).
3 years in 4 later than	April 8	March 21	March 12	February 23	February 8	(1).
2 years in 3 later than	April 10	March 24	March 15	February 27	February 12	(1).
1 year in 2 later than	April 15	March 30	March 20	March 6	February 19	(1).
1 year in 3 later than	April 20	April 5	March 25	March 13	February 26	(1).
1 year in 4 later than	April 22	April 8	March 28	March 17	March 2	(1).
1 year in 10 later than	April 28	April 17	April 4	March 27	March 12	(1).
Fall:						
1 year in 10 earlier than	October 15	November 2	November 6	November 25	November 27	(1).
1 year in 4 earlier than	October 20	November 9	November 13	November 30	December 4	(1).
1 year in 3 earlier than	October 22	November 12	November 16	December 2	December 6	(1).
1 year in 2 earlier than	October 26	November 17	November 21	December 5	December 11	(1).
2 years in 3 earlier than	October 30	November 22	November 26	December 8	December 16	(1).
3 years in 4 earlier than	November 1	November 25	November 29	December 10	December 18	(1).
9 years in 10 earlier than	November 6	December 2	December 6	December 15	December 25	(1).

[1] No data. Temperatures of 16° F. or lower did not occur every year.

Snowfall averaged 25 inches at the airport for the winters of 1950–51 through 1966–67; the annual total at Annapolis averaged 17 inches for the period 1931–60. The greatest one-day snowfall was 24 inches at Annapolis on January 28, 1922.

Drought may occur in any month or any season, but serious drought is most likely to occur in summer. Generally, the rainfall and the moisture stored in the soil are adequate for good crop yields; however, the unequal distribution of summer showers and occasional dry periods at critical stages in crop development may make irrigation necessary for maximum crop yields in some years.

Thunderstorms occur on an average of 31 days per year; almost 70 percent of these occur from May through August. Tornadoes are rare and have caused little damage in the past. For the State of Maryland, the average for a 10-year period, 1953–64, is two tornadoes per year. Tropical storms or hurricanes affect the county about once a year, usually in the period from August through October. Most of these have caused minor damage.

Prevailing winds are mostly from the west to northwest, except during summer when they become more southerly. The average annual velocity of wind is 10 miles per hour; however, winds may reach 50 to 60 miles per hour and even higher in severe thunderstorms, hurricanes, or general storms in winter.

Vegetation

At one time Anne Arundel County was almost entirely covered by hardwoods. The dominant trees were red and white oaks, sweetgum, and yellow-poplar. More than 50 percent of the county still has woodland cover, but there have been drastic changes in the distribution of the species. Conifers, especially Virginia pine, have invaded many cleared and cutover areas. Many sandy areas are now occupied by scrub growth of many species, dominantly Virginia pine, blackjack oak, and sweetgum.

The areas of tidal marsh support coarse grasses and rushes. Some areas are growing up in shrubs and small trees that tolerate salt or brackish water.

Industries and Transportation

Many people who live in Anne Arundel County are employed at Federal and State installations within the county. In 1960, there were 21,622 people employed in manufacturing and fabricative industries. Of these, 46 industries had 100 or more employees each. Also, there were 15 private research and development organizations in the electronic, chemical, and engineering fields. Boat building and mining of sand and gravel are also important industries.

In addition to the government facilities of the State and the county in Annapolis, the Federal Government maintains several research and communication centers on the east side of the Severn River, a large dairy farm at Gambrills, the U.S. Naval Academy near Annapolis, and Fort Meade, the headquarters of the United States 1st Army. Both the State and the Federal Governments have detention and rehabilitation centers in the county.

Main lines of the Penn-Central and the Baltimore and Ohio Railroads run through the county, and the Baltimore and Ohio tracks form a part of the boundary with Howard County on the northwest.

Friendship International Airport, one of the major commercial airports of the country, lies in the northern

part of the county. Several small private and commercial airports are scattered about the county.

The county is served by a good system of State roads. Maryland State Routes 2 and 3 connect the central part of Anne Arundel County with Baltimore City to the north. U.S. Highway Nos. 50 and 301, a multiple-lane highway, runs in an east-west direction through the county. The Eastern Shore of Maryland is connected to the county near Annapolis by the Chesapeake Bay Bridge, one of the longest bridges in the world. Nearly every farm in the county has a paved access road.

Farming

The major farm crops grown in Anne Arundel County are corn, soybeans, small grain, tobacco, and hay. Tobacco (fig. 2) has always been the leading cash crop and is now the most important farm crop. The coarse textured and moderately coarse textured soils of the Collington, Marr, Monmouth, and Sassafras series are among the best soils for growing tobacco of high quality. A small market for hay and bedding is provided by Laurel Race Track in the northern part of the county and by Bowie Race Track in nearby Prince Georges County.

As Anne Arundel County becomes more urbanized, farming will likely decline in economic importance. In 1959, there were 961 farms comprising 81,793 acres in the county. Five years later there were only 812 farms, and these comprised 76,268 acres. The size of the average farm increased from 85.1 acres in 1959 to 93.9 acres in 1964. In 1964, only 2,852 persons were in farm-operated households and 6,466,703 pounds of tobacco were produced on 6,353 acres of land. Also in that year, 7,648 acres were in corn, 965 were in soybeans, and 939 were in truck crops other than potatoes (*2*).[2]

How This Survey Was Made

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*8*).

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

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Collington fine sandy loam, 0 to 2 percent slopes, is one of several phases within the Collington series.

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

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

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

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Collington-Urban land complex, 5 to 15 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Evesboro and Galestown loamy sands, 6 to 12 percent slopes, is an example.

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

[2] Italic numbers in parentheses refer to Literature Cited, p. 125.

Figure 2.—Irrigated tobacco on a Collington fine sandy loam.

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 soil in other places are assembled. Data on yield of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. 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 as to be readily useful to different groups of users, among them farmers, managers of woodland, engineers, and homeowners.

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, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

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

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

The seven soil associations in Anne Arundel County are described in the following paragraphs. The terms

for texture used in the descriptive heading of each association apply to the surface layer. Associations 1, 2, 3, 4, and 7 are on the uplands of the Coastal Plain, association 5 is on low, nearly level terraces adjacent to the Chesapeake Bay, and association 6 is on the river terrace of the lower Patuxent River. Many of the soils in association 1 have a gravelly subsoil, and in places the subsoil is compacted. In association 2 are large areas of soil that have an unstable, clayey subsoil. Most of the soils in associations 3 and 6 are deep and sandy. The soils in association 4 for the most part formed in material that is high in content of the mineral glauconite. Most of the soils in associations 4 and 7 have a fairly friable subsoil and are well drained. Association 5 consists dominantly of soils that need some kind of drainage.

If the general soil map for Anne Arundel County is compared with those recently published for Prince Georges County and Howard County, it can be seen that many adjacent areas do not coincide in name, especially along the Patuxent River. This is due mainly to the erratic and highly complex geologic history and subsequent erosion cycle of the Upper Coastal Plain. On the east side of the Patuxent River in northern Anne Arundel County, the cretaceous clays are either exposed at the surface (Loamy and clayey land and Christiana soils) or have thin deposits of loamy or sandy material over them (Muirkirk soils). On the west side of the Patuxent, the older geologic deposits, including cretaceous clays, have been covered with a few to many feet of silty, loamy, and gravelly sediments of Pleistocene age. These are the sediments in which the Beltsville, Chillum, Croom, and Sassafras soils formed. Farther south along the Patuxent River, the sediments in Anne Arundel County are generally sandier than those adjacent to the river in Prince Georges County. In other places along the river, the flood plain soils are extensive enough to constitute a designated soil association (Bibb-Tidal marsh association in Prince Georges County), whereas they are only minor soils within an upland association of soils adjacent to the Patuxent in Anne Arundel County. Therefore, the Patuxent River is not only the established political boundary between counties, but is an appropriate demarcation line between soil associations along much of its route.

1. Sassafras-Croom-Chillum association

Gently sloping to steep, well-drained, loamy soils; compact, gravelly subsoil in places

This association is in the northern part of the county. It extends from the county line southward to Friendship International Airport and Furnace Creek. This association occupies about 5 percent of the county. The Sassafras soils make up about 47 percent of the total acreage; the Croom soils, about 13 percent; and the Chillum soils, about 7 percent. Minor soils make up the remaining 33 percent.

The Sassafras soils are deep and well drained. They have a fine sandy loam surface layer and a dominantly sandy clay loam subsoil. These soils have only a moderate amount of gravel in their profile. The Croom soils are gravelly and have a compacted or cemented subsoil. They are somewhat droughty and have a shallow root zone. The Chillum soils have a silt loam surface layer and a heavy silt loam and light silty clay loam subsoil. The substratum is compacted, gravelly, and firm. The gently sloping Sassafras and Chillum soils are at higher elevations, whereas the steeper Croom soils mainly occupy positions below the Sassafras and Chillum soils.

Some important minor soils of this association are those in the Beltsville and Matapeake series, as well as Mixed alluvial land along the Patapsco River and Loamy and clayey land that cannot be classified by soil series.

Very little of this association is used for farming; however, Sassafras and Chillum soils have a moderate to high available moisture capacity and under good management are suitable for general crops. Some areas are in native hardwoods, but most of this association is used for residential and industrial purposes.

The major soils have few limitations, other than slope, for further development. However, some of the minor soils are severely limited for development by slope, wetness, and an unstable, clayey substratum.

2. Loamy and clayey land-Muirkirk-Evesboro association

Nearly level to steep, well-drained, loamy and clayey soils and excessively drained, sandy soils

This association is largely in the northwestern part of the county and extends from Howard County and the Patuxent River eastward to the vicinity of Ridge Road, the Severn Run east of Odenton, and State Route 3 near Millersville. A small area is south and east of Glen Burnie and extends to the Patapsco River. This association occupies about 15 percent of the county. Loamy and clayey land, a miscellaneous land type, makes up 30 percent of this association (fig. 3); the Muirkirk soils, about 12 percent; and the Evesboro soils, about 12 percent. Some poorly drained soils of the flood plains and other minor soils make up the remaining 46 percent.

Loamy and clayey land is dominant on the landscape of this association. This land is underlain by unstable red and white clay. It is mostly deep and well drained, but moisture moves slowly through the underlying clayey material. Most of Loamy and clayey land is nearly level to strongly sloping, but some areas are steep. The Muirkirk soils have a thick loamy sand surface layer and a red clay subsoil. They are well drained and somewhat excessively drained; their sandy surface layer is very droughty and has a low content of plant nutrients. The Evesboro soils are loamy sand and sand throughout and are well drained to excessively drained.

The important minor soils of this association are those in the Bibb, Christiana, Elkton, Keyport, Rumford, and Sassafras series, as well as other poorly drained soils of the flood plain.

Only a small part of this association is used for farming, but fairly large areas are in mixed hardwoods and pines. The soils respond fairly well to good management, but large quantities of fertilizer are needed for growing general crops, and irrigation is needed on the more droughty soils if crops are to be grown economically.

The Fort Meade Military Reservation occupies a large area, and residential or industrial expansion has been extensive. Further development will require special attention to the unstable clay underlying most of the association.

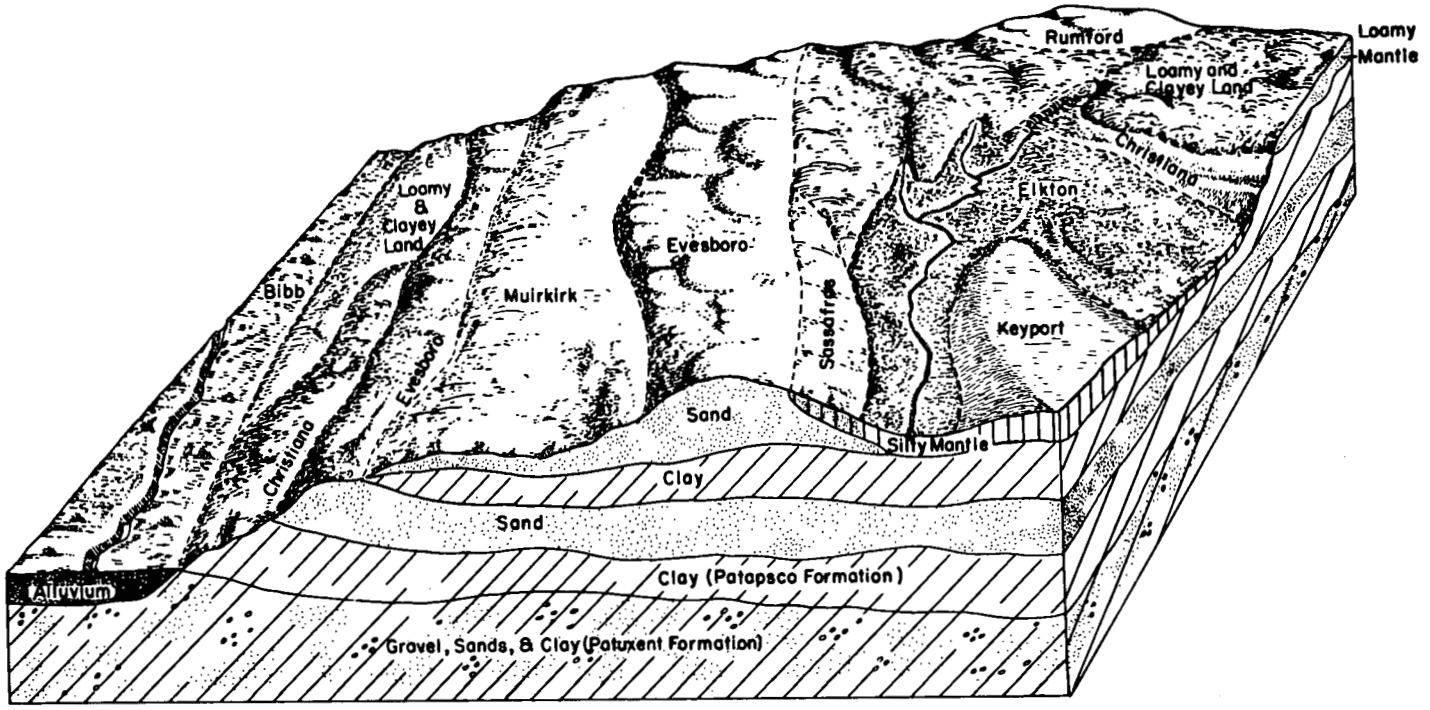

Figure 3.—Representative pattern of soils and parent material in soil association 2.

3. *Evesboro-Rumford-Sassafras association*

Gently sloping to moderately steep, excessively drained and well-drained, sandy and loamy soils

This association is in the northern part of the county adjoining the Chesapeake Bay and is roughly east of Ridge Road, south of Friendship International Airport and Furnace Creek, and north of Millersville, Crownsville, and the Magothy River. This association occupies about 21 percent of the county. The Evesboro soils make up about 50 percent of the association; the Rumford soils, about 20 percent; and the Sassafras soils, 10 percent. Minor soils make up the remaining 20 percent.

The Evesboro soils are mostly coarse, loose, droughty sands. These deep soils are underlain by a thick, slowly permeable, clayey layer in some places. The Rumford soils are deep and have a loose, thick loamy sand surface layer and a sandy loam subsoil. These soils are mostly gently sloping, but some areas are strongly sloping. The Sassafras soils are well drained. They have a fine sandy loam surface layer and a dominantly sandy clay loam subsoil. They formed in finer textured materials than the Evesboro soils and have more clay in their subsoil than the Rumford soils. Like the Rumford soils, Evesboro soils are mostly gently sloping but, in some places, are strongly sloping.

The most important minor soils of this association are those in the Muirkirk, Bibb, and Fallsington series. There are also some extensive areas of Loamy and clayey land that cannot be classified by soil series.

The major soils of this association are well suited to general truck crops. They are also suited to tobacco of good quality, but some irrigation is needed for tobacco on the Evesboro and Rumford soils.

The major soils of this association have few limitations, other than slope, for residential and community development. Some of the important minor soils have limitations for use as building sites or for septic systems because they have an unstable substratum, a slowly permeable subsoil, or a seasonal high water table.

4. *Monmouth-Collington association*

Nearly level to moderately steep, well-drained, sandy and loamy soils that developed in sediments containing glauconite

This association is in a single area in the central part of the county. It extends from within one mile of the Patuxent River eastward to the Chesapeake Bay. It is the largest soil association in the county and occupies about 30 percent of the total acreage. Monmouth soils make up about 34 percent of the association and Collington soils, about 25 percent. Minor soils make up the remaining 41 percent.

The dominant Monmouth soils have a sticky sandy clay loam to clay subsoil and contain large quantities of glauconite, or greensand. The Collington soils have a fine sandy loam surface layer and a sandy clay loam subsoil, and they are underlain by fine sandy loam and loamy fine sand. The Monmouth soils and the Collington soils are well drained. They occupy most of the higher elevations and are the more strongly sloping soils of the association.

Some of the minor soils in this association are the well drained Marr and Howell soils, the moderately well drained Adelphia and Donlonton soils, and the poorly drained Shrewsbury and Colemantown soils.

The soils of this association are among the most productive in Anne Arundel County. They are well suited

425-215—73——2

to hay, pasture, and orchards and to row crops if they are cultivated on the contour. Under good management, tobacco of high quality can be grown on most of the well-drained soils.

Some of the farmland in this association has been used for residential expansion. The well-drained soils have few limitations, other than slope, for residential development.

5. *Elkton-Othello-Mattapex association*

Level to sloping, poorly drained and moderately well drained, loamy soils

This association consists of two areas in the eastern part of the county. It is composed of a low, mainly nearly level, silty terrace adjacent to the Chesapeake Bay. The northern area is east of Annapolis, across the Severn River, in the vicinity of the Chesapeake Bay Bridge, and adjoins Mill and Whitehall Creeks. The southern part of the association is in the Deale-Shadyside area. This part is the larger of the two areas of this association and extends from the Rhode River at Cumberstone, east of State Route 468 and Tracys Creek, to Herring Bay on the Chesapeake Bay. This association occupies about 5 percent of the county. The Elkton soils make up about 50 percent of the total acreage; the Othello soils, about 20 percent; and the Mattapex soils, about 15 percent. Minor soils make up the remaining 15 percent.

The soils of this association formed in silty and clayey sediments that are underlain in places by very fine sandy material. In the northern part the dominant soils are the moderately well drained Mattapex soils, and in the larger southern part, the poorly drained Elkton soils (fig. 4). Elkton soils have a silt loam surface layer and a clay or silty clay subsoil that is slowly to very slowly permeable. Othello soils are poorly drained and have a silt loam surface layer and a silt loam and silty clay loam subsoil. The Mattapex soils have a silt loam surface layer and a silt loam to silty clay loam subsoil. In most places the soils are nearly level, but there are a few slopes up to about 5 percent.

The important minor soils in this association are the moderately well drained Keyport soils and the well drained Matapeake soils. There are also some extensive areas of the well-drained Sassafras soils.

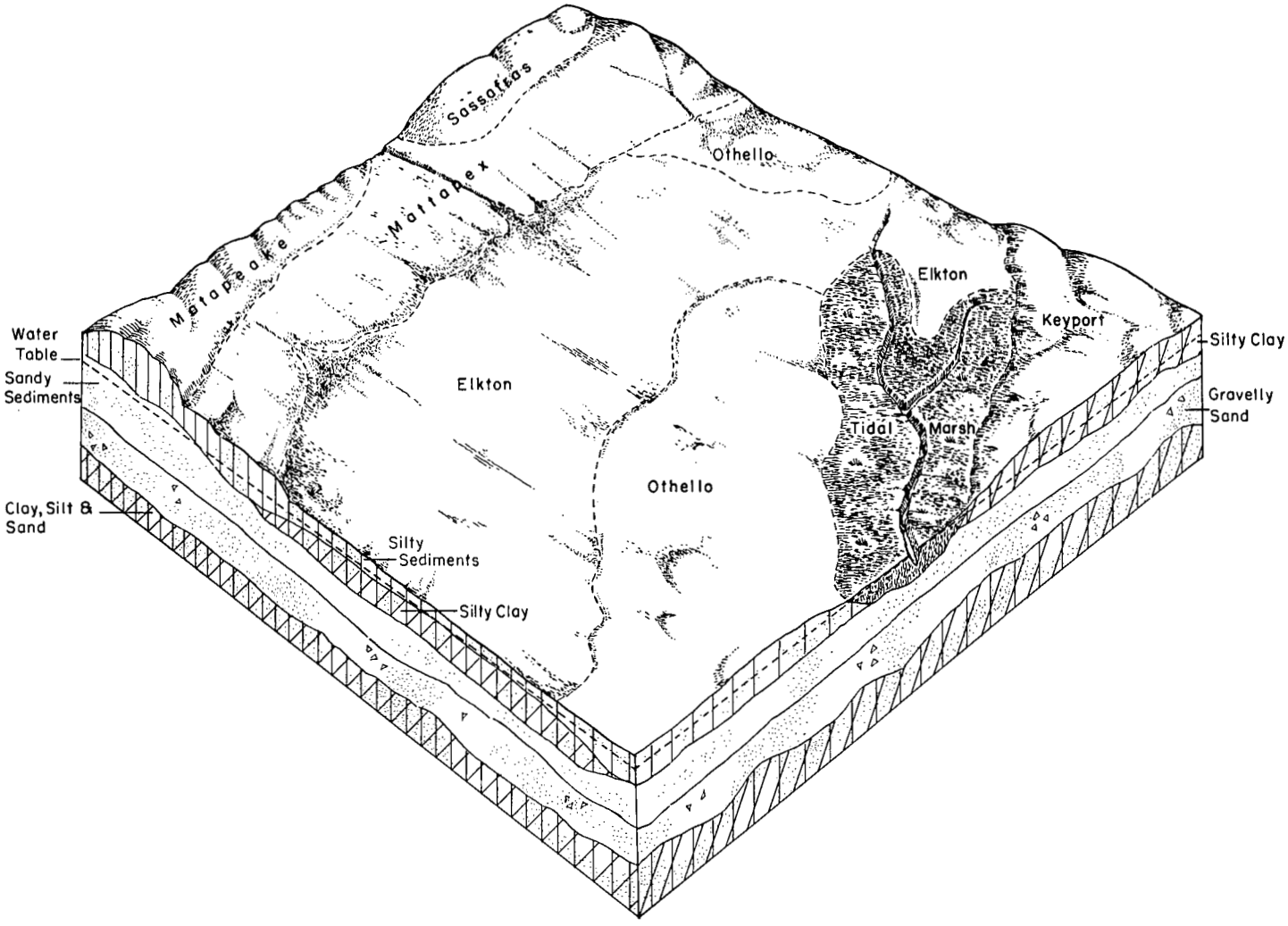

Figure 4.—**Representative pattern of soils and parent material in soil association 5.**

Some areas of this association are used for farming, but other fairly large areas are wooded. In places the trees are young, having reseeded naturally in idle fields. Some areas of the Elkton and Othello soils are used chiefly for hay and pasture, whereas the Mattapex soils are used for corn and, in some places, tobacco. The soils of this association respond well to good management, including fertilization. Some artificial drainage is required on most of the soils if they are to be cropped efficiently.

There is some residential and community development on the soils of this association; however, the use of major soils for building sites and sewage effluent disposal from septic tanks is limited by wetness. Some minor soils, such as those of the Matapeake and Sassafras series, have few limitations for development, except where limited by slope.

6. *Galestown-Evesboro-Rumford association*

Mostly nearly level and gently sloping, sandy soils

This association occupies a narrow strip along the Patuxent River in the southwestern part of the county. The northern boundary is near Priest Bridge, and the southern boundary is the county line at Lyons Creek. This association occupies about 4 percent of the county. The Galestown soils make up about 70 percent of the association; the Evesboro soils, about 10 percent; and the Rumford soils, about 10 percent. Minor soils, including some large areas of Bibb soils, make up the remaining 10 percent.

This association consists of very droughty soils that formed in thick beds of sandy material along the Patuxent River. The sandy Galestown soils are dominant. They are deep, somewhat excessively drained soils that are mostly nearly level or gently sloping. They are loamy sand throughout. The Evesboro soils are well drained to excessively drained and are loamy sand and sand throughout. The Evesboro soils in the southern part of this association have a deep, underlying clayey substratum that contains some glauconite, or greensand. The Rumford soils have a loamy sand surface layer and a sandy loam subsoil.

Some of the minor soils in this association are the poorly drained Bibb soils on the flood plain of the Patuxent River and the well-drained Matapeake and Sassafras soils.

The major soils of this association are suited to truck crops and tobacco of good quality, but irrigation is usually needed during the growing season. Most of the association is in forests of Virginia pine and scattered hardwoods.

Most areas of the well-drained soils of this association have few limitations, other than slope, for residential and community development.

7. *Marr-Westphalia-Sassafras association*

Gently sloping to steep, dominantly severely eroded, well-drained, loamy soils that contain much fine sand

This association is in the southern part of the county. It is roughly bordered on the west by Sands Road and on the east by the low, nearly level silt flats of the Deale-Shadyside area and the Chesapeake Bay. It extends southward from the Davidsonville-Birdsville area to the Calvert County line. This association is characterized by rounded knolls, gently sloping ridges, and strongly sloping irregular hillsides. The landscape has been dissected by many steep-walled, V-shaped valleys and drainageways. Erosion is severe except on some of the more gentle slopes. This association occupies about 20 percent of the county. The Marr soils make up about 30 percent of the total acreage; the Westphalia soils, about 25 percent; and the Sassafras soils, 10 percent. Minor soils make up the remaining 35 percent.

This association consists of soils of the uplands that formed mainly in fine sand that contains much silt and clay. This material is of Miocene age and contains local deposits of diatomaceous earth. The major soils of this association are deep and well drained. The Marr and Sassafras soils have a fine sandy loam surface layer and a dominantly sandy clay loam subsoil. The Westphalia soils have a fine sandy loam surface layer and subsoil. The Miocene sand in which the Marr and Westphalia soils formed is more uniform in grain size and is much finer than the sand in which the Sassafras soils formed.

Some important minor soils of this association are the well drained Howell soils, which have a slowly permeable, clayey subsoil; the moderately well drained Adelphia soils; and the poorly drained Shrewsbury soils.

The major soils of this association are well suited to tobacco. Crops respond well to good management, such as the use of fertilizers and lime, but intensive cropping in the past has caused severe erosion in many areas of the strongly sloping soils.

The major soils of this association are suitable for residential and community development, except where limited by slope.

Descriptions of the Soils

This section describes the soil series and mapping units of Anne Arundel County. The approximate acreage and the proportionate extent of each mapping unit are given in table 3.

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

Each series description contains a short description of a typical soil profile and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations.

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

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Adelphia sandy loam, 0 to 2 percent slopes	580	0.2	Donlonton fine sandy loam, 2 to 5 percent slopes, moderately eroded	1,390	.5
Adelphia sandy loam, 2 to 5 percent slopes	1,670	.6	Donlonton-Urban land complex, 0 to 5 percent slopes	340	.1
Adelphia silt loam, 0 to 2 percent slopes	220	(1)	Elkton sandy loam	530	.2
Adelphia silt loam, 2 to 5 percent slopes	250	(1)	Elkton silt loam	7,330	2.8
Beltsville silt loam, 2 to 5 percent slopes, moderately eroded	430	.2	Evesboro loamy sand, 0 to 6 percent slopes	21,045	7.9
Beltsville-Urban land complex, 0 to 5 percent slopes	430	.2	Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes	4,280	1.6
Bibb silt loam	11,000	4.1	Evesboro loamy sand, clayey substratum, 5 to 10 percent slopes	560	.2
Butlertown silt loam, 0 to 2 percent slopes	490	.2	Evesboro and Galestown loamy sands, 6 to 12 percent slopes	6,600	2.5
Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	2,200	.8	Evesboro and Galestown loamy sands, 12 to 40 percent slopes	4,710	1.8
Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	260	(1)	Evesboro-Urban land complex, 0 to 15 percent slopes	5,180	2.0
Butlertown silt loam, 5 to 10 percent slopes, severely eroded	350	.1	Fallsington sandy loam	1,870	.8
Butlertown silt loam, 10 to 15 percent slopes, severely eroded	200	(1)	Galestown loamy sand, 0 to 5 percent slopes	4,530	1.7
Chillum silt loam, 2 to 6 percent slopes, moderately eroded	320	.1	Gravel and borrow pits	1,760	.7
Chillum silt loam, 6 to 12 percent slopes, moderately eroded	330	.1	Hatboro silt loam	1,100	.4
Chillum-Urban land complex, 0 to 6 percent slopes	370	.1	Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded	480	.2
Christiana silt loam, 2 to 5 percent slopes, moderately eroded	1,350	.5	Howell fine sandy loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	120	(1)
Christiana silt loam, 5 to 10 percent slopes, moderately eroded	430	.2	Howell silt loam, 2 to 6 percent slopes, moderately eroded	290	.1
Christiana clay, 5 to 10 percent slopes, severely eroded	440	.2	Howell silt loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	280	.1
Coastal beaches	280	.1	Howell clay loam, 6 to 12 percent slopes, severely eroded	1,020	.4
Codorous silt loam	150	(1)	Howell clay loam, 12 to 20 percent slopes, severely eroded	800	.3
Colemantown sandy loam	1,390	.5	Howell clay loam, 20 to 40 percent slopes, severely eroded	470	.2
Colemantown silt loam	730	.3	Howell clay loam, shaly subsoil, 6 to 12 percent slopes, severely eroded	270	.1
Collington loamy sand, 2 to 5 percent slopes, moderately eroded	750	.3	Keyport sandy loam, 0 to 2 percent slopes	420	.2
Collington loamy sand, 5 to 10 percent slopes, moderately eroded	650	.2	Keyport sandy loam, 2 to 5 percent slopes	1,370	.5
Collington fine sandy loam, 0 to 2 percent slopes	390	.1	Keyport silt loam, 0 to 2 percent slopes	980	.4
Collington fine sandy loam, 2 to 5 percent slopes, moderately eroded	4,250	1.6	Keyport silt loam, 2 to 5 percent slopes, moderately eroded	1,390	.5
Collington fine sandy loam, 5 to 10 percent slopes, moderately eroded	1,630	.6	Keyport-Urban land complex, 0 to 5 percent slopes	350	.1
Collington fine sandy loam, 5 to 10 percent slopes, severely eroded	2,700	1.0	Klej loamy sand	650	.2
Collington fine sandy loam, 10 to 15 percent slopes, moderately eroded	960	.4	Loamy and clayey land, 0 to 5 percent slopes	5,830	2.0
Collington fine sandy loam, 10 to 15 percent slopes, severely eroded	1,600	.6	Loamy and clayey land, 5 to 10 percent slopes	4,300	1.6
Collington fine sandy loam, 15 to 40 percent slopes	5,400	2.0	Loamy and clayey land, 10 to 40 percent slopes	2,270	.9
Collington silt loam, 0 to 2 percent slopes	180	(1)	Made land	100	(1)
Collington silt loam, 2 to 5 percent slopes, moderately eroded	460	.2	Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded	7,750	2.9
Collington-Urban land complex, 0 to 5 percent slopes	640	.2	Marr fine sandy loam, 6 to 12 percent slopes, moderately eroded	1,120	.4
Collington-Urban land complex, 5 to 15 percent slopes	470	.2	Marr fine sandy loam, 6 to 12 percent slopes, severely eroded	7,800	3.0
Comus silt loam	110	(1)	Marr fine sandy loam, 12 to 20 percent slopes, moderately eroded	840	.3
Croom gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	700	.3	Marr fine sandy loam, 12 to 20 percent slopes, severely eroded	4,250	1.6
Croom gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	430	.2	Marr fine sandy loam, 20 to 35 percent slopes, severely eroded	1,090	.4
Croom gravelly sandy loam, 15 to 40 percent slopes	340	.1	Matapeake fine sandy loam, 0 to 2 percent slopes	100	(1)
Croom-Urban land complex, 5 to 15 percent slopes	360	.1	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	200	(1)
Cut and fill land, 0 to 5 percent slopes	4,500	1.7	Matapeake silt loam, 0 to 2 percent slopes	390	.2
Cut and fill land, 5 to 15 percent slopes	910	.3	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	830	.3
Cut and fill land, 15 to 30 percent slopes	250	(1)	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	400	.2
Donlonton fine sandy loam, 0 to 2 percent slopes	1,170	.4	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	230	(1)

See footnote at end of table.

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Matapeake silt loam, 10 to 15 percent slopes, severely eroded	230	(1)	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	1,540	0.6
Matawan loamy fine sand, 0 to 2 percent slopes	280	0.1	Rumford loamy sand, 5 to 10 percent slopes, severely eroded	1,420	.5
Matawan loamy fine sand, 2 to 5 percent slopes	420	.2	Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	490	.2
Mattapex fine sandy loam, 0 to 2 percent slopes	130	(1)	Rumford-Urban land complex, 0 to 5 percent slopes	1,350	.5
Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	220	(1)	Rumford-Urban land complex, 5 to 15 percent slopes	330	.1
Mattapex silt loam, 0 to 2 percent slopes	2,230	.9	Sassafras fine sandy loam, 0 to 2 percent slopes	1,220	.5
Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	1,740	.6	Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded	7,170	2.7
Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	420	.2	Sassafras fine sandy loam, 5 to 10 percent slopes, moderately eroded	920	.3
Mixed alluvial land	4,850	1.8	Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded	1,990	.8
Monmouth loamy sand, 0 to 2 percent slopes	340	.1	Sassafras fine sandy loam, 10 to 15 percent slopes, moderately eroded	460	.2
Monmouth loamy sand, 2 to 5 percent slopes, moderately eroded	4,520	1.7	Sassafras fine sandy loam, 10 to 15 percent slopes, severely eroded	1,590	.6
Monmouth loamy sand, 5 to 10 percent slopes, moderately eroded	990	.4	Sassafras fine sandy loam, 15 to 40 percent slopes	1,910	.7
Monmouth loamy sand, 5 to 10 percent slopes, severely eroded	950	.4	Sassafras loam, 0 to 2 percent slopes	240	(1)
Monmouth loamy sand, 10 to 15 percent slopes, moderately eroded	450	.2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	1,010	.4
Monmouth loamy sand, 10 to 15 percent slopes, severely eroded	570	.2	Sassafras-Urban land complex, 0 to 5 percent slopes	850	.3
Monmouth fine sandy loam, 0 to 2 percent slopes	460	.2	Sassafras-Urban land complex, 5 to 15 percent slopes	310	.1
Monmouth fine sandy loam, 2 to 5 percent slopes, moderately eroded	3,780	1.4	Shrewsbury fine sandy loam	1,310	.5
Monmouth fine sandy loam, 5 to 10 percent slopes, moderately eroded	870	.3	Shrewsbury silt loam	520	.2
Monmouth fine sandy loam, 10 to 15 percent slopes, moderately eroded	750	.3	Swamp	65	(1)
Monmouth fine sandy loam, 15 to 40 percent slopes	7,790	3.0	Tidal marsh	3,400	1.3
Monmouth clay loam, 5 to 10 percent slopes, severely eroded	2,340	.9	Urban land	690	.3
Monmouth clay loam, 10 to 15 percent slopes, severely eroded	1,040	.4	Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	1,820	.7
Monmouth-Urban land complex, 0 to 5 percent slopes	2,020	.8	Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	510	.2
Monmouth-Urban land complex, 5 to 15 percent slopes	830	.3	Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	3,210	1.2
Muirkirk loamy sand, 0 to 5 percent slopes	2,490	1.0	Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded	4,470	1.7
Muirkirk loamy sand, 5 to 10 percent slopes	880	.3	Westphalia fine sandy loam, 20 to 50 percent slopes, severely eroded	5,130	2.0
Muirkirk loamy sand, 10 to 15 percent slopes	410	.2	Woodstown sandy loam, 0 to 2 percent slopes	830	.3
Muirkirk loamy sand, 15 to 30 percent slopes	260	(1)	Woodstown sandy loam, 2 to 5 percent slopes	1,260	.5
Muirkirk-Urban land complex, 0 to 5 percent slopes	870	.3	Woodstown loam, 0 to 2 percent slopes	250	(1)
Muirkirk-Urban land complex, 5 to 15 percent slopes	280	.1	Woodstown loam, 2 to 5 percent slopes	250	(1)
Osier loamy sand	390	.1	Fort George G. Meade	2,640	1.0
Othello silt loam	4,040	1.5			
Rumford loamy sand, 0 to 2 percent slopes	1,050	.4	Total	266,880	100.0
Rumford loamy sand, 2 to 5 percent slopes, moderately eroded	8,500	3.1			

[1] Less than 0.1 percent.

In describing a soil profile, the letter symbols, for example, "A1" or "B2t," have a special meaning in soil science. Most readers need to remember only that the symbol "A" refers to the surface and subsurface layers, "B" refers to the subsoil, and "C" refers to the substratum, or parent material. It may be helpful to remember that the small letter "p" indicates a plowed layer, and that the small letter "t" indicates an accumulation of clay.

Soil scientists use Munsell notations to indicate a precise color, and they provide an equivalent term in words for those not familiar with the Munsell system; for example, "dark brown (10YR 3/3)."

Such terms as "fine sandy loam" are used to describe the texture of the soil; that is, the content of sand, silt, and clay. "Weak, fine, granular," for example, describes a kind of structure, or the way the individual soil particles are arranged in aggregates, and the amount of pore space between the aggregates and soil particles.

Consistence of the soil is described by such words as "hard, friable, plastic." In this description, the first word is for a dry soil, the second for a moist soil, and the third for a wet soil.

Many other terms used in the soil descriptions and other sections of the survey are defined in the Glossary and in the "Soil Survey Manual"(*8*).

Adelphia Series

The Adelphia series consists of deep, moderately well drained, gently sloping to nearly level soils on the Coastal Plain. These soils are on uplands. They formed in old deposits of sandy material that contains a moderate amount of silt and clay and a considerable amount of glauconite, or greensand. The native vegetation consists of mixed hardwoods.

In a typical profile the surface layer is olive-brown sandy loam about 9 inches thick. The subsoil, about 26 inches thick, has an upper 5-inch layer of mottled, olive, friable heavy sandy loam; a 7-inch layer of mottled, olive, friable to firm sandy clay loam; and a lower 14-inch layer of mottled, olive, friable to firm heavy sandy clay loam. The underlying material, to a depth of about 60 inches, is olive and olive-gray, friable sandy loam.

Adelphia soils are usually easy to work, but they are somewhat wet and warm up late in spring. Drainage is not difficult, but artificial drainage is needed in some nearly level areas. Tile drains or ditches can be used where there are adequate outlets. The available moisture capacity is moderate. Seasonal wetness is a limitation, particularly for building sites and septic tanks.

Typical profile of an Adelphia sandy loam (in a cultivated area at the end of Cumberstone Road in Cumberstone):

Ap—0 to 9 inches, olive-brown (2.5Y 4/4) sandy loam; very fine, granular structure; slightly hard, very friable; plentiful roots; medium acid; abrupt, smooth boundary.

B1—9 to 14 inches, olive (5Y 4/3) heavy sandy loam; few, fine and medium, faint mottles of olive gray (5Y 5/2) in lower part; weak, fine, subangular blocky structure; slightly hard, friable, nonplastic and nonsticky; common roots; very strongly acid; clear, wavy boundary.

B21t—14 to 21 inches, olive (5Y 4/4) sandy clay loam; few, medium, distinct mottles of olive gray (5Y 5/2); moderate, medium, subangular blocky structure; hard, friable to firm, slightly plastic and slightly sticky; few roots; few distinct but discontinuous clay films; very strongly acid; clear, wavy boundary.

B22t—21 to 35 inches, olive (5Y 4/4) heavy sandy clay loam; common, medium, distinct mottles of olive gray (5Y 5/2) and common prominent mottles of yellowish red (5YR 4/8); weak, moderate, subangular blocky structure; hard, friable to firm, sticky and slightly plastic; very few roots; few discontinuous clay films; very strongly acid; clear, smooth boundary.

C1—35 to 42 inches, olive (5Y 4/3) sandy loam; common, medium, prominent mottles of yellowish red (5YR 4/8); massive (structureless); friable, slightly sticky and slightly plastic; very strongly acid; gradual, wavy boundary.

C2—42 to 60 inches, olive-gray (5Y 4/2) sandy loam; many, coarse, prominent mottles of yellowish red (5YR 4/8); massive (structureless); friable; extremely acid.

The A horizon is sandy loam or silt loam. The Bt horizon is sandy clay loam, heavy sandy clay loam, or light clay loam; the clay content is between 18 and 35 percent. The C horizon ranges from loamy sand to heavy sandy loam. The solum ranges from about 30 to 45 inches in thickness.

In wooded areas there is a dark-gray or dark olive-gray A1 horizon up to 4 inches thick and a grayish-brown A2 horizon ranging from 6 to 8 inches in thickness. The B horizon is olive, olive brown, or light olive brown and grades toward yellowish brown. Mottles that range from strong brown to red in color occur most commonly in soils that have a high content of glauconite. The B22t horizon is at a depth ranging from 16 to 25 inches. It is generally deeper in profiles that have a coarser textured A horizon.

Among other moderately drained soils in the county, Adelphia soils differ from Beltsville and Butlertown soils in lacking a Bx horizon. They differ from Donlonton and Keyport soils in having a less clayey and more permeable Bt horizon. Adelphia soils are sandy, whereas Mattapex soils are silty.

Adelphia sandy loam, 0 to 2 percent slopes (AdA).—This soil has the profile described as typical for the series. Included with this soil in mapping are a few areas where the surface layer contains a considerable amount of fine sand and a few areas where it contains sticky material that was originally part of the subsoil.

Unless drained, this soil dries out slowly or drains slowly. Frequently, planting dates are delayed. The removal of seasonal excess water is the most serious management problem. Tile lines function well in this soil, but shallow ditches may also be used. There is little risk of erosion. If drained and well managed, this soil is good for most crops but is not generally used for tobacco. (Capability unit IIw–5; woodland group 2w3)

Adelphia sandy loam, 2 to 5 percent slopes (AdB).—This soil is better drained than Adelphia sandy loam, 0 to 2 percent slopes. Included with this soil in mapping are a few places where the soil is somewhat thinner than is typical, some areas where the surface layer contains much fine sand, and a few severely eroded areas.

Excess surface water is generally disposed of by natural surface runoff, but tile drains or other means are commonly needed for adequate subsoil drainage. (Capability unit IIe–36; woodland group 2w3)

Adelphia silt loam, 0 to 2 percent slopes (AsA).—When dry, the surface layer of this soil is soft and has a floury feel. Included with this soil in mapping are a few areas where the surface layer contains fine, gritty material.

This soil does not dry out so quickly as the Adelphia soils that have a sandy loam surface layer. It stays wet

long enough to delay planting. The water table is within a depth of 2 feet in spring. Some system of drainage such as tile lines or ditches is needed to remove excess water. There is little or no hazard of erosion. The quality of tobacco grown on this soil is not so good as that grown on soils that have a sandy loam surface layer. (Capability unit IIw–1; woodland group 2w3)

Adelphia silt loam, 2 to 5 percent slopes (AsB).—This soil has an erosion hazard and slow internal drainage. Its surface layer stays wet longer than that of the sandier Adelphia soils. Included with this soil in mapping are a few areas where the surface layer is somewhat gritty and some areas where the soil is somewhat thinner than is typical for the series.

The quality of tobacco grown on this soil is somewhat low compared with that grown on the more sandy Adelphia soils. (Capability unit IIe–16; woodland group 2w3)

Beltsville Series

The Beltsville series consists of moderately well drained, silty soils that have a grayish-brown surface layer, a yellowish-brown upper subsoil, and a very dense and brittle lower subsoil. These soils are level to gently sloping and are on uplands. They formed in a silty mantle over very old sandy and gravelly sediments. The native vegetation consists of mixed hardwoods that have been cleared or severely cut over. Poor quality hardwoods and Virginia pine are now the main trees that grow in forested areas.

In a typical profile the surface layer is grayish-brown silt loam about 10 inches thick. The subsoil, about 30 inches thick, has an upper 5-inch layer of yellowish-brown, friable heavy silt loam; an 11-inch layer of mottled, yellowish-brown, firm light silty clay loam; and a lower 14-inch layer of mottled, yellowish-brown, extremely firm silty clay loam. The underlying material, to a depth of about 60 inches, is very pale brown, very hard gravelly sandy loam.

The Beltsville soils are saturated by a perched water table part of the year.

Beltsville soils are fairly easy to work at the right moisture content, but they are usually too wet for cultivation early in spring and are late to warm up. Planting dates are generally delayed. The more nearly level areas may require some artificial drainage. Ditches or tile lines may be used, but tile lines will not drain the soil properly if placed in or below the hardpan. Beltsville soils have a moderate available moisture capacity. It is difficult for water and plant roots to penetrate the hardpan. These soils are moderately productive under good management, but they are limited for some uses by impeded drainage, a seasonal perched water table, slow permeability, slope, and erosion. The perched water table and slow movement of internal moisture particularly limit use of the soils for seasonal construction of buildings, and they severely limit the proper functioning of septic tanks.

Typical profile of Beltsville silt loam (in a nearly level field, about one-fourth mile northeast of Fort George Meade Junction):

Ap—0 to 10 inches, grayish-brown (2.5Y 5/2) silt loam; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; plentiful roots; very strongly acid; abrupt, smooth boundary.

B1—10 to 15 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common roots; very strongly acid; clear, smooth boundary.

B2t—15 to 26 inches, yellowish-brown (10YR 5/6) light silty clay loam; few, medium, faint mottles of light yellowish brown (10YR 6/4) in lower part; weak, thick, platy structure; hard, firm, sticky and slightly plastic; common roots; distinct clay films; very strongly acid; gradual, wavy boundary.

Bx—26 to 40 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium mottles of reddish yellow (7.5YR 6/8) and grayish brown (2.5Y 5/2); moderate, medium, platy structure; extremely hard, firm, slightly sticky and slightly plastic; very few, fine roots in upper part; pale-brown clay films; very strongly acid; clear, smooth boundary.

IIC—40 to 60 inches, very pale brown (10YR 7/4) gravelly sandy loam; light-gray (2.5Y 7/2) streaks; massive (structureless); very hard; very strongly acid.

The B2t horizon ranges from silt loam to silty clay loam. It has a clay content that ranges from 18 to 35 percent. The C horizon is coarser textured than the solum, and in most places it is sandy and gravelly. The solum ranges from about 40 inches to more than 50 inches in thickness.

In forested areas the A1 and A2 horizons are grayish brown. In most places the B2t horizon has a hue of 10YR, but the Bx horizon may have a hue of 2.5Y in places. The B1 and B2t horizons have a value ranging from 4 to 6 and a chroma ranging from 6 to 8. In places the lower part of the B2t horizon has some faint mottling with a low chroma, but the solum has little or no mottling above a depth of 18 to 22 inches. The Bx horizon has mottling with some reddish hue and a high chroma and yellow hues with a low chroma. The Bx horizon in places has mottling with a chroma of 2 or less. The IIC horizon is pale in color and may not have low-chroma mottling. It is variegated, streaked, or mottled. In places the IIC horizon is silt and clay or a mixture of sand, silt, clay, and gravel.

Among the moderately well drained soils in the county, only the Beltsville and Butlertown soils have a Bx horizon. In the Beltsville soils this dense layer is more strongly developed, more compact, and harder than that of the Butlertown soils. Beltsville soils have a lower silt content and a higher sand content in the B horizon than the Butlertown soils. In contrast to the Beltsville soils, the moderately well drained Mattapex soils and the poorly drained Othello soils formed in similar silty material but lack a Bx horizon.

Beltsville silt loam, 2 to 5 percent slopes, moderately eroded (BeB2).—This soil has the profile described as typical for the series. Included with this soil in mapping are a few areas that have a surface layer of fine sandy loam.

This soil has enough slope for water to run off readily. Consequently, erosion is more important in management for farming than the impeded drainage of the soil. (Capability unit IIe–13; woodland group 3w2)

Beltsville-Urban land complex, 0 to 5 percent slopes (BlB).—This complex consists of Beltsville soils and disturbed land that is mainly Beltsville soil material. These areas are used for community development. They occur in complex patterns and, although the individual soils can be recognized, mapping them separately is impractical. Beltsville soils that are similar to the soil described as typical for the series make up about 25 percent of each mapped area. Those Beltsville soils that have been disturbed or altered by man make up the remainder. Included with these soils in mapping are a few areas that have a sandy surface layer and a few areas that have a slope above 5 percent.

Beltsville soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the

original soil profile removed make up about 60 percent of each area. The surface layer of these severely disturbed areas is variable in texture and may be fine sandy loam, silt loam, or a mixture of sand, silt, and clay in any proportion. Land fills 18 inches or more in depth, or areas where most or all of the Beltsville soil profile has been cut away, make up about 15 percent of this mapping unit. The surface layer here is a mixture of sand, silt, and clay in various proportions, or it is a dense hardpan of silty and clayey materials. (Capability unit and woodland group not assigned)

Bibb Series

The Bibb series consists of poorly drained, silty soils that have a dark grayish-brown to light olive-brown silt loam surface layer and dark-gray or gray silt loam underlying material. These soils occur on flood plains along many of the major streams and drainageways in the county. They formed in recently deposited material that was washed from silty and sandy uplands. The native vegetation consists of maple, gum, oak, and other hardwoods that tolerate wetness.

In a typical profile the surface layer is dark grayish-brown silt loam about 9 inches thick and is mottled in the lower part. The underlying material, to a depth of about 50 inches, has an upper 18-inch layer of mottled, dark-gray, friable silt loam; a 9-inch layer of mottled, gray, friable loam; and a lower 14-inch layer of mottled, gray, firm silty clay.

The use of Bibb soils is limited by wetness most of the year and by frequent flooding. These soils are rarely used for farming, but some areas produce corn, hay, and pasture. Residential use is limited by flooding and poor drainage.

Typical profile of Bibb silt loam (one-half mile south of the intersection of State Route 450 and State Route 3, on the flood plain of the Patuxent River):

A11—0 to 3 inches; dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure; soft, very friable; abundant roots; very strongly acid; clear, smooth boundary.

A12—3 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; few, medium, distinct mottles of dark brown (7.5YR 4/2); weak, medium, subangular blocky and weak, fine, granular structure; soft, friable, slightly sticky; many roots; very strongly acid; clear, smooth boundary.

C1g—9 to 27 inches, dark-gray (5Y 4/1) silt loam; few, medium, distinct mottles of dark brown (7.5YR 4/2); weakly stratified; some evidence of blocky structure; slightly hard, friable, slightly sticky; few roots; very strongly acid; clear, smooth boundary.

C2g—27 to 36 inches, gray (5Y 6/1) loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); weakly stratified; some evidence of blocky structure; slightly hard, friable; very few roots; very strongly acid; abrupt, smooth boundary.

IIC3g—36 to 50 inches, gray (5Y 6/1) silty clay; common, medium, distinct mottles of brown or dark brown (7.5YR 4/4); structureless; hard, firm, sticky and plastic; some coarse sand and fine gravel; extremely acid.

The IIC horizon is silty clay, loose sand and gravel, or sandy and clayey materials.

In cultivated areas the A horizon of Bibb soils is generally grayish brown or light olive brown (2.5Y 5/2 or 2.5Y 5/4). The C1 and C2 horizons have a hue of 2.5Y or 5Y, a chroma of 2 or less, and a value ranging from 4 to 6. Mottles in the C1 and C2 horizons have a hue of 10YR or 7.5YR, a chroma ranging from 2 to 8, and a value ranging from 4 to 6. The IIC3 horizon varies in color and is gleyed.

The Bibb soils differ from Hatboro soils in lacking the micaceous material weathered from acid crystalline rock in which the Hatboro soils formed.

Bibb silt loam (Bm).—This soil generally is nearly level, but slopes are as much as 8 percent in some places. The surface layer has a floury feel when dry. Included with this soil in mapping are a few areas of soils that contain greensand, and some places where the surface layer contains enough sand to be gritty. Also included in mapping are a few areas that are moderately well drained, and some areas where the surface layer is fine sandy loam.

The only erosion hazard is along streambanks. Areas that are frequently flooded are used for pasture, woodland (fig. 5), wildlife habitat, or recreation. (Capability unit IIIw–7; woodland group 2w2)

Butlertown Series

The Butlertown series consists of moderately well drained, silty soils that have a yellowish-brown, sticky upper subsoil and a brittle, silty lower subsoil. These soils are level to moderately sloping and are on uplands. The native vegetation consists mainly of mixed upland hardwoods, but Virginia pine is common in some severely cutover areas.

In a typical profile the surface layer is silt loam about 12 inches thick. It is dark grayish brown in the upper part and light brownish gray in the lower part. The subsoil, about 30 inches thick, has an upper 8-inch layer of yellowish-brown, friable silt loam; a 13-inch layer of mottled, dark yellowish-brown, firm light silty clay loam; and a lower 9-inch layer of mottled, yellowish-brown, firm and brittle silt loam. The underlying material, to a depth of about 60 inches, is mottled, yellowish-brown, firm sandy loam.

Butlertown soils have a friable or crumbly plow layer that is easy to work at the right moisture content, but it tends to be somewhat wet in the spring and is a little late to warm up. Planting dates may be slightly delayed. Some artificial drainage may be needed, particularly in the most nearly level areas. Tile lines generally function well in the Butlertown soils. These soils have a high available moisture capacity and are moderately to highly productive under good management. They are limited for some uses by seasonal wetness, by impeded drainage, and by the hazard of erosion in sloping areas. The Butlertown soils are seasonally wet for building sites, and septic tanks will not function properly during wet periods.

Profile of a Butlertown silt loam (on Davidson Road, one-fourth mile south of St. Margarets Church):

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine, granular structure; soft, very friable, slightly sticky; many roots; strongly acid; abrupt, smooth boundary.

A2—2 to 12 inches, light brownish-gray (10YR 6/2) silt loam; weak, medium, crumb structure; slightly hard, friable, slightly sticky; many fine roots; strongly acid; abrupt, smooth boundary.

B1—12 to 20 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; strongly acid; abrupt, smooth boundary.

Figure 5.—**Flooded woodland. The soil is Bibb silt loam.**

B2t—20 to 33 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; few, fine, distinct mottles of gray (5Y 6/1); moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; very strongly acid; abrupt, clear boundary.

Bx—33 to 42 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, faint mottles of light brownish gray (10YR 6/2); moderate, thin, platy structure; hard, firm and brittle, slightly sticky and slightly plastic; very few roots; few, dark, yellowish-brown (10YR 4/4) clay films; very strongly acid; abrupt, smooth boundary.

C—42 to 60 inches, yellowish-brown (10YR 5/6) sandy loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); hard, firm, slightly sticky; massive (structureless) in places; very strongly acid.

The B2t horizon ranges from silt loam to light silty clay loam. The C horizon ranges from sandy loam to very fine sand and may have pockets of fine sand. Stratification is evident. The solum ranges from about 42 to 50 inches in thickness. The Bx horizon is at a depth ranging from 30 to 38 inches.

Hue is generally 10YR throughout the profile, but it is 7.5YR in the B horizon in some places. The A1 horizon is normally dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). The Ap and A2 horizons have a value ranging from 4 to 6 and a chroma ranging from 2 to 4. The B2t horizon has a value normally of 5 and a chroma ranging from 4 to 8. The Bx horizon has a matrix value normally of 5 and a chroma ranging from 3 to 6. Mottling in the Bx horizon has a chroma of 1 or 2. The C horizon is variegated in some places. The Bx horizon is weakly to moderately expressed. The A and B horizons in unlimed areas are strongly acid to very strongly acid, and acidity increases with depth.

The Butlertown soils are similar to the Beltsville soils, but their Bx horizon is not so hard, so dense, or so slowly permeable as that of the Beltsville soils. They formed in the same kind of silty material as the well drained Matapeake soils, the moderately well drained Mattapex soils, and the poorly drained Othello soils, but none of those soils has a hardpan.

Butlertown silt loam, 0 to 2 percent slopes (BuA).—This level or nearly level soil has the profile described as typical for the Butlertown series. Included with this soil in mapping are some areas that are moderately eroded and a few areas that are severely eroded.

Erosion is only a slight hazard on this soil under ordinary good management. However, the firm, brittle layer that is at a depth of about 30 inches limits the internal drainage of the soil. The water table is from 2 to 4 feet below the surface in the spring, and the soil may be wet enough to delay planting dates for a few days. Tile lines or ditches may be needed to remove excess water. (Capability unit IIw–1; woodland group 2o1)

Butlertown silt loam, 2 to 5 percent slopes, moderately eroded (BuB2).—Internal drainage is a limitation in this soil, and erosion is a hazard. The surface layer has a soft, floury feel when dry. Included with this soil in mapping are a few areas where the surface layer contains some fine sand. Also included are a few areas that are severely eroded and a few spots that are uneroded. (Capability unit IIe–16, woodland group 2o1)

Butlertown silt loam, 5 to 10 percent slopes, moderately eroded (BuC2).—This soil has limited internal drainage and has lost a large part of its original surface layer through erosion. The erosion hazard is the most important concern in management. Seepage areas or wet spots may need some tile drainage. Included with this soil in mapping are some areas that are only slightly eroded. (Capability unit IIIe–16; woodland group 2o1)

Butlertown silt loam, 5 to 10 percent slopes, severely eroded (BuC3).—This moderately sloping soil has retained little of its original surface layer, and plowing turns up sticky subsoil material. Seepage areas or wet spots need tile drainage. Included with this soil in mapping are some areas where gullies have formed. Also included are places where a hard, brittle layer is exposed at the surface, and a few areas that have a sandy surface layer. (Capability unit IVe–9; woodland group 2o1)

Butlertown silt loam, 10 to 15 percent slopes, severely eroded (BuD3).—This moderately steep soil has retained little of its original surface layer, and in many places a firm, brittle layer is exposed on the surface. Included with this soil in mapping are some areas that have a reddish-brown, gravelly subsoil and a few areas where the surface layer contains some gritty material. Also included are a few places that have some deep gullies, and other places that have numerous wet spots. A few acres that are only moderately eroded are included. (Capability unit VIe–2; woodland group 2r1)

Chillum Series

The Chillum series consists of well-drained, brown soils that are moderately deep to sand and gravel. These soils are gently sloping to moderately sloping in most areas and are on uplands of the Coastal Plain. They formed in a thin mantle of silty to somewhat sandy material underlain by older deposits of very hard sandy and gravelly material. The native vegetation is upland hardwoods, but Virginia pine is dominant in abandoned fields or in severely cutover areas.

In a typical profile the surface layer is silt loam about 7 inches thick. It is very dark grayish brown in the upper part and brown in the lower part. The subsoil, about 20 inches thick, is dark-brown, friable heavy silt loam in the upper part and strong-brown, friable to firm light silty clay loam in the lower part. The underlying material, to a depth of about 60 inches, is variegated light yellowish-brown, reddish-yellow, and brown gravelly sandy loam in the upper part and variegated pale-brown, brown, and reddish-yellow very gravelly sandy loam in the lower part.

The Chillum soils are suitable for most kinds of farming and for building sites. The hard substratum does not appreciably restrict drainage. The available moisture capacity is high.

Typical profile of a Chillum silt loam (in a wooded area one-half mile north of the interchange of the Baltimore Beltway and State Route 3 at Linthicum):

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable, slightly sticky; abundant roots; strongly acid; clear, smooth boundary.

A2—2 to 7 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable, slightly sticky; plentiful roots; very strongly acid; clear, smooth boundary.

B21t—7 to 16 inches, dark-brown (7.5YR 4/4) heavy silt loam; very weak, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; fairly common roots; common fine pores; few, faint clay films; very strongly acid; gradual, smooth boundary.

B22t—16 to 27 inches, strong-brown (7.5YR 5/8) light silty clay loam; moderate, fine to coarse, subangular blocky structure; hard, friable to firm, sticky and plastic; few roots; distinct continuous clay films; very strongly acid; abrupt, smooth boundary.

IIC1—27 to 36 inches, light yellowish-brown (10YR 6/4) gravelly sandy loam, variegated with reddish yellow and brown (7.5YR 6/6 and 10YR 5/3); massive (structureless); very firm and brittle when moist; about 20 percent, by volume, fine well-rounded gravel; very strongly acid; clear, smooth boundary.

IIC2—36 to 60 inches, pale-brown (10YR 6/3) very gravelly sandy loam, variegated with brown (10YR 5/3) and reddish yellow (7.5YR 6/6); massive (structureless); extremely hard, very firm and brittle; 50 percent, by volume, fine and medium well-rounded gravel; very strongly acid.

The B horizon has a clay content of 18 to 35 percent. The C horizon everywhere is coarser textured than the B horizon and generally is very gravelly. In uneroded areas the solum normally ranges from 30 to 40 inches in thickness, but the profile just described is a little thinner than normal for the series.

In cultivated areas the A horizon is brown to grayish brown. This horizon has a hue of 10YR, a value of 3 or 4, and a chroma ranging from 2 to 4. The B horizon has a hue of 7.5YR, a value of 4 or 5, and a chroma ranging from 4 to 8. The C horizon has a hue of 5YR, 7.5YR or 10YR, a value usually ranging from 4 to 6, and a chroma ranging from 3 to 6.

The Chillum soils have the same underlying gravelly sandy loam material as the moderately well drained Beltsville soils. In contrast to the Chillum soils, the well drained Matapeake soils, the moderately well drained Mattapex soils, and the poorly drained Othello soils are on thicker deposits of silty material underlain by looser, sandier material.

Chillum silt loam, 2 to 6 percent slopes, moderately eroded (CaB2).—This soil has the profile described as typical for the Chillum series. Included with this soil in mapping are a few scattered areas where erosion has been severe and some small areas where the surface layer contains much fine sand. Also included are areas that are only slightly eroded and a few areas that have sticky subsoil material mixed in the surface layer.

This soil has a limited root zone. It has a high available moisture capacity, but it can be droughty during long, dry periods. The hazard of erosion also limits use. (Capability unit IIs–7; woodland group 3o1)

Chillum silt loam, 6 to 12 percent slopes, moderately eroded (CaC2).—This soil is similar to Chillum silt loam, 2 to 6 percent slopes, moderately eroded, but is more sloping and thinner. The surface layer is a mixture of the original surface layer and some of the sticky subsoil material. Included with this soil in mapping are areas that are uneroded or only slightly eroded, and places that have most of the original surface layer eroded away. Also included are areas that have a thick, brittle,

hard layer in the subsoil, and places where the surface layer contains much fine sand.

Erosion is the most important hazard of management, but seasonal droughtiness and a restricted root zone also influence management, use, and crop growth. (Capability unit IIIe–7; woodland group 3o1)

Chillum-Urban land complex, 0 to 6 percent slopes (CbB).—This complex consists of areas of Chillum soils that occur in complex patterns and are now in rural-fringe developments. Although the individual soils can be recognized, the mapping of each soil separately is impractical.

The Chillum soils that are similar to those described for the series make up about 25 percent of each mapped area, and those Chillum soils that have been disturbed or altered by man make up the remainder.

The Chillum soils that are covered with up to 18 inches of soil materials or have had as much as two-thirds of the original soil profile removed make up about 50 percent of the acreage. Fills that are 18 inches or more in depth, or areas where most or all of the Chillum soil profile has been cut away, make up about 25 percent. (Capability unit and woodland group not assigned)

Christiana Series

The Christiana series consists of deep, well-drained soils that have a silt loam or clay surface layer and a clay subsoil. These soils are on the higher part of the uplands of the Coastal Plain. They are gently sloping or moderately sloping. They formed in thick beds of very old, red clay of Cretaceous age that is covered in places with a very thin mantle of silty material. The native vegetation is upland hardwoods, mainly oak, but in some places it is Virginia pine.

In a typical profile the surface layer is silt loam about 8 inches thick. It is very dark gray in the upper part and yellowish red in the lower part. The subsoil, about 58 inches thick, has an upper 4-inch layer of friable to firm, red silty clay; a 20-inch layer of firm, red clay; and a lower 34-inch layer of very firm, red clay. The underlying material, to a depth of about 120 inches, is very firm clay that is variegated red and pinkish gray.

Because of their location and distribution, the Christiana soils are becoming more important for community development than for farming. Christiana soils are very unstable, especially when wet or after they have been disturbed by leveling or grading. Special precautions should be taken when planning developments on Christiana soils, as building foundations have been known to settle and crack; roads to settle, buckle, and warp; and entrenchments and embankments to cave in or to collapse without warning.

Typical profile of a Christiana silt loam (in a wooded area on Brock Bridge Road, three-fourths of a mile south of its intersection with State Route 175 at Jessup):

A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; slightly hard, friable; abundant roots; very strongly acid; abrupt, smooth boundary.

A2—2 to 8 inches, yellowish-red (5YR 5/6) silt loam; weak, thin, platy structure and weak, fine, granular structure; slightly hard, friable; plentiful roots; very strongly acid to extremely acid; abrupt, smooth boundary.

B1—8 to 12 inches, red (2.5YR 5/8) silty clay; moderate, fine, blocky structure; hard, friable to firm, sticky and plastic; common roots; very strongly acid; gradual, smooth boundary.

B21t—12 to 32 inches, red (2.5YR 5/6) clay; strong, fine to coarse, blocky and subangular blocky structure; very hard, firm, sticky and plastic; few roots; distinct, continuous clay films; very strongly acid; diffuse boundary.

B22t—32 to 66 inches, red (2.5YR 4/6) clay; strong, fine to coarse, blocky structure; very hard, very firm, sticky and plastic; few roots in upper part; distinct, continuous clay films of red (10R 4/6) in upper part and of reddish brown (2.5YR 4/4) in lower part; some black (N 2/0) films below a depth of 34 inches; very strongly acid; diffuse boundary.

C—66 to 120 inches, red (2.5YR 4/6) clay; many, fine, prominent streaks and variegations of pinkish gray (7.5YR 7/2); massive (structureless), or weak, very coarse, blocky structure; very hard, very firm, sticky and plastic; few, black (N 2/0), patchy clay films; some broken faces are pinkish gray (5YR 7/2) or brown (7.5YR 4/4); thin clay films in cracks and on some ped faces; very strongly acid to extremely acid.

The A horizon normally is silt loam, but in severely eroded areas the Ap horizon is clay. The A horizon is brown or reddish brown in uneroded areas, but it is reddish brown, weak red, or red in severely eroded areas. The Bt horizon has a uniform color; the hue is generally 2.5YR but grades toward 10R, the value ranges from 3 to 5, and chroma ranges from 6 to 8. The C horizon is variable in color and in places grades to particolored red, yellow, brown, pink, and white clay.

The Christiana soils formed in material similar to that in which the moderately well drained Keyport soils and the poorly drained Elkton soils formed. The Christiana soils have a B2t horizon similar to that of the Muirkirk soils, which have a thick loamy sand A horizon.

Christiana silt loam, 2 to 5 percent slopes, moderately eroded (CcB2).—This soil has the profile described as typical for the Christiana series. Because slopes are gentle, the risk of erosion is moderate, but runoff is rapid because water moves through this soil slowly. Some included areas are uneroded, and a few are severely eroded. Also included in mapping are small areas where the surface layer contains fine sand, and a few areas that have some gravelly material in the surface layer.

This soil is difficult to work if the tools used penetrate for more than a few inches, especially if the upper part of the subsoil is dry and hard. If the soil is worked when wet, the surface layer and subsoil become compact and very hard as they dry. (Capability unit IIe–42; woodland group 3c1)

Christiana silt loam, 5 to 10 percent slopes, moderately eroded (CcC2).—The surface layer of this soil is dominantly silt loam. Included with this soil in mapping are areas where the surface layer contains an appreciable amount of fine sand. Also included are some areas that are uneroded or only slightly eroded, and a few areas that have some gravelly material in the profile.

Like Christiana silt loam, 2 to 5 percent slopes, moderately eroded, this soil is difficult to work. It has a more severe hazard of erosion than that soil because of its steeper slopes. (Capability unit IIIe–42; woodland group 3c1)

Christiana clay, 5 to 10 percent slopes, severely eroded (CdC3).—This soil has lost all or nearly all of its original surface layer through erosion. The present surface layer of clay is much redder than the original surface layer. Surface runoff is rapid and the hazard

of erosion is severe because water can penetrate the clay only slowly. Included with this soil in mapping are areas that have some fine sand in the surface layer and other areas that have a silty clay surface layer. (Capability unit IVe–3; woodland group 3c1)

Coastal Beaches

Coastal beaches (Ce) are areas of sandy beaches in Anne Arundel County along the shores of the Chesapeake Bay. Generally, these beaches are nearly level, but in areas where small dunes have formed, slopes range from 2 to 30 percent.

Coastal beaches show no soil development and support very little vegetation. In places a few scattered plants of American beachgrass or switchgrass are growing. Occasionally, some poorly developed Virginia pines are established. Beaches have no value for farming, but they provide important sites for recreation. (Capability unit VIIIs–2; woodland group not assigned)

Codorus Series

The Codorus series consists of moderately well drained soils that contain a considerable amount of fine mica in most places. These soils are nearly level to very gently sloping and are on flood plains adjacent to streams of the Piedmont. In some places they extend along the major streams into the Coastal Plain. The Codorus soils formed in recently deposited material that washed from soils derived from acid crystalline rocks of the Piedmont. The native vegetation is chiefly maple, gum, birch, water-tolerant oak, and other wetland hardwoods.

In a typical profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The underlying material, to a depth of about 60 inches, is friable silt loam. The upper 14 inches of this material is dark yellowish brown; the next 14 inches is mottled dark yellowish brown; and the lower 26 inches is mottled light brownish gray.

The Codorus soils have a seasonally high water table that is seldom much below a depth of 4 feet, even in long dry periods. In most places artificial drainage is not difficult, but flooding is likely. Codorus soils are of small extent in the county. They occur chiefly on the flood plains of the Patuxent River. These soils are suited to many crops if they are drained and protected from flooding. They are probably more useful for parks, wildlife habitat, playgrounds, and other recreational uses because they are mainly near the expanding residential areas of the county.

Typical profile of Codorus silt loam (on flood plain of the Patuxent River near the Patuxent Wildlife Research Center):

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable, slightly sticky; abundant roots; fine pores; few flakes of mica; strongly acid; clear, smooth boundary.

C1—6 to 20 inches, dark yellowish-brown (10YR 4/4) silt loam; massive (structureless); weakly stratified; friable, slightly sticky; plentiful roots; common, fine flakes of mica; strongly acid; clear, smooth boundary.

C2—20 to 34 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium, distinct mottles of grayish brown (2.5Y 5/2); massive (structureless); somewhat stratified; friable, slightly sticky and slightly plastic; few roots; common, fine flakes of mica; strongly acid; clear smooth boundary.

C3—34 to 60 inches, light brownish-gray (2.5Y 6/2) silt loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); stratified; friable, slightly sticky and very slightly plastic; abundant, fine flakes of mica; strongly acid.

In some places the C horizon is strong brown. The depth to mottling ranges from about 15 to 25 inches. In many places clayey or sandy material that contains much waterworn gravel underlies these soils at a depth of 4 feet or more. The Codorus soils in Anne Arundel County are outside the defined range for the series by lacking a B horizon that has weak subangular blocky structure that is normally in the Codorus soils elsewhere, but this difference does not alter their usefulness or behavior.

The Codorus soils formed in the same general kinds of material as the well-drained Comus soils and the poorly drained Hatboro soils.

Codorus silt loam (Ch).—The surface layer of this nearly level soil has a floury feel when it is dry, but it is slightly sticky when wet. This soil is limited in use by impeded drainage and local floods. Drainage is improved by using open ditches or tile. (Capability unit IIw–7; woodland group 1w1)

Colemantown Series

The Colemantown series consists of poorly drained soils that have a sandy loam or silt loam surface layer. These soils have an olive-gray to greenish-colored, dominantly clayey subsoil through which water moves slowly. They formed in sandy clay material that contains a considerable amount of greensand (glauconite). The native vegetation on these nearly level soils is hardwoods that tolerate wetness.

In a typical profile the surface layer is dark grayish-brown sandy loam about 5 inches thick. The subsoil is mottled, olive gray, and about 27 inches thick. It is friable sandy clay loam in the upper part and firm heavy sandy clay to clay in the lower part. The underlying material, to a depth of about 60 inches, is friable, mottled, dark greenish-gray heavy sandy clay loam.

Colemantown soils are difficult to work unless the moisture content is right. They are always late for spring planting. Drainage is needed to lower the water table in the spring and to drain off any excess water during wet periods. Drainage may be difficult because water moves so slowly through the clayey subsoil. Ditches are more satisfactory than tile lines, and they must be closely spaced. Colemantown soils, when adequately drained, are suitable for corn, soybeans, and some hay and pasture plants. They have a high available moisture capacity and are moderately productive under very good management. They are generally limited in use by poor natural drainage, a high water table, and the difficulty of artificial drainage. Their use for building sites and septic tanks is severely limited because of the high water table and seasonal wetness.

Typical profile of Colemantown sandy loam (in a recently cleared area 50 feet south of State Route 214 at Mayo):

A11—0 to 1 inch, dark grayish-brown (2.5Y 4/2) sandy loam; weak, fine, granular structure; loose; many fine roots; very strongly acid; abrupt, smooth boundary.

A12—1 to 5 inches, dark grayish-brown (2.5Y 4/2) sandy loam; weak, fine, granular structure; soft, friable; many fine roots; very strongly acid; abrupt, smooth boundary.

B1—5 to 9 inches, olive-gray (5Y 5/2) sandy clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6); weak, fine to medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common roots; very strongly acid; gradual, smooth boundary.

B2tg—9 to 32 inches, olive-gray (5Y 5/2) heavy sandy clay to clay; common, fine and medium, prominent mottles of dark red (2.5YR 3/6) and reddish yellow (5YR 7/8); strong, medium, blocky structure; very hard, firm, very sticky and very plastic; few roots; clay films of olive (5Y 4/4); many grains of dark greenish-black glauconitic particles; very strongly acid; gradual, smooth boundary.

Cg—32 to 60 inches, dark greenish-gray (5GY 4/1) heavy sandy clay loam; common, coarse, prominent mottles of reddish yellow (5YR 7/8) to dark red (2.5YR 3/6); massive (structureless) in place; layers of stratified loam or fine sandy loam; soft, friable, sticky and plastic; many greenish-black grains of glauconite; extremely acid.

The A horizon is sandy loam or silt loam. The B2 horizon is clay, sandy clay, or silty clay. The C horizon ranges from loam to clay.

The A1 horizon has a hue of 10YR or 2.5Y, a value generally of 4, and a chroma of 1 or 2; the value may be as low as 2 or 3 where the A11 horizon is very thin. The B1 and B2 horizons have a matrix hue that ranges from 2.5Y to 5GY or, in some places, 5G as the amount of glauconite increases. The B1 and B2 horizons have a matrix value ranging from 3 to 5 and a chroma ranging from 2 to 4. Mottling in the B1 and B2 horizons has a hue ranging from 2.5Y to 5Y, a value ranging from 3 to 7, and a chroma mainly of 6 or 8, but there may be low-chroma mottling. The C horizon has colors in the same range as the B horizons.

The solum ranges from about 28 to 40 inches in thickness. The glauconite content ranges from about 20 to 70 percent, and everywhere increases with increasing depth from the surface.

The Colemantown soils formed in the same general kind of material as the well drained Monmouth soils and the moderately well drained Donlonton soils. The Colemantown soils are similar to the Shrewsbury soils, but they contain more clay in their B2t horizon. They are less dense than Elkton soils, which are gray in color and do not contain glauconite.

Colemantown sandy loam (Ck).—This soil has the profile described as typical for the Colemantown series. The surface layer contains much medium and coarse sand. Included with this soil in mapping are some areas where the surface layer contains mostly fine sand. Also included are some areas that have a surface layer that contains some of the sticky subsoil material, and some areas where the soil has been severely disturbed for urban use. Most of this soil is nearly level, but some areas have slopes of as much as 5 percent. (Capability unit IIIw–6; woodland group 2w4)

Colemantown silt loam (Cm).—The surface layer of this poorly drained soil has a soft and floury feel when dry and is slightly sticky when wet. A high water table makes this nearly level soil wet from late in fall through spring. Included with this soil in mapping are a few areas where there is some fine sand in the surface layer. Also included are a few areas that have a very dark surface layer, and some places where the slopes are nearly 5 percent.

Wetness is the most serious limitation in managing this soil. This soil is more difficult to drain or to work than Colemantown sandy loam. (Capability unit IIIw–7; woodland group 2w4)

Collington Series

The Collington series consists of deep, well-drained, dominantly brown soils of the uplands. The surface layer of the Collington soils is silt loam, fine sandy loam, or loamy sand; the subsoil is sandy clay loam. These soils formed in unconsolidated sandy sediments of the Coastal Plain that contain a moderate amount of greensand (glauconite). The native vegetation is primarily mixed hardwoods, mainly oaks, but there are many stands of Virginia pine.

In a typical profile the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, about 24 inches thick, has an upper 7-inch layer of dark yellowish-brown, friable sandy clay loam; a 10-inch layer of dark yellowish-brown, friable heavy sandy clay loam; and a lower 7-inch layer of yellowish-brown, friable sandy clay loam. The underlying material, to a depth of about 50 inches, is light olive-brown heavy fine sandy loam grading to fine sandy loam in its lower part.

Collington soils are fairly easy to work, and they warm up readily in spring. They have a high available moisture capacity and are highly productive under good management. They are suited to practically all uses, except where they may be limited by slope and the erosion hazard. A wide variety of crops is grown on them. They are well suited to tobacco. Collington soils make good building sites and have few limitations for sewage disposal by septic tanks, except where limited by slope.

Typical profile of a Collington fine sandy loam (in a cultivated area, one-half mile south of the intersection of Johns Hopkins Road and Underwood Road, one-fourth mile east of Underwood Road):

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam; few black grains of glauconite; weak, fine, granular structure; very friable; many fine roots; slightly acid; abrupt, smooth boundary.

B21t—8 to 15 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; few, fine, distinct, black grains of glauconite; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; few medium and fine pores; few, thin, continuous clay films; medium acid; gradual, wavy boundary.

B22t—15 to 25 inches, dark yellowish-brown (10YR 4/4) heavy sandy clay loam; many, fine, distinct, black grains of glauconite; moderate, coarse, subangular blocky structure; friable, sticky and slightly plastic; few roots; many medium and few fine pores; continuous clay films; strongly acid; gradual, wavy boundary.

B3—25 to 32 inches, yellowish-brown (10YR 5/6) sandy clay loam; many, distinct, fine, black grains of glauconite; weak, coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; thin, discontinuous clay films; strongly acid; diffuse, wavy boundary.

C1—32 to 42 inches, light olive-brown (2.5Y 5/6) heavy fine sandy loam; many, fine, black grains of glauconite; very weak, coarse, subangular blocky structure; friable, slightly sticky and nonplastic; strongly acid; clear, wavy boundary.

C2—42 to 50 inches, light olive-brown (2.5Y 5/6) fine sandy loam stratified with loamy fine sand; many, fine, black grains of glauconite; very friable; strongly acid.

The A horizon is generally fine sandy loam, but there are areas of loamy sand and silt loam. The B21t and B22t horizons are generally heavy sandy clay loam, but in some places they are clay loam that has a clay content ranging from 18 to 35 percent. The B3 horizon is transitional to the C horizon and may be heavy fine sandy loam.

The A horizon is normally 10YR in hue and has a value ranging from 3 to 4 and a chroma ranging from 2 to 3. The B2t horizon has a hue of 7.5YR or 10YR, a value ranging from 4 to 5, and a chroma ranging from 3 to 4. The C horizon is more variable in color than the A and B horizons, but everywhere it includes some dark colors of glauconite.

The Collington soils are similar to the well-drained Sassafras and Matapeake soils. Collington and Sassafras soils are generally of similarly textured materials, but Sassafras soils lack the glauconitic materials of the Collington soils. Unlike Collington soils, the Matapeake soils contain much silt in their B horizon. Collington soils formed in the same kind of materials as the well-drained Monmouth soils, which have more clay in the B horizon, the moderately well drained Adelphia soils, and the poorly drained Shrewsbury soils.

Collington loamy sand, 2 to 5 percent slopes, moderately eroded (CnB2).—The surface layer of this soil is thicker than that of the profile described as typical for the series. In some places the surface layer is 20 inches thick or more. Included with this soil in mapping are some areas that are uneroded or only slightly eroded. Also included are a few severely eroded areas that have shallow gullies in some places, and some areas that are nearly level.

This soil is well suited to tobacco and some other crops because it is easily worked and warms quickly in spring. Its capacity to hold moisture, however, is lower than that of Collington fine sandy loam, 2 to 5 percent slopes, moderately eroded. Sandiness is a limitation in general farming. The hazard of erosion is slight. (Capability unit IIs–4; woodland group 2o2)

Collington loamy sand, 5 to 10 percent slopes, moderately eroded (CnC2).—This soil has a loamy sand surface layer and is sloping; the erosion hazard is severe. Included with this soil in mapping are some severely eroded areas where the sandy surface layer is mixed with brown subsoil material. Also included are a few places that are only slightly eroded.

This soil requires management to conserve moisture and to control erosion. This soil is well suited to tobacco and some other crops. It produces tobacco of high quality, is easily worked, and warms up quickly in spring. (Capability unit IIIe–33; woodland group 2o2)

Collington fine sandy loam, 0 to 2 percent slopes (CoA).—This soil has the profile described as typical for the series. Included with this soil in mapping are places where the surface layer contains some coarse sand. Also included are a few areas that are moderately eroded.

This soil is well suited to general crops and to deep-rooted crops. It is among the best soils in Maryland for tobacco, especially high-quality tobacco. This soil is easy to work, has a high available moisture capacity, and is highly productive under good management. Erosion and excess water are not hazards. (Capability unit I–5; woodland group 2o2)

Collington fine sandy loam, 2 to 5 percent slopes, moderately eroded (CoB2).—This is one of the most important well-drained soils of the uplands in the county. The risk of erosion is moderate. In some places this soil is shallower to the underlying sandy material than that described as typical for the series. Included with this soil in mapping are areas where the surface layer contains some sticky subsoil material. Also included are areas that are uneroded or only slightly eroded, a few areas where gullies have formed, and a few areas where the surface layer contains some coarse sand.

The soil is well suited to most general crops and to deep-rooted crops. If it is properly managed, it is well suited to truck crops, corn, small grain, hay, and pasture. It is suited to tobacco. The available moisture capacity is high. Conservation measures are needed to protect this soil from erosion. (Capability unit IIe–5; woodland group 2o2)

Collington fine sandy loam, 5 to 10 percent slopes, moderately eroded (CoC2).—This soil is moderately sloping and, therefore, susceptible to serious damage by erosion. In some places the surface layer contains some of the subsoil material. Included with this soil in mapping are some areas that have a surface layer that contains a considerable amount of silt, and other areas that have a surface layer with some medium and coarse sand. In places there are a few seepage areas or wet spots.

The use of this soil for farming is limited, but in some well-managed areas, tobacco of high quality is produced. This soil has a high available moisture capacity. Conservation measures are needed to control erosion. (Capability unit IIIe–5; woodland group 2o2)

Collington fine sandy loam, 5 to 10 percent slopes, severely eroded (CoC3).—This soil is so severely eroded that the present surface layer consists mostly of brown, sticky material from the subsoil. Gullies, some of them fairly deep, have formed in places. Included with this soil in mapping are areas where the surface layer contains some coarse sand and some areas that have many seepage areas or wet spots.

The use of this soil for cultivated crops is marginal, but hay and pasture plants can be grown safely. Protection from erosion is the most important concern in management; however, seepage areas can be improved by using tile lines. (Capability unit IVe–5; woodland group 2o2)

Collington fine sandy loam, 10 to 15 percent slopes, moderately eroded (CoD2).—This moderately steep soil is readily eroded if it is cultivated and if conservation measures are not adequate. Included with this soil in mapping are a few areas that are only slightly eroded. Also included are areas where the surface layer is silty or very sandy.

This soil can be used for a cultivated crop if the crop is grown only occasionally in a long rotation. Hay or pasture is a less intensive use. (Capability unit IVe–5; woodland group 2o2)

Collington fine sandy loam, 10 to 15 percent slopes, severely eroded (CoD3).—This soil has a profile that is thinner than the one described as typical for the series, because most of the original surface layer has been lost through erosion that occurred during many years of continuous cultivation. The present surface layer is a mixture of the original surface layer and brown, sticky subsoil material. Gullies, some of them deep, have formed in places. Included with this soil in mapping are a few wet seepage areas.

Sod or other protective plants should be used to protect this soil, for it is not suitable for cultivated crops. If management is good, a safe use is hay or pasture. (Capability unit VIe–2; woodland group 2o2)

Collington fine sandy loam, 15 to 40 percent slopes (CoE).—This is a steep soil. In a few areas the original surface layer has been eroded away, and there are a few places where gullies, some of them deep, have formed. Included with this soil in mapping are a few areas where the surface layer is slightly sandier or siltier than is normal.

Most areas of this soil are wooded and should remain so. The cleared areas can be managed for limited grazing or forage, or they can be planted in trees. (Capability unit VIe–2; woodland group 2r2)

Collington silt loam, 0 to 2 percent slopes (CpA).—The surface layer of this nearly level soil generally has a soft and floury feel, but in places it contains some gritty material. Included with this soil in mapping are a few areas that are moderately eroded.

This soil is well suited to general crops and to deep-rooted crops. Tobacco grows well on this soil, but it is not of as high a quality as that produced on Collington loamy sand, 2 to 5 percent slopes, moderately eroded. This soil has a high available moisture capacity. (Capability unit I–4; woodland group 2o2)

Collington silt loam, 2 to 5 percent slopes, moderately eroded (CpB2).—Erosion is a moderate hazard on this gently sloping soil. The surface layer is silt loam and has a soft or floury feel, but in some places it contains gritty material. Included with this soil in mapping are some areas that are only slightly eroded, and a few areas that are severely eroded.

This deep soil is well suited to most general crops, and tobacco grows well. The quality of tobacco is not as good as that produced on Collington loamy sand, 2 to 5 percent slopes, moderately eroded soil. The available moisture capacity is high. Some conservation measures are needed to protect this soil from further erosion. (Capability unit IIe–4; woodland group 2o2)

Collington-Urban land complex, 0 to 5 percent slopes (CpuB).—This complex consists of nearly level to gently sloping Collington soils and disturbed land that is mainly of Collington soil material. These areas are used for community developments. The soils have been rearranged into complex patterns. Although the individual soils can be recognized, mapping them separately is impractical. Undisturbed Collington soils make up 25 percent of each mapped area. Collington soils that have been severely disturbed or altered by machines make up the remainder.

Collington soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the original soil profile removed make up about 50 percent of the acreage. The surface layer of these areas has variable texture and may be fine sandy loam, silt loam, or a mixture of sand, silt, and clay in any proportion. Land fills 18 inches or more in depth, or places where most or all of the Collington soil has been cut away, make up about 25 percent of this mapping unit. The surface layer in these areas is a mixture of sand, silt, and clay in various proportions, or it is loose, yellowish sandy material that contains some greensand, or glauconite. (Capability unit and woodland group not assigned)

Collington-Urban land complex, 5 to 15 percent slopes (CpuD).—Except for being steeper and having a severe erosion hazard, this complex is similar to the Collington-Urban land complex, 0 to 5 percent slopes. The Collington soils in this complex have been graded, terraced, and generally rearranged for community developments. Buildings, streets, and sidewalks occupy from 15 to 40 percent of the complex. Collington soils that have been slightly to severely eroded make up about 10 percent of each mapped area, and those Collington soils that have been disturbed or altered by machines make up the remainder. Collington soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the soil profile removed make up about 60 percent of the acreage. Land fills 18 inches or more in depth, or places where Collington soil profile has been cut away, make up about 30 percent of this unit. The surface layer of these disturbed Collington soils may be a mixture of sand, silt, and clay in any proportion. In places this sandy material contains greensand, or glauconite. (Capability unit and woodland group not assigned)

Comus Series

The Comus series consists of well-drained soils that are deep or moderately deep to sand and gravel. These soils are nearly level and are on flood plains. They formed in very recent alluvium that was washed originally from areas of soils developed in the Piedmont. These flood-plain areas of Comus soils extend from within the Piedmont well into the Coastal Plain in places. The alluvium consists of materials from acid crystalline rock and contains a considerable amount of finely divided mica. Most areas of Comus soils are wooded. The native vegetation is hardwoods.

In a typical profile the surface layer is silt loam about 6 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material, to a depth of about 60 inches, is brown. It is very friable micaceous loam in the upper part and stratified gravelly sandy loam in the lower part.

Comus soils are well drained; the water table is generally 4 feet or more below the surface. However, flooding is a hazard when streams are high. Water moves moderately well through the Comus soils. These soils have a high available moisture capacity and are moderately to highly productive under good management. They are suited to nearly all crops and other uses, except as limited by the hazard of flooding. This hazard may limit the location of permanent buildings. Septic tanks will not function properly and may pollute considerable areas when the soil is flooded. Comus soils are suitable sites for parks and other recreational areas. They are well suited to trees and are excellent as habitat for some kinds of wildlife.

Typical profile of Comus silt loam (on the wooded flood plain of the Patuxent River, one-fourth mile southeast of the Baltimore-Washington Parkway):

A11—0 to 1 inch, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable, slightly sticky; plentiful roots; some fine mica; very strongly acid; clear, smooth boundary.

A12—1 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, crumb structure; friable, slightly plastic and slightly sticky; plentiful roots; some fine mica; many old root channels; very strongly acid; abrupt, smooth boundary.

C1—6 to 30 inches, brown (7.5YR 4/4) micaceous loam; stratified; very friable, slightly sticky; common roots in upper part, few below; mica content in-

creases rapidly with depth; very strongly acid; abrupt, smooth boundary.

IIC2—30 to 60 inches, brown (7.5YR 4/4) gravelly sandy loam; stratified; slightly sticky; abundant, medium and coarse mica flakes; very strongly acid.

The IIC2 horizon is generally stratified sand and gravel, but it may be mixed red and gray, gravelly, clayey material. The Comus soils in Anne Arundel County are outside of the defined range for the series by lacking a B horizon with weak, subangular blocky structure that is normally in the Comus soils elsewhere, but this difference does not alter their usefulness or behavior.

The Comus soils formed in the same general kind of materials as the moderately well drained Codorus soils and the poorly drained Hatboro soils.

Comus silt loam (Cr).—This nearly level soil is on the flood plains of the Patuxent and Little Patuxent Rivers. In some places thin lenses of sandy or gritty materials have been deposited throughout the surface layer.

This soil has good natural fertility and high available moisture capacity. It is suited to a wide range of crops, but planting dates may be delayed in the spring because of flooding. (Capability unit I–6; woodland group 1o2)

Croom Series

The Croom series consists of well-drained gravelly soils that have a yellowish-brown subsoil. These soils are sloping to steep and have a shallow to moderately deep root zone because of a very gravelly, very hard, firm layer. They formed in old deposits of sandy and clayey gravel. The native vegetation is scrub hardwoods, but Virginia pine is dominant in severely cutover areas and abandoned fields.

In a typical profile the surface layer, about 10 inches thick, has an upper 1-inch layer of very dark grayish-brown gravelly sandy loam; a 5-inch layer of grayish-brown gravelly sandy loam; and a lower 4-inch layer of yellow, very friable gravelly sandy loam. The subsoil, about 26 inches thick, is yellowish-brown, very firm very gravelly sandy clay loam in the upper 10 inches and is variegated yellowish-brown, strong-brown, and yellowish-red, very firm very gravelly sand and loamy sand in the lower 16 inches. The underlying material, to a depth of about 60 inches, is stratified, yellowish-brown and light brownish-gray, loose to somewhat firm sandy gravel and gravelly sand.

Croom soils have a very gravelly surface layer. They have moderately slow permeability and have a low available moisture capacity. The compacted subsoil limits the depth of root penetration of most plants. Croom soils are suited to tobacco and general crops. These soils make good building sites unless they are limited for this use by slope and erosion.

Typical profile of a Croom gravelly sandy loam (in wooded area 500 feet east of Ridge Road, one-fourth mile south of Deep Creek):

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) gravelly sandy loam; weak, fine, granular structure; loose; approximately 50 percent well-rounded quartz gravel; strongly acid; gradual, smooth boundary.

A21—1 to 6 inches, grayish-brown (2.5Y 5/2) gravelly sandy loam; weak, fine, granular structure; friable; plentiful roots; approximately 50 percent well-rounded quartz gravel; strongly acid; clear, smooth boundary.

A22—6 to 10 inches, yellow (2.5Y 7/6) gravelly sandy loam; very weak, fine, granular structure; very friable; common roots; approximately 50 percent well-rounded quartz gravel; strongly acid; abrupt, smooth boundary.

B2t—10 to 20 inches, yellowish-brown (10YR 5/6) very gravelly sandy clay loam; massive (structureless); extremely hard, very firm, sticky and plastic; a few roots in upper part but none below a depth of 16 inches; prominent, strong-brown (7.5YR 5/8) clay films on gravel; approximately 50 percent well-rounded quartz gravel; strongly acid; clear, wavy boundary.

B3—20 to 36 inches, variegated yellowish-brown (10YR 5/4), strong-brown (7.5YR 5/8), and yellowish-red (5YR 5/8) very gravelly sand and loamy sand; massive (structureless); very hard, very firm, slightly sticky and slightly plastic; some gravel in upper part has clay films of strong brown (7.5YR 5/8); 80 to 90 percent well-rounded quartz gravel; strongly acid; diffuse, wavy boundary.

C—36 to 60 inches, stratified, yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) sandy gravel and gravelly sand; loose to somewhat firm in places; 80 to 90 percent well-rounded quartz gravel; very strongly acid.

The B2t horizon has a clay content that ranges from 20 to 35 percent and a gravel content that ranges from 50 to 75 percent. The B3 horizon is very gravelly sand, loamy sand, or sandy gravel, and contains a small amount of clay. The B3 horizon has very little silt. The solum of the Croom soils ranges from about 30 inches to 60 inches in thickness, mainly because of the wide range in thickness of the B3 horizon.

In cultivated areas the A horizon is grayish brown to pale brown. The A2 horizon has a hue of 2.5Y, a value ranging from 5 to 7, and a chroma ranging from 2 to 6. The B2t horizon is generally yellowish brown, is 10YR in hue, and has a chroma of 6 or 8, but in places it is brownish yellow and may be streaked with strong brown. The B3 horizon and the C horizon are commonly variegated with a hue ranging from 5YR to 10YR, a value of 5, and a chroma ranging from 4 to 8.

Croom soils formed in material that is similar to the underlying strata of the well-drained Chillum soils, and they occur in association with the Chillum and Sassafras soils.

Croom gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (CsC2).—This soil has the profile described as typical for the series. Included with this soil in mapping are areas where the surface layer is shallow to the very hard and firm gravelly and sandy clay material of the subsoil, and some places where the subsoil is redder than described as typical for the series. Also included are some areas that have slopes of less than 5 percent and are only slightly eroded. Included also are a few areas that have a silty subsoil and impeded drainage, and some areas where the surface is gravelly loam.

This soil is droughty and does not hold plant nutrients well. Plants tend to wilt during dry periods. Tobacco is generally of high quality. The hard, dense, very gravelly subsoil limits the depth of the root zone to shallow-rooting plants. The erosion hazard on this moderately sloping soil is severe and erosion control is the most important concern of management. (Capability unit IIIe–9; woodland group 3f1)

Croom gravelly sandy loam, 10 to 15 percent slopes, moderately eroded (CsD2).—The profile of this soil is similar to that described as typical for the series. Included with this soil in mapping are areas where the surface layer is very shallow to the hard, gravelly subsoil. Also included are a few areas that have a somewhat silty subsoil and wet spots, and a few areas that have a subsoil that is redder than normal.

This soil is not generally suited to cultivated crops, but a row crop can be grown occasionally in a long rotation if good management and intensive conservation practices are used. (Capability unit IVe–7; woodland group 3f1)

Croom gravelly sandy loam, 15 to 40 percent slopes (CsE).—In many places this soil has a somewhat thin surface layer that is underlain by a hard, gravelly layer. In some areas the soil is slightly eroded, and in a few places shallow gullies have formed. Included with this soil in mapping are a few areas where the subsoil is redder or siltier than normal. Also included are a few wet spots.

The hazard of erosion, droughtiness, and a shallow root zone severely limit cultivation on this soil. The soil is well suited to woodland or wildlife. (Capability unit VIIe–2; woodland group 3f2)

Croom-Urban land complex, 5 to 15 percent slopes (CfD).—This complex consists of Croom soils and disturbed land that is mainly Croom soil material. These areas are used for community developments. The soils have been rearranged into complex patterns. Although the individual soils can be recognized, mapping them separately is not practical. Undisturbed Croom soils make up about 15 percent of each mapped area, and those Croom soils that have been disturbed or altered by machines make up the remainder. In some places the subsoil is silty, and some included spots are wet.

Croom soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the original soil profile removed make up about 40 percent of the acreage. The surface layer of these areas has variable texture and may be gravelly loam or a mixture of gravel, sand, silt, and clay in any proportion. Land fills 18 inches or more in depth, or areas where most of the soil profile has been cut away, make up about 30 percent of this unit. The surface layer is generally a mixture of sand, silt, and gravelly clay in various proportions. (Capability unit and woodland group not assigned)

Cut and Fill Land

Cut and fill land consists of miscellaneous land types in which the soil has been so severely disturbed or altered by machines that it cannot be identified by soil series. Most of this land consists of community-developed areas that have been graded for homesites, schools, recreation sites, highway interchanges, and industrial establishments.

Cut and fill land, 0 to 5 percent slopes (CuB).—Most of this nearly level and gently sloping land type consists of soil materials that have been altered by machines for urban uses. Grading has cut away the original soil profiles, or land filling has covered the original soil. The surface layer varies in texture and may be sandy, silty, or clayey material that contains gravel in some places, or it may be a mixture of these in various proportions.

Some of these areas are extremely droughty during the drier periods, but others are subject to frequent flooding. Some areas are well drained, whereas others have variable internal drainage that ranges from a permanent deep water table to one that is seasonal just a few inches below the surface. (Capability unit and woodland group not assigned)

Cut and fill land, 5 to 15 percent slopes (CuD).—This land type consists of soil materials that are mostly excessively drained or well drained. It is used mostly for community developments. Grading has cut away the original soil profile, or land filling (fig. 6) has covered the original surface layer. The present surface layer varies in texture and may be sandy, silty, or clayey, and in some places gravelly, or it may be a mixture of these in varying proportions. Some of these soil materials are extremely droughty during the drier periods.

Erosion is a serious hazard because of the strong slopes of this land type. These slopes also limit the use of the land for certain urban and recreational purposes, such as streets and playgrounds. In a very few places, a small area of a developed soil can be recognized. (Capability unit and woodland group not assigned)

Cut and fill land, 15 to 30 percent slopes (CuE).—This steep land type consists of soil that has been used for community developments. The original soils have been so altered by machines that it is impossible to assign them to a soil series. Most of the areas have been graded and the original soils have been cut away, or land filling has covered the original soil. The present surface layer varies in texture. It may be a mixture of sand, silt, or clay in various proportions. Some areas have a few pebbles scattered over the land surface. There are a few small spots where an original soil profile can be identified, but these spots cannot be separated on the soil map.

Erosion is a very serious hazard on this land type. Some conservation practices are needed to prevent gullying of the soil material and undercutting of structures that have been built. The steep slopes also limit the use of this land for urban purposes, such as septic systems, roads and streets, campsites, and playgrounds. (Capability unit and woodland group not assigned)

Donlonton Series

The Donlonton series consists of moderately well drained soils that have a very dark grayish-brown fine sandy loam surface layer and an olive heavy sandy to sandy clay loam subsoil. These soils are level to gently sloping and are on uplands. They formed in old deposits of olive sandy clays that contain a considerable amount of greensand. The native vegetation consists of mixed upland hardwoods, but Virginia pine is dominant in cutover areas.

In a typical profile the surface layer is fine sandy loam about 13 inches thick. It is very dark grayish brown in the upper part and brownish yellow and yellowish brown in the lower part. The subsoil, about 28 inches thick, has an upper 15-inch layer of mottled, olive, very firm heavy clay loam; and a lower 13-inch layer of mottled, olive, very firm heavy sandy clay loam. The underlying material, to a depth of about 60 inches, is mottled, olive light sandy clay loam.

The Donlonton soils have a water table that is seasonally within a depth ranging from 1½ to 2 feet below the surface, but is normally much deeper. The subsoil is moderately fine textured, but drainage is difficult. Donlonton soils have a high available moisture capacity and are

Figure 6.—**Cut and fill land after a heavy thunderstorm.**

moderately to highly productive under good management. They are strongly acid to very strongly acid unless limed. These soils are suited to most crops but may be limited by impeded drainage, slope, and erosion. Planting dates may be late, and herbaceous perennials may not do well because of frost heaving when the soil is wet in winter.

Seasonal wetness also limits the use of the Donlonton soils for many nonfarm purposes. Excess water is a limitation in connection with foundations and excavations, and the subsoil and underlying material may not support heavy structures without danger of excessive settlement. The Donlonton soils are severely limited for disposing of effluent from septic tanks because of moderately slow to slow permeability.

Typical profile of a Donlonton fine sandy loam (in a wooded area 500 feet southwest of State Route 665, where it intersects Spa Road) :

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, crumb structure; loose, friable; abundant roots; strongly acid; abrupt, smooth boundary.

A2—5 to 13 inches, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/8) fine sandy loam; weak, fine, subangular blocky structure; soft, very friable; plentiful roots; strongly acid; abrupt, smooth boundary.

B1—13 to 15 inches, olive-yellow (5Y 6/6) heavy sandy clay loam; weak, medium, subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine roots; very strongly acid; abrupt, wavy boundary.

B2t—15 to 28 inches, olive (5Y 4/4) heavy clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8); strong, coarse, blocky structure; very hard, very firm, sticky and plastic; few fine roots; some thin, light olive-brown (2.5Y 5/4) clay films; very strongly acid; gradual, irregular boundary.

B3—28 to 41 inches, olive (5Y 4/4) heavy sandy clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8); weak, coarse, blocky structure; hard, very firm, sticky and plastic; a few, thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

C—41 to 60 inches, olive (5Y 4/4) light sandy clay loam; common, medium, prominent mottles of yellowish red (5YR 5/8); massive (structureless) in place, single grain (structureless) when broken out; very strongly acid.

The B2t horizon is heavy sandy clay or heavy clay loam. The C horizon ranges from heavy sandy clay loam to sandy loam.

The A horizon is generally dark grayish brown (2.5Y 4/2). The A2 horizon has a hue ranging from 2.5Y to 10YR, a value ranging from 5 to 6, and a chroma ranging from 6 to 8. The B2 horizon has a hue of 2.5Y or 5Y, a value ranging from 4 to 6, and a chroma ranging from 4 to 6. Mottles in the B horizon are generally strong brown (7.5YR 5/6 or 7.5YR 5/8) or yellowish brown (10YR 5/8) and in

places greenish gray (5GY 6/1). The C horizon has a hue of 5Y or 5GY, a value of 3 to 4, and a chroma ranging from 2 to 4. Mottles in the C horizon are generally yellowish red (5YR 5/8) but may have a hue of 5G.

The Donlonton soils formed in the same kind of material as the well-drained Monmouth soils and the poorly drained Colemantown soils. They have a finer textured B horizon than the moderately well drained Adelphia soils. Donlonton soils are similar to the moderately well drained Keyport soils, but Keyport soils do not contain greensand and do not have an olive B horizon.

Donlonton fine sandy loam, 0 to 2 percent slopes (DnA).—This soil has the profile described as typical for the Donlonton series. Included with this soil in mapping are a few areas that are severely eroded. Also included are some areas where the surface layer is thicker and sandier than normal, and other areas that have a loam surface layer.

This nearly level soil has slow runoff and is wet for considerable periods unless it is artificially drained. Improving drainage is the main concern of management. This soil is fairly easy to work when it is not wet, and generally it is not susceptible to erosion. (Capability unit IIw–9; woodland group 2w3)

Donlonton fine sandy loam, 2 to 5 percent slopes, moderately eroded (DnB2).—This soil has better surface drainage than Donlonton fine sandy loam, 0 to 2 percent slopes, but it is more susceptible to erosion. Fine sand is dominant in the surface, or plow, layer. Included with this soil in mapping are a few areas where the plow layer contains a considerable amount of loose, coarse, sandy material, and other areas that have a silty surface layer. Also included are some areas that are uneroded, a few areas that are severely eroded, and a few areas having slopes slightly more than 5 percent.

Controlling erosion is the most important concern in managing this moderately wet soil. Some conservation practices are needed to improve surface drainage and to prevent excessive erosion. (Capability unit IIe–36; woodland group 2w3)

Donlonton-Urban land complex, 0 to 5 percent slopes (DuB).—This complex consists of Donlonton soils and disturbed land that is mainly Donlonton soil material. These soils are used for community developments.

Donlonton soils that have been relatively undisturbed make up from 15 to 20 percent of each mapped area. Donlonton soils that are covered with up to 18 inches of fill material or have had as much as two-thirds of the original soil profile removed make up about 50 percent. Land fills more than 18 inches in depth, or areas where nearly all of the Donlonton soil profile has been cut away, make up the remainder. The fills have variable texture, and the exposed cuts are rich in clay in most places. (Capability unit and woodland group not assigned)

Elkton Series

The Elkton series consists of poorly drained soils that are grayish brown and have a mainly fine textured, gray or grayish-brown mottled subsoil. These soils are level or nearly level. They formed in old marine sediments. The native vegetation is mixed wetland hardwoods, including oaks, gums, swamp maple, and holly.

In a typical profile the surface layer is grayish-brown silt loam, about 7 inches thick, that is mottled in the lower part. The subsoil, about 33 inches thick, has an upper 8-inch layer of mottled, grayish-brown, friable silt loam; a 16-inch layer of mottled, grayish-brown, firm silty clay; and a 9-inch layer of mottled, gray, very firm silty clay. The underlying material, to a depth of about 55 inches, is mottled, gray silty clay loam.

The Elkton soils are generally difficult to work, except when at the right moisture content. Artificial drainage is necessary for most crops and for most other uses, particularly to lower the water table in spring and to drain off excess water during prolonged wet periods. Drainage is generally difficult because water moves slowly to very slowly through the clay or silty clay subsoil. Ditches are more satisfactory than tile and should be closely spaced. The Elkton soils have a high available moisture capacity and are moderately productive under good management. Corn and soybeans are the most commonly planted crops. These soils are generally limited in use by poor natural drainage and the high water table and by difficulty of artificial drainage. They make poor building sites, and their use as filter fields for septic tanks is severely limited.

Typical profile of Elkton silt loam (in wooded area 300 feet west of Chalk Point Road, approximately 200 feet from the intersection with State Route 468):

O1—1 inch to 0, loose leaf litter of oak and sweetgum.
A1—0 to 1 inch, grayish-brown (2.5Y 5/2) silt loam; fine, granular structure; slightly hard, friable, slightly sticky; many fine roots; very strongly acid; abrupt, smooth boundary.
A2g—1 to 7 inches, grayish-brown (2.5Y 5/2) silt loam; few, fine, prominent mottles of strong brown (7.5YR 5/6); weak, very fine, subangular blocky structure; slightly hard, friable, slightly sticky; many fine roots; very strongly acid; abrupt, smooth boundary.
B1g—7 to 15 inches, grayish-brown (2.5Y 5/2) silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; hard, friable, sticky and plastic; plentiful roots; extremely acid; gradual, smooth boundary.
B21tg—15 to 31 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, prominent mottles of yellowish brown (10YR 5/8); moderate, coarse, blocky structure; firm, sticky and plastic; very few roots; dark-gray (N 4/0) clay films; extremely acid; gradual, smooth boundary.
B22tg—31 to 40 inches, gray (N 5/0) silty clay; few, medium, prominent mottles of dark brown (7.5YR 4/4); moderate, medium, blocky structure; extremely hard, very firm, very sticky and very plastic; very dark gray (N 3/0) clay films; extremely acid; clear, smooth boundary.
Cg—40 to 55 inches, gray (N 5/0) silty clay loam; many, fine, prominent mottles of dark brown (7.5YR 4/4); massive (structureless); extremely acid.

The A horizon is silt loam or, in a few places, sandy loam. In some areas the A1 and A2 horizons are gray. The B2t horizon is silty clay, heavy silty clay, or clay and has an average clay content well above 35 percent. The C horizon is silty or clayey material or unconforming sandy material. The solum ranges from 35 to 40 inches in thickness.

The B horizon generally has a hue of 10YR or yellower and may be neutral. It has a value of 5 or 6 and a chroma ranging from 0 to 2. Mottles range from faint to prominent and have a hue of 7.5YR or yellower; most chromas range from 4 to 6. Unlimed profiles are very strongly acid to extremely acid throughout. Acidity generally increases with depth.

Among the poorly drained soils in the county, only the Elkton and Colemantown soils have a fine-textured, slowly to very slowly permeable B horizon. Elkton soils differ from the Colemantown soils in lacking greensand. Elkton soils

formed in the same clayey materials as the moderately well drained Keyport soils.

Elkton sandy loam (Ek).—This soil is level to nearly level. The sandy loam surface layer is generally about 15 inches thick over a gray, sticky clay subsoil. In some places, however, this sandy layer is nearly 20 inches thick. Included with this soil in mapping are a few areas that have a surface layer of fine sand, and some areas that are loamy sand. Also included are areas having slopes greater than 2 percent. A few areas have been disturbed by construction machinery.

This soil is suited to some crops that can be planted late and to hay and pasture plants. In most places undrained areas are used for grazing or as woodland. Drainage can be improved by use of ditches or tile at the base of the sandy surface layer. This soil dries out more readily and can be cultivated a little earlier in the season than Elkton silt loam. (Capability unit IIIw–11; woodland group 3w3)

Elkton silt loam (En).—This soil has the profile described as typical for the Elkton series. It is nearly level; however, included with this soil in mapping are areas of gently sloping soils. In most places the surface layer has a floury feel when it is dry, but included in mapping are some places with a surface layer that contains some of the sticky subsoil material.

Drainage is a major limitation affecting management on this soil. Tile is not suitable for drainage, and ditches must be closely spaced. A few areas are in community developments. (Capability unit IIIw–9; woodland group 3w3)

Evesboro Series

The Evesboro series consists of very deep, well-drained to excessively drained, very sandy soils of the uplands. These soils have a surface layer that is generally grayish brown and a subsoil that is brighter yellowish brown or brownish yellow. They are the sandiest soils in the county. They formed primarily in old dunelike deposits of sand. The native vegetation is chiefly scrub hardwoods but there are local invasions of Virginia pine.

In a typical profile the surface layer is light brownish-gray loamy sand about 2 inches thick. The underlying material, to a depth of about 60 inches, has an upper 26-inch layer of yellowish-brown, loose loamy sand; a 15-inch layer of brownish-yellow, loose loamy sand; and a lower 17-inch layer of pale-brown sand that has lenses of dark-brown, loose light sandy loam.

The Evesboro soils are easily worked over a wide range of moisture content. Some of the earliest crops, particularly garden and truck crops, can be grown on them. They have a low to very low available moisture capacity and low natural fertility. These soils respond well to, and may require, supplemental irrigation. The Evesboro soils are fairly well suited to many crops, but they are most frequently used for early vegetable crops. Tobacco of good quality can be produced on these soils. These soils are subject to erosion, particularly soil blowing, when their surface becomes dry and is not covered by protective vegetation. Soil losses, however, may cause more damage to other areas where washed or blown sands are deposited than to the Evesboro soils themselves. These soils make good building sites, but they may be unstable on steep cuts or slopes where the sand is not confined. They are suitable for use as filter fields for septic tanks, but effluent may move long distances rapidly and may be a pollution hazard, particularly on strong slopes.

Typical profile of an Evesboro loamy sand (in a wooded area of Virginia pine on Benefield Road, three-quarters of a mile east of State Route 3):

A1—0 to 2 inches, light brownish-gray (10YR 6/2) loamy sand; weak, fine, granular structure; loose; few fine roots; extremely acid; abrupt, smooth boundary.
C1—2 to 28 inches, yellowish-brown (10YR 5/6) loamy sand; weak, fine, granular structure; loose; very few roots; extremely acid; abrupt, smooth boundary.
C2—28 to 43 inches, brownish-yellow (10YR 6/6) loamy sand; thin bands of dark-brown (7.5YR 4/4) light sandy loam; weak, fine, granular structure; loose; some large roots; extremely acid; diffuse, broken boundary.
C3—43 to 60 inches, pale-brown (10YR 6/3) sand; thin lenses of dark-brown (7.5YR 4/4) light sandy loam; loose; very few roots; extremely acid.

The C3 horizon is sand, fine sand, or gravelly sand. The A1 horizon and the C1 horizon range from about 26 to 45 inches in combined thickness.

The hue is generally 10YR throughout but is 2.5Y in parts of some profiles. The A1 horizon has a value ranging from 3 to 6 and a chroma ranging from 2 to 4. The C1 horizon generally has a value of 5 or 6 and a chroma ranging from 6 to 8. The C2 horizon may have a higher value and generally a lower chroma than the C1 horizon. Unlimed profiles are strongly acid to extremely acid throughout.

Evesboro soils formed in materials the same as or similar to those of the Galestown, Klej, and Osier soils. Evesboro soils are dominantly yellowish brown below the A1 horizon and do not have a B horizon, whereas Galestown soils have a strong-brown B2 horizon. In contrast to the Evesboro soils, the Klej soils are only moderately well drained and Osier soils are poorly drained.

Evesboro loamy sand, 0 to 6 percent slopes (EoB).—This soil has the profile described as typical for the Evesboro series. It is by far the most extensive soil in the county. Included with this soil in mapping are a few areas that have gravelly materials in the profile. Also included are some areas that have some discontinuous sandy clay lenses in the subsoil.

This soil consists of deep, droughty sandy material that has a very low available moisture capacity and a low natural fertility. Erosion of this deep soil is not a serious hazard, although streams and adjacent soils are affected by the eroded material. This soil is suited to deep-rooted crops, but irrigation is required if shallow-rooted crops are grown. If irrigation is available, truck crops and tobacco of good quality can be grown economically. (Capability unit IVs–1; woodland group 3s1)

Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes (ErB).—This soil has a profile that differs from the one described as typical for the series in that it has a thick moisture-retention layer that is 40 to 65 inches below the soil surface. In the mid-central part of the county, this clayey substratum is a gray sandy clay that is hard and firm when dry and only very slightly sticky when wet. In other parts of the county, the moisture-retention layer is light sandy clay loam. Included with this soil in mapping are some areas that have dark olive-green glauconitic particles in the clayey substratum.

This soil has a low to moderate available moisture capacity and low natural fertility. The sandy layers are very droughty; however, plant roots can use the moisture from summer showers that collects in and above the

clayey materials of the substratum. Tobacco of high quality and excellent truck crops can be grown. (Capability unit IIIs–1; woodland group 3s1)

Evesboro loamy sand, clayey substratum, 5 to 10 percent slopes (ErC).—This soil is similar to Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes, but it is steeper, somewhat more droughty, and more susceptible to erosion. In some areas this soil is less than 40 inches thick to the underlying clayey layer.

If irrigation is available, truck crops and tobacco of high quality can be grown on this soil. (Capability unit IVs–1; woodland group 3s1)

Evesboro and Galestown loamy sands, 6 to 12 percent slopes (EsC).—This mapping unit consists of Evesboro and Galestown soils. Some areas are made up entirely of Evesboro soils, other areas consist entirely of Galestown soils, and still other areas are made up of both soils. Both of these sandy soils are very droughty. Included with these soils in mapping are areas with some gullies.

These soils have a very low to low available moisture capacity and very low natural fertility. A good plant cover is permanently needed to prevent washing and blowing. The soils are severely limited for any cultivated crops. Better uses are for woodland, wildlife, and community development. (Capability unit VIIs–1, woodland group 3s1)

Evesboro and Galestown loamy sands, 12 to 40 percent slopes (EsE).—This mapping unit consists of steep soils of the Evesboro and Galestown series. These soils have profiles that are similar to the ones described as typical for their respective series, except that in wooded areas the Galestown soil lacks the typical surface layer but instead has a light brownish-gray surface layer about 2 inches thick. In nonwooded areas the Evesboro soil has a dark yellowish-brown surface layer about 8 inches thick. Both of these steep soils are very droughty. Included with these soils in mapping are a few gravelly areas, and areas that have some wet spots.

These soils have a very low to low available moisture capacity and very low natural fertility. They are not used for farm crops, and they have severe limitations for most other uses. A permanent plant cover is needed to prevent washing or blowing of the sandy material. (Capability unit VIIs–1; woodland group 3s2)

Evesboro-Urban land complex, 0 to 15 percent slopes (EuC).—This complex consists of nearly level to sloping Evesboro soils and disturbed land that is mainly Evesboro soil material. These areas are used for community developments. The soils have been rearranged into complex patterns. Although the original soils can be recognized, mapping them separately is impractical.

Undisturbed Evesboro soils average about 30 percent of each mapped area. Evesboro soils that have been disturbed or altered by machines make up the remainder.

Evesboro soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the original soil removed make up about 40 percent of the original acreage. Except for the Evesboro soils that have a clayey substratum, and except for small included areas of other soils, the surface layer of the soils in this unit is sand or loamy sand that is gray or yellowish brown. Where Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes, and Evesboro loamy sand, clayey substratum, 5 to 10 percent slopes, have been disturbed, the surface layer is either loamy sand or a mixture of clayey material and silt or sand. Fills 18 inches or more in depth, or places where most of the Evesboro soil has been cut away, make up about 30 percent of this complex. The surface layer is generally loose and sandy but may include other kinds of soil material.

This complex has few limitations where it is used for urban development; however, droughtiness of the soils may require special measures to prevent dying of lawns or ornamental flowers. (Capability unit and woodland group not assigned)

Fallsington Series

The Fallsington series consists of poorly drained soils that have a grayish-brown sandy loam surface layer and a grayish-brown, mottled sandy clay loam subsoil. These soils formed in old sandy sediments of the Coastal Plain that include some amounts of silt and clay. Most Fallsington soils formed in the nearly level sandy material in the northern part of the county. The native vegetation is wetland hardwoods, including oaks and holly; however, some second growth areas have mixed stands that include loblolly pine and Virginia pine.

In a typical profile the surface layer is sandy loam about 14 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The subsoil, about 22 inches thick, has an upper 6-inch layer of mottled, grayish-brown, friable light sandy clay loam; an 8-inch layer of mottled, grayish-brown, firm sandy clay loam; and a lower 8-inch layer of mottled, grayish-brown, friable light sandy clay loam. The underlying material, to a depth of about 50 inches, is mottled, light brownish-gray, loose gravelly loamy sand.

In wet periods the water table is at or very near the surface. Water moves moderately well through the soil, and artificial drainage is generally not difficult. The Fallsington soils have a moderate to high available moisture capacity, and they are moderately productive under good management if adequately drained. They are very strongly acid to extremely acid unless limed. The Fallsington soils are well suited to many crops, but wetness may delay planting dates. Poor drainage and the seasonally high water table strongly limit these soils as sites for buildings, unless the water table is permanently lowered. They are severely limited for sewage disposal by septic tank because of the high water table.

Typical profile of Fallsington sandy loam (one-half mile from the north side of State Route 170, 1½ miles east of its intersection with State Route 46):

Ap—0 to 8 inches, grayish-brown (10YR 5/2) sandy loam; weak, fine, granular structure; soft, friable; plentiful roots; very strongly acid; abrupt, smooth boundary.

A2—8 to 14 inches, light brownish-gray (10YR 6/2) sandy loam; few, fine, distinct mottles of light olive brown (2.5Y 5/4); weak, fine, granular structure; soft, friable; common roots; very strongly acid; clear, wavy boundary.

B21tg—14 to 20 inches, grayish-brown (2.5Y 5/2) light sandy clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; hard, friable, sticky and slightly plastic; few roots; discontinuous, faint, gray clay films; extremely acid; clear, wavy boundary.

B22tg—20 to 28 inches, grayish-brown (2.5Y 5/2) sandy clay loam; common, medium, prominent mottles of

strong brown (7.5YR 5/8) and yellowish red (5YR 5/8); hard, firm, sticky and plastic; very few roots; thin clay films in pores; extremely acid; clear, wavy boundary.

B3g—28 to 36 inches, grayish-brown (2.5Y 5/2) light sandy clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/8) and few, fine, faint mottles of light yellowish brown (2.5Y 6/4); slightly hard, friable, slightly sticky; extremely acid; abrupt, smooth boundary.

Cg—36 to 50 inches, light brownish-gray (2.5Y 6/2) gravelly loamy sand; common, medium, distinct mottles of strong brown (7.5YR 5/8); single grain (structureless); loose; extremely acid.

The B2t horizon ranges from heavy sandy loam to sandy clay loam; it has an average clay content between 18 and 35 percent. The C horizon is coarser textured than the B horizon and ranges from loamy sand to sandy loam. A IIC horizon of gray clay and gravel is present in some places. In some places the C horizon contains some small, smooth gravel. The solum ranges from 28 to 36 inches in thickness.

In unplowed areas there is a thin, dark A1 horizon. The matrix hue ranges from 10YR to 5Y throughout the profile. The A1 horizon has a value of 3 to 4 and a chroma of 1 to 2. The A2 horizon has a value of 4 to 5 and a chroma of 2 to 3. The B and C horizons have a matrix value ranging from 4 to 6 and a chroma ranging from 0 to 2. Mottles in these horizons are generally olive brown to strong brown and yellowish brown. Mottles may be very faint.

The Fallsington soils formed in the same kind of material as the well drained Sassafras soils and the moderately well drained Woodstown soils. The Fallingston soils are somewhat similar to the Elkton and Othello soils. They differ from these soils in having a sandy loam A horizon and a sandy clay loam B horizon, whereas the Elkton soils have a silt loam A horizon and a clayey B horizon and the Othello soils are silt loam in the A and B horizons.

Fallsington sandy loam (Fa).—This soil is mostly level or nearly level, but some areas have slopes of 1 to 5 percent. Included with this soil in mapping are a few areas that are more shallow to the underlying sands than described as typical for the series. Also included are some areas where the surface layer is fine sandy loam.

Wetness is the most serious limitation in management. If adequately drained, however, this soil is suited to corn, soybeans, and some hay and pasture plants. Being somewhat sandy, it is easy to work and not too difficult to drain. This soil has severe limitation for most nonfarm uses. (Capability unit IIIw–6; woodland group 2w1)

Galestown Series

The Galestown series consists of deep, very sandy soils that have a dark yellowish-brown surface layer and a strong-brown subsoil. These somewhat excessively drained soils are on uplands of the Coastal Plain. They formed in deep, loose, sandy sediments. The native vegetation is chiefly hardwoods, such as oaks and gums; however, most wooded areas now consist of poor stands of Virginia pine.

In a typical profile the surface layer is loamy sand about 12 inches thick. It is dark yellowish-brown in the upper part and brownish-yellow in its lower part. The subsoil is strong-brown, very friable loamy sand about 24 inches thick. The underlying material, to a depth of about 60 inches, is strong-brown, loose loamy sand.

The Galestown soils are very easy to work and warm readily in the spring. They have a low available moisture capacity and low natural fertility. They are suited to most deep-rooted crops, most truck crops, and tobacco if management practices are used that supply generous amounts of fertilizer and water by irrigation. They are strongly acid to very strongly acid unless limed. Galestown soils make good building sites and are suitable for sewage disposal by septic tanks, except for a hazard of ground water pollution.

Typical profile of Galestown loamy sand (in an old abandoned field on the west side of Sands Road, 500 feet south of intersection with State Route 422):

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) loamy sand; weak, fine, granular structure; loose; abundant roots; very strongly acid; abrupt, smooth boundary.

A2—8 to 12 inches, brownish-yellow (10YR 6/6) loamy sand; very weak, medium, subangular blocky structure; loose; common roots; strongly acid; clear, wavy boundary.

B2t—12 to 36 inches, strong-brown (7.5YR 5/8) loamy sand; very weak, medium, subangular blocky structure; very friable, slightly sticky; fairly common roots; sand grains are coated with clay; clay bridge between sand grains; very strongly acid; gradual, wavy boundary.

C—36 to 60 inches, strong-brown (7.5YR 5/8) loamy sand; single grain (structureless); loose; few roots; very strongly acid.

The Ap horizon has a value and a chroma ranging from 4 to 6; however, in unplowed areas the A1 horizon has a value of generally 3 and a chroma ranging from 2 to 4. The B2t horizon has a chroma ranging from 6 to 8. The C horizon generally has a hue of 7.5YR, a value of 5, and a chroma of 8; however, in places it may have a value of 4 and a chroma of 4. The IIC horizon has gravelly material in places, and the sand has a hue of 10YR, a value of 5, and a chroma of 4. In some areas the C horizon contains much fine and medium, water-rounded gravel.

Galestown soils formed in materials similar to those of the excessively drained Evesboro, the well drained Rumford, the moderately well drained Klej, and the poorly drained Osier soils. Galestown soils differ from Evesboro soils by having brown colors and a B horizon, whereas Evesboro soils are yellowish brown below the A1 horizon and do not have a B horizon. Galestown soils lack the better developed B2t horizon of Rumford soils, which contain more clay. Galestown soils lack the mottles and seasonal high water table of the Klej and Osier soils.

Galestown loamy sand, 0 to 5 percent slopes (GaB).—The underlying material of this soil is practically free of gravel in some places and contains varying amounts of gravel in others. Included with this soil in mapping are a few areas that have a gravelly surface layer or a sand surface layer. Also included are a few areas that have large amounts of mica throughout the soil profile and some areas that have a sandy loam surface layer.

This soil is coarse textured, loose, and droughty, and it is severely limited for farming. It is suited to deep-rooted crops, but irrigation is required if shallow-rooted crops are grown. A permanent plant cover is needed to prevent washing and blowing of the sandy materials. (Capability unit IVs–1; woodland group 3s1)

Gravel and Borrow Pits

Gravel and borrow pits (Gp) consists chiefly of areas where soil material has been removed for use in industrial enterprises, highway construction, or land fills.

When the areas were mapped in Anne Arundel County, the soil had been entirely removed from about 1,760 acres. This includes areas that had been mined for gravel, sand, clay, and iron. In other areas soil materials had been borrowed for highway construction and land fills. Although these areas are no longer suited to farming,

some of them can be planted to grass or to shrubs and trees. For most purposes, these areas require intensive or drastic reclamation that includes filling and grading and, in some places, establishing drainage outlets. Some pits could be filled with compacted refuse and covered with clean soil material; other pits could be converted into ponds. After improvements are made, many areas of this mapping unit would be suitable as wildlife habitat, as recreation areas, or as commercial or industrial sites. (Capability unit VIIIs–4; woodland group not assigned)

Hatboro Series

The Hatboro series consists of nearly level, poorly drained soils that are on the flood plains adjacent to the Patuxent and Patapsco Rivers in the northern and northwestern parts of the county. These soils formed in recent sediments that washed from areas of acid crystalline rocks, and they contain a considerable amount of fine mica. The native vegetation consists of wetland hardwoods.

In a typical profile the surface layer, about 5 inches thick, is brown silt loam that is mottled in the lower part. The subsoil, about 31 inches thick, is mottled, grayish-brown, friable light silty clay loam in the upper part and mottled, gray, friable loam in the lower part. The underlying material, to a depth of about 50 inches, is mottled, gray, loose to very friable fine sandy loam.

Hatboro soils are wet and sticky most of the year. They are subject to flooding; therefore, they are limited for cultivation and residential uses. Most areas of these soils are now used as woodland.

Typical profile of Hatboro silt loam (on the wooded flood plain of the Patuxent River, one-fourth mile northwest of the Baltimore-Washington Parkway):

A11—0 to 2 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; abundant roots; many, fine, mica flakes; strongly acid; abrupt, smooth boundary.

A12—2 to 5 inches, brown (10YR 4/3) silt loam; common, fine, faint mottles of very dark grayish brown (10YR 3/2); moderate, coarse, granular structure; soft, friable, slightly sticky and slightly plastic; plentiful roots; many mica flakes; strongly acid; gradual, smooth boundary.

IIB21g—5 to 15 inches, grayish-brown (10YR 5/2) light silty clay loam; common, medium, faint mottles of brown (7.5YR 5/2); weak, coarse, granular structure; hard, friable, slightly sticky and plastic; few roots; many mica flakes; strongly acid; abrupt, smooth boundary.

IIB22g—15 to 36 inches, gray (5Y 6/1) loam; medium and coarse, prominent mottles of yellowish brown (10YR 5/6); weakly stratified; soft, friable, slightly sticky and slightly plastic; very few roots; old root channels filled with brown silt; very micaceous; strongly acid; gradual, smooth boundary.

IIICg—36 to 50 inches, gray (5Y 6/1) fine sandy loam; common, coarse, prominent mottles of yellowish brown (10YR 5/6); single grain (structureless); soft, loose to very friable; highly micaceous; medium acid.

The A1 horizon has a value of 4 to 5 and a chroma of 2 or 3. In some places mottles in the A12 horizon have a hue of 7.5YR, a value ranging from 3 to 5, and a chroma of 2 or 3. The IIB2 horizon has a hue ranging from 5Y to 10YR, a value of 5 or 6, and a chroma of 1 or 2. Mottles of the IIB2 horizon have a hue of 7.5YR and 10YR and a chroma of 2, 4, or 6. Mottles of the C horizon have a color range like those of the B horizon.

The Hatsboro soils occupy a position on the flood plains similar to that of the well drained Comus soils, the moderately well drained Codorus soils, and the poorly drained Bibb soils. They formed in sediments from acid crystalline rocks and have much finely divided mica in their profile like the Comus and Codorus soils, but, in this respect, differ from the poorly drained Bibb soils, which formed in Coastal Plain sediments and have little mica in their profiles.

Hatboro silt loam (Ha).—This soil is nearly level and is on the flood plain of the Patuxent and Little Patuxent Rivers.

This soil is subject to flooding and is wet for long periods. Ditches or tile can be used for drainage if outlets are adequate. This soil is not susceptible to erosion. Areas subject to frequent flooding are limited mainly to use for grazing, woodland, wildlife, or recreation. (Capability unit IIIw–7; woodland group 3w7)

Howell Series

The Howell series consists of deep to very deep, well-drained soils on uplands that have a dark yellowish-brown surface layer of fine sandy loam, silt loam, or clay loam and a strong-brown, dominantly fine textured, sticky subsoil. These soils formed in old, fine-textured sediments that contain some beds of diatomaceous earth. The native vegetation is mixed upland hardwoods, most of which have been severely cut over. Some second-growth areas have a high percentage of Virginia pine.

In a typical profile the surface layer is fine sandy loam about 11 inches thick. It is dark yellowish brown in the upper part and yellowish brown in the lower part. The subsoil, about 49 inches thick, has an upper 5-inch layer of strong-brown, friable heavy fine sandy loam; a 5-inch layer of strong-brown, firm silty clay loam; a 15-inch layer of variegated strong-brown and pale-olive, firm silty clay; and a lower 24-inch layer of variegated, yellowish-red and strong-brown, firm silty clay.

Most Howell soils are not difficult to work when they have the right moisture content, but in severely eroded areas the plow layer is quite sticky when wet and very hard when dry. Howell soils have a high available moisture capacity and are fairly highly productive under good management, though they are somewhat limited because of slope and erosion. These soils do not make good building sites if septic tanks are to be use for sewage disposal, because the fine-texturde subsoil is slowly permeable.

Typical profile of Howell fine sandy loam (on the east side of Little Polling House Road, 0.4 mile north of Bayard Road):

A1—0 to 4 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; soft, very friable; many fine roots; very strongly acid; abrupt, smooth boundary.

A2—4 to 11 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky; many fine roots; very strongly acid; abrupt, wavy boundary.

B1—11 to 16 inches, strong-brown (7.5YR 5/6) heavy fine sandy loam; weak, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; plentiful roots; very strongly acid; clear, wavy boundary.

B21t—16 to 21 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, coarse, subangular blocky structure; hard, firm, sticky and plastic; common roots; thin clay films; very strongly acid; clear, smooth boundary.

B22t—21 to 36 inches, strong-brown (7.5YR 5/6) silty clay; few, medium, distinct variegations of pale olive (5Y 6/4) below a depth of 30 inches; moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few roots; thin, distinct clay films; very strongly acid; clear, smooth boundary.

B3—36 to 60 inches, yellowish-red (5YR 5/8) silty clay; common, medium, distinct variegations of strong brown (7.5YR 5/6); moderate, medium, blocky structure that reflects stratification; hard, firm, sticky and plastic; very few roots; extremely acid.

The A horizon is fine sandy loam, silt loam, or clay loam. The B1 horizon is heavy sandy clay loam, heavy fine sandy loam, clay loam, or silty clay loam. The B2t horizon ranges from clay loam to silty clay. The upper 20 inches of the B horizon contains at least 35 percent clay, on the average. The B3 horizon ranges from silt to clay, including clay loam, silty clay, and sandy clay loam. The underlying material is commonly stratified. The solum ranges from about 40 to 60 inches in thickness.

In unplowed areas the A1 horizon is up to 5 inches thick and the A2 horizon ranges from 7 to 12 inches in thickness. The A1 horizon has a value of 3 to 4 and a chroma ranging from 2 to 4. The A2 horizon has a value of 4 or 5 and a chroma ranging from 4 to 6. The B2 horizon has a hue ranging from 10YR through 7.5YR toward 5YR, a value of 5, or rarely 6, and a chroma of 6 or 8. The B3 horizon ranges from gray or dark gray to pale brown or yellowish red. Some places contain much diatomaceous earth that is generally more apparent in the B3 horizon than in the upper part of the solum.

The Howell soils have a less coarse-textured and less permeable subsoil than the associated well-drained soils of the Marr, Rumford, and Westphalia series, but the A and B horizons in Howell fine sandy loam and in the Marr series are much alike. Howell soils are similar in permeability to the moderately well drained Keyport soils and the poorly drained Elkton soils, which also formed in fine-textured sediments.

Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded (HfB2).—This soil has the profile described as typical for the Howell series. Included with this soil in mapping are some areas that are uneroded or only slightly eroded. During prolonged rains the surface layer is subject to rapid erosion because the underlying clay materials allow water to enter them only slowly.

This soil is very susceptible to erosion, and some conservation measures are needed. High-quality tobacco is grown on this soil. (Capability unit IIe–28; woodland group 2c1)

Howell fine sandy loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded (HgB2).—The profile of this soil is similar to that described as typical for the Howell series, except that the subsoil consists of many, small, angular blocks and small, flat, shalelike fragments of pink clay. These fragments are firm or extremely firm when moist, and they are very hard when dry. These blocks and fragments form waxy ribbons when crushed. Included with this soil in mapping are a few areas that are nearly level. Also included are some places where the sandy surface layer is shallow to the underlying clay.

During prolonged rains, surface runoff is rapid. Water moves rapidly through the fine sandy loam surface layer to the underlying clay, where it can penetrate only slowly. Water moves more slowly through the subsoil of this soil than it does through the subsoil of Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded.

Some conservation measures are needed to protect this soil from further erosion. The available moisture capacity is high. High-quality tobacco is grown on this soil. (Capability unit IIe–28; woodland group 2c1)

Howell silt loam, 2 to 6 percent slopes, moderately eroded (HsB2).—This gently sloping soil has a silt loam surface layer and a clayey subsoil. Included with this soil in mapping are some areas that have gritty material in the surface layer. Also included are some places that are nearly level and slightly eroded, and a few areas that are severely eroded.

This soil has rapid surface runoff because of the slow permeability of the fine-textured subsoil. Conservation measures are needed to control this runoff and prevent further erosion. This soil is suited to general crops and to deep-rooted crops. Tobacco grown on this soil is of low quality compared to that grown on Howell fine sandy loam. (Capability unit IIe–29; woodland group 2c1)

Howell silt loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded (HtB2).—This deep, well-drained, gently sloping soil has a silt loam surface layer and a pink or red, clayey subsoil that contains many small, angular blocks and flat, shalelike fragments. These fragments are firm or extremely firm when moist. Some of them can be crushed between the fingers to form clayey ribbons. They are very hard when dry. Included with this soil in mapping are some areas that are nearly level and only slightly eroded. Also included are some severely eroded places.

This soil has rapid surface runoff. Water moves moderately slowly through the loamy surface layer. It moves more slowly through the shaly subsoil than it does through the subsoil of Howell silt loam, 2 to 6 percent slopes, moderately eroded. Conservation measures are needed to control erosion if this soil is used for cultivated crops. Tobacco grown on this soil is of low quality compared to that grown on Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded. (Capability unit IIe–29; woodland group 2c1)

Howell clay loam, 6 to 12 percent slopes, severely eroded (HyC3).—This soil has a clay loam surface layer that normally is in poor tilth. This layer is firm and very hard when dry and is sticky and easily puddled when wet. Included with this soil in mapping are areas where the surface layer contains a considerable amount of fine sand. Also included are a few areas that are moderately eroded. Gullies, some of them quite deep, occur in places.

This soil can be worked only within a narrow range of moisture content. It is susceptible to erosion and requires intensive conservation measures if it is to be used safely for farming. Tobacco grown on this soil is of low quality. (Capability unit IVe–3; woodland group 2c1)

Howell clay loam, 12 to 20 percent slopes, severely eroded (HyD3).—This moderately steep soil has a clay loam surface layer that is firm and hard when dry and very sticky when wet. Included with this soil in mapping are a few areas of soils that have a thin sandy surface layer, and some areas of soils that have a pink shaly clay subsoil. Also included are a few areas that are moderately eroded. Gullies, some of them quite deep, have formed in places.

During prolonged rains, surface runoff is rapid and the hazard of erosion is very severe. Permanent pasture or woodland is a good use for this soil to protect it from further erosion. (Capability unit VIe–2; woodland group 2c2)

Howell clay loam, 20 to 40 percent slopes, severely eroded (HyE3).—This steep soil has a clay loam surface layer that is firm and hard when dry and very sticky when wet.

Included with this soil in mapping are a few areas that have a thin, sandy surface layer and some areas that are moderately eroded. Also included are some areas where the subsoil consists of many angular blocks and flat, shalelike fragments of pink clay, and other areas where these pink clayey materials are in the surface layer.

This soil has very rapid surface runoff. Crops that require cultivation should not be grown on this soil. (Capability unit VIIe–2; woodland group 2c3)

Howell clay loam, shaly subsoil, 6 to 12 percent slopes, severely eroded (HzC3).—This soil has a clay loam surface layer that normally is in poor tilth. This layer is firm and very hard when dry and very sticky when wet. The subsoil, and in many places the surface layer, consists of many small, angular blocks and flat, shalelike fragments of pink clay that form waxy ribbons when crushed. Included with this soil in mapping are some areas that have a thin surface layer of sandy material. Also included are a few areas that are only moderately eroded.

This soil can be worked only within a narrow range of moisture content. It is susceptible to erosion, and many conservation measures are needed if it is to be used safely for farming. Water moves more slowly through this slowly permeable soil than it does through Howell clay loam, 6 to 12 percent slopes, severely eroded. Tobacco grown on this soil is of low quality. (Capability unit IVe–3; woodland group 2c1)

Keyport Series

The Keyport series consists of deep to very deep, moderately well drained soils that have a slowly permeable, fine-textured, yellowish-brown to grayish-brown subsoil. These soils formed in old deposits of clay and silty clay. The native vegetation is mostly mixed hardwoods, but many areas have been invaded by Virginia pine.

In a typical profile the surface layer is olive-brown silt loam about 9 inches thick. The subsoil, about 46 inches thick, has an upper 3-inch layer of yellowish-brown, friable silty clay loam; a 14-inch layer of yellowish-brown, firm silty clay; a 12-inch layer of mottled, dark grayish-brown, very firm clay; and a lower 17-inch layer of mottled, very dark gray, firm clay.

The Keyport soils may be difficult to work unless they are at the right moisture content, and they generally remain a little too wet to work until late in spring. These soils need artificial drainage for some crops, particularly in the more nearly level areas. Ditches are generally more suitable than tile for drainage systems. The Keyport soils have a moderate to high available moisture capacity and are moderately productive under good management, but they are limited in use by impeded drainage and slow moisture movement, and also by slope and the hazard of erosion. Permanent building sites are affected by seasonal wetness and by plasticity of the subsoil. Sewage disposal by septic tanks is severely limited because of slow permeability.

425–215—73——3

Typical profile of a Keyport silt loam (in a nearly level cultivated field about one-fourth mile east of the end of Cumberstone Road at Cumberstone):

Ap—0 to 9 inches, olive-brown (2.5Y 4/4) silt loam; weak, fine, granular structure; slightly hard, friable, slightly sticky; plentiful roots; very strongly acid; abrupt, smooth boundary.

B1—9 to 12 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common roots; extremely acid; clear, smooth boundary.

B21t—12 to 26 inches, yellowish-brown (10YR 5/6) silty clay; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; common roots in upper part; discontinuous clay films; extremely acid; abrupt, smooth boundary.

B22t—26 to 38 inches, dark grayish-brown (2.5Y 4/2) clay; common, coarse, distinct mottles of dark yellowish brown (10YR 4/4) and dark gray (5Y 4/1); strong, medium, blocky structure; extremely hard, very firm, very sticky and very plastic; few roots; yellowish-brown (10YR 5/4) clay films; extremely acid; abrupt, wavy boundary.

B3—38 to 55 inches, very dark gray (5Y 3/1) clay; few, medium, faint mottles of olive gray (5Y 5/2); strong, coarse, blocky structure; hard, firm, sticky and plastic; extremely acid.

The A horizon is silt loam or sandy loam. The B2t horizon ranges from heavy silty clay loam to clay that has an average clay content generally greater than 40 percent. The solum ranges from about 36 to 55 inches in thickness.

In undisturbed areas there is an A1 horizon that ranges from 2 to 4 inches in thickness. This horizon has a value of 3 to 4 and a chroma of 1 to 2. The B21t horizon has a value of 5 to 6 and a chroma of 6 or greater. The B22t horizon may have a higher matrix value and a lower matrix chroma than the B21t horizon.

The B21t horizon may have some high-chroma mottling or variegation. The B22t horizon may have a medium to high-chroma matrix and mottling of 2 or less in chroma, or may have a low-chroma matrix and high-chroma mottling. In either case, the B22t horizon everywhere has some grayish color that has a chroma of 2 or less. The B3 horizon has about the same range of color in the matrix and mottles as the B22t horizon. Reaction throughout unlimed profiles is strongly acid to extremely acid.

The Keyport soils are similar in drainage to the Donlonton, Mattapex, and Woodston soils. They differ from Mattapex and Woodston soils in having a clay or silty clay B horizon and in having a slower movement of water through the profile. The Keyport soils lack the glauconite content of the Donlonton soils. The Keyport soils formed in the same clayey sediments as the grayish-brown, poorly drained Elkton soils. These clayey sediments are only slightly different from the somewhat less clayey materials in which the well-drained Howell soils formed.

Keyport sandy loam, 0 to 2 percent slopes (KeA).—This soil is level or nearly level and has a sandy loam surface layer that is generally about 20 inches thick over dark grayish-brown clay. Included with this soil in mapping are some areas that have large amounts of fine sand in the surface layer. In some places the surface layer is thicker than normal.

Wetness is the most important concern of management. Drainage can be improved by using field ditches, as needed, and by using tile lines in areas where the sandy surface layer is at least 24 inches thick. This soil dries out more readily and can be cultivated a little earlier in the season than Keyport silt loam, 0 to 2 percent slopes. (Capability unit IIw–9; woodland group 3w1)

Keyport sandy loam, 2 to 5 percent slopes (KeB).—This soil is gently sloping and has a tight clayey subsoil. Included with this soil in mapping are a few areas that

have a surface layer that is dominantly fine sand and other areas that have a loamy sand surface layer. Also included are a few areas that have slopes greater than 5 percent. Some included areas are severely eroded, and others are only moderately so.

Because surface runoff is rapid during prolonged rains, erosion is the most critical problem of management. This soil is not difficult to work. It dries out more readily and can be cultivated a little earlier in the season than Keyport soils that have a silt loam surface layer. (Capability unit IIe–36; woodland group 3w1)

Keyport silt loam, 0 to 2 percent slopes (KpA).—This soil has the profile described as typical for the Keyport series. The surface layer has a soft and floury feel when dry, though in spots it is slightly gritty. Included with this soil in mapping are a few areas where the clay in the subsoil is red or pink.

Drainage is impeded because water moves slowly through the subsoil, and the use of this soil for crops is limited. Ditches are better than tile for removing excess water because the subsoil is slowly permeable and tile does not function properly. (Capability unit IIw–8; woodland group 3w1)

Keyport silt loam, 2 to 5 percent slopes, moderately eroded (KpB2).—This soil has rapid runoff and has a greater hazard of erosion than Keyport silt loam, 0 to 2 percent slopes. Included with this soil in mapping are a few areas that are slightly eroded and areas where deep plowing has mixed some subsoil material with the surface layer. Also included are a few areas of soils that have slopes greater than 5 percent, and a few areas with some gritty material in the surface layer.

Because drainage is impeded and water penetrates slowly into the soil, runoff tends to be excessive, especially when the soil is wet. Controlling erosion is generally more necessary than improving drainage. (Capability unit IIe–13; woodland group 3w1)

Keyport-Urban land complex, 0 to 5 percent slopes (KrB).—This complex consists of Keyport soils and disturbed land that is mainly of Keyport soil material. These soils are used for community developments. Septic tank systems do not function well in them because of their clayey subsoil.

The Keyport soils that have a silt loam or sandy loam surface layer make up from 15 to 20 percent of each mapped area. The Keyport soils that are covered with up to 18 inches of fill material or have had as much as two-thirds of the original soil profile removed make up about 50 percent. Fills more than 18 inches thick, or areas where nearly all of the Keyport soil profile has been cut away, make up the remainder. The fills have variable texture, and the exposed cuts are rich in clay in most places. (Capability unit and woodland group not assigned)

Klej Series

The Klej series consists of deep, moderately well drained soils that have a grayish-brown surface layer and light olive-brown underlying material. These soils are nearly level and are on uplands. They formed in thick beds of very sandy material. The native vegetation is mixed hardwoods, but Virginia pine is now dominant in many severely cutover areas.

In a typical profile the surface layer is grayish-brown loamy sand about 10 inches thick. The underlying material, to a depth of about 50 inches, is light olive-brown, loose loamy sand that is mottled in the lower part.

The Klej soils are easily worked, but they are slow to warm up in the spring because of wetness. Artificial drainage is not difficult, because water moves through these sands rapidly. Tile lines are more satisfactory than ditches because ditches tend to collapse. The Klej soils have a low to moderate available moisture capacity and are moderately productive under good management. They are suited to many crops, particularly truck crops, but are limited by seasonal wetness. Building sites on these soils are seasonally wet, and septic tanks function poorly during wet periods.

Typical profile of Klej loamy sand (in a cultivated area 400 feet east of Gambrills Road, 3 miles south of State Route 3):

Ap—0 to 10 inches, grayish-brown (10YR 5/2) loamy sand; weak, fine, granular structure; loose; common roots; strongly acid; clear, smooth boundary.

C1—10 to 24 inches, light olive-brown (2.5Y 5/4) loamy sand; very weak, fine, granular structure; loose; few roots; very strongly acid; clear, smooth boundary.

C2—24 to 50 inches, light olive-brown (2.5Y 5/4) loamy sand; common, medium, faint mottles of light brownish gray (2.5Y 6/2) and few, medium, prominent mottles of reddish yellow (7.5YR 6/6); single grain (structureless); loose; extremely acid.

Some fine, smooth gravel may occur any place in the profile. The A horizon is grayish brown to dark gray. The A1 horizon in unplowed areas is generally dark brown. Throughout the profile the hue may range from 10YR to 2.5Y, becoming yellower with depth. The C horizon has a value ranging from 4 to 6 and a chroma ranging from 3 to 6. Mottles in the lower C2 horizon are common and normally have a chroma of 2 or less, but the chroma may be higher in places. Depth to mottling, which is normally the same as depth to the C2 horizon, is between 18 and 30 inches.

The Klej soils formed in the same kinds of sandy material as the somewhat excessively drained Galestown soils, the excessively drained Evesboro soils, and the poorly drained Osier soils. The Klej soils are similar to the moderately well drained Woodstown soils, but Klej soils are more sandy than the Woodstown soils and lack a Bt horizon.

Klej loamy sand (Ks).—Most of this deep, sandy soil is nearly level, but some areas have slopes ranging from 1 to 5 percent. Included with this soil in mapping are a few areas that are moderately eroded.

When artificially drained, this moderately well drained soil is suited to most crops. Drainage is fairly easy, and tile works especially well. (Capability unit IIIw–10; woodland group 3s2)

Loamy and Clayey Land

Loamy and clayey land occurs mainly in the northern and northwestern parts of the county. The soil material consists of a mantle of various kinds of material that is underlain by deposits of clay. In some areas this mantle consists of a thin layer of sand, silt, or clay and, in places, much fine, smooth gravel. In large areas the surface material is mainly silty, or silty and sandy, but these areas are intricately mixed on the landscape. The surface mantle varies from gray through yellow and brown to almost red, and it ranges from less than an inch to several feet in thickness. The color and thickness of this mantle vary widely within short distances.

The surface mantle abruptly overlies clay, to which it is not related in any way. In places the clay is a little sandy or silty. It is almost any color or mixture of colors, including red, purplish red, gray, yellow, pink, and white. The clay is at the surface in places but, only a few feet away, may be covered with sand and gravel or with more silty material. The clay is very plastic and sticky. Its most important characteristic is probably poor stability. Cuts through this clay are very difficult to stabilize, as the clay frequently slides, slumps, or flows down the surface of the cut. The stability is even poorer in areas where the clay has been disturbed in land leveling, filling, or other operations.

The mixed soil materials of Loamy and clayey land have a variable but normally low available moisture capacity. This land contains only a small amount of plant nutrients and is not productive, even under good management. Its suitability for crops varies with the texture and thickness of the surface layer, the availability of moisture and plant nutrients, and with conditions of slope and erosion. Some areas are cultivated and some have been stripped for mining clay, but most areas are idle or are wooded.

Loamy and clayey land, 0 to 5 percent slopes (LoB).—This mapping unit has a surface layer that is dominantly silt loam. Included with this unit in mapping are some places that have a thin, sandy surface layer and many areas that are gravelly.

The available moisture capacity is variable, but productivity is low. Erosion is difficult to control and is a hazard if this land is cropped or cleared for community development. The underlying clayey materials have poor stability, and building footings or basements may crack and settle. Some areas of this unit are used for community developments. (Capability unit IIIe–42; woodland group 3c1)

Loamy and clayey land, 5 to 10 percent slopes (LoC).—This land type has a loamy surface layer that is very thin or shallow to the underlying clay in most places. Included with this unit in mapping are many areas that have a surface layer consisting almost entirely of clay. Also included are areas that have a thin sandy or sandy and gravelly surface layer.

The hazard of erosion is severe because of the strong slopes. In addition to this there is a serious hazard of this clayey material slipping when wet, or shrinking and swelling, and thus causing damage to buildings by cracking or collapsing foundations. Generally, pasture is the most intensive suitable use, though a cultivated crop can be grown if protection is good. Some areas of this unit are used for community developments. (Capability unit IVe–3; woodland group 3c1)

Loamy and clayey land, 10 to 40 percent slopes (LoD).—This land type is moderately steep and very erodible and unstable. Included with this unit in mapping are some areas that have a thin, sandy surface layer and other areas that have a few gravelly spots. Also included are some wet areas.

The hazard of erosion and poor stability make this unit unsuited to cultivated crops and severely limited for most other uses. Grasses and trees are the most suitable plants. Close-growing vegetation can help to control erosion. The poor stability of the clayey materials has caused entrenchments and embankments to cave in or collapse without warning. Some community developments are in areas of this unit, but its use for construction of buildings should require soil tests and borings to determine the extent of clay and kind of foundations needed. (Capability unit VIe–2; woodland group 3c2)

Made Land

Made land (Ma) consists of areas where the soils have been so disturbed or modified by grading or filling that they cannot be classified. This land has slopes ranging from 1 to 45 percent.

Included in these areas are sanitary land fills, waste materials of iron, clay, and gravel mining operations, and other waste materials that have been disposed of in manmade and natural pits, trenches, and ravines. Also included are rubble piles from demolished buildings and those in abandoned mines or pits. In most of the sanitary land fills a layer of soil materials, several feet in thickness, has been spread over the waste and then leveled and compacted by use of heavy machinery.

This land is not suitable for farming. In some areas, where the sanitary land fills have been completed, trees have been planted. Other areas of Made land are used as industrial sites, as parking lots, and for other urban development. (Capability unit and woodland group not assigned)

Marr Series

The Marr series consists of deep, well-drained, dark-brown soils on uplands. These soils formed in old deposits of fine sandy to very fine sandy material containing a considerable amount of silt and clay. The sand particles in the Marr soils are fine and of uniform size. Practically all areas of these soils have been cultivated at some time, and some of these areas have been allowed to return to woodland. The present vegetation consists of mixed upland hardwoods, dominantly oaks, but there are many pure stands of Virginia pine.

In a typical profile the surface layer is dark-brown fine sandy loam about 10 inches thick. The subsoil, about 24 inches thick, has an upper 3-inch layer of brown, friable heavy fine sandy loam; an 11-inch layer of strong-brown, firm heavy fine sandy clay loam; and a lower 10-inch layer of strong-brown, friable heavy fine sandy clay loam. The underlying material, to a depth of about 50 inches, is brownish-yellow, soft very fine sandy loam.

Marr soils are important for farming, particularly for growing tobacco. Nearly all areas have been farmed in the past, and most areas are still in cultivation. Many areas having slopes above 12 percent, however, have been allowed to return naturally to forest.

Typical profile of a Marr fine sandy loam (in a nearly level tobacco field 200 feet east of State Route 4, one-fourth mile north of Mt. Zion):

Ap—0 to 10 inches, dark-brown (10YR 3/3) fine sandy loam; weak, medium, granular structure; soft, friable; plentiful roots; strongly acid; clear, smooth boundary.

B1—10 to 13 inches, brown (7.5YR 5/4) heavy fine sandy loam; weak, medium, subangular blocky structure; slightly hard, friable, very slightly plastic; common roots; medium acid; gradual, smooth boundary.

B21t—13 to 24 inches, strong-brown (7.5YR 5/6) heavy fine sandy clay loam; weak, medium, subangular blocky structure; hard, firm, sticky and slightly plastic;

fairly common roots; thin, distinct clay films; strongly acid; gradual, smooth boundary.

B22t—24 to 34 inches, strong-brown (7.5YR 5/8) heavy fine sandy clay loam; weak, medium, subangular blocky structure; slightly hard, friable, slightly plastic; very few roots; distinct, discontinuous, strong-brown (7.5YR 5/6) clay films; very strongly acid; clear, smooth boundary.

C—34 to 50 inches, brownish-yellow (10YR 6/8) very fine sandy loam; massive (structureless); soft; very few roots; very strongly acid.

The B2t horizon has an average clay content between 18 and 35 percent. In some places the B2t horizon is reddish yellow (7.5YR 6/6 or 6/8). The C horizon ranges from loamy fine sand to very fine sandy loam and contains less clay than any part of the solum.

The Ap horizon has a value normally ranging from 3 to 5 and a chroma ranging from 2 to 4. The B2t horizon has a hue normally of 7.5YR but may have a hue of 10YR. It has a value of 5 or 6 and a chroma of 6 or more. The C horizon has a high value and a high chroma, and it may not be variegated in hue. The profiles throughout are strongly acid to very strongly acid unless limed, and even when limed they increase in acidity with depth.

Marr soils formed in the same kinds of material as the well-drained Howell and Westphalia soils. They have less clay in the B2 horizon and have a less strongly developed structure than the Howell soils. Marr soils have a strong-brown B2 horizon, whereas Westphalia soils have a yellowish-brown B2 horizon that is commonly less than 10 inches thick. Marr soils occur in association with the Sassafras and Westphalia soils.

Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded (MfB2).—This soil is thinner to the underlying sand in some places than the profile described as typical for the series, and it has a few areas where the surface layer contains some sticky subsoil material. Included with this soil in mapping are places that are only slightly eroded, a few areas of soils that are nearly level, and a few places where shallow gullies have formed. Also included are some areas that have a surface layer of very fine sandy loam.

This soil is well suited to most general crops and to deep-rooted crops. Erosion is a moderate hazard on this soil, but if properly managed, the soil is well suited to tobacco, truck crops, corn, small grain, and hay and pasture plants. Most areas have been used for the cultivation of tobacco since colonial times. This soil has a high available moisture capacity. (Capability unit IIe–5; woodland group 3o3)

Marr fine sandy loam, 6 to 12 percent slopes, moderately eroded (MfC2).—The profile of this soil is similar to the one described as typical for the series except that it is somewhat shallower to the underlying sand. Some places have a surface layer that contains some subsoil material, and in a few places shallow gullies have formed. Included with this soil in mapping are a few areas that have a very fine sandy loam surface layer.

This soil is suited to general crops and to deep-rooted crops, but it is susceptible to serious damage by erosion. Under good management, tobacco of fine quality can be grown. This soil has a high available moisture capacity, though during long dry periods plants show signs of moisture stress. (Capability unit IIIe–5; woodland group 3o3)

Marr fine sandy loam, 6 to 12 percent slopes, severely eroded (MfC3).—This soil has a surface layer that consists mostly of brown, sticky subsoil material as a result of severe erosion. Gullies, some of them deep, have formed in places. Included with this soil in mapping are areas that have a very fine sandy loam surface layer.

This soil is marginal for cultivated crops. It is suited to most general crops. Under a high level of management, tobacco is generally of high quality. This soil is suited to hay and permanent pasture. (Capability unit IVe–5; woodland group 3o3)

Marr fine sandy loam, 12 to 20 percent slopes, moderately eroded (MfD2).—This soil is too steep for frequent cultivation. Included with this soil in mapping are some areas that are only slightly eroded. Also included are some areas that have a very fine sandy loam surface layer.

The soil is very susceptible to erosion. Intensive conservation measures, including protective vegetation, are needed. (Capability unit IVe–5; woodland group 3r1)

Marr fine sandy loam, 12 to 20 percent slopes, severely eroded (MfD3).—This soil is severely eroded and has a surface layer that consists mainly of brown, sticky subsoil material. Gullies, some of them deep, have formed in many places. Included with this soil in mapping are areas that have a very fine sandy loam surface layer.

This soil is not suitable for cultivation, but well-established grasses or legumes can be grazed or cut for hay. Steep slopes severely limit the nonfarm uses of this soil. (Capability unit VIe–2; woodland group 3r1)

Marr fine sandy loam, 20 to 35 percent slopes, severely eroded (MfE3).—This steep soil is severely eroded and is gullied in places. Included with this soil in mapping are a few areas that are slightly eroded, and areas that have some slopes of more than 35 percent. Also included are areas that have a surface layer of very fine sandy material.

Most areas of this soil are still wooded and probably should remain so. Planting of trees on the cleared slopes is beneficial. Steep slopes severely limit the nonfarm uses of this soil. (Capability unit VIIe–2; woodland group 3r1)

Matapeake Series

The Matapeake series consists of deep, well-drained soils that formed in a mantle of silt and very fine sand over older deposits of sandy material. These soils are level to moderately steep and are on uplands of the Coastal Plain. The Matapeake soils generally occur on terraces along major waterways.

The native vegetation is mixed upland hardwoods, mainly oak.

In a typical profile the surface layer is silt loam about 13 inches thick. It is dark brown in the upper part and yellowish brown in the lower part. The subsoil, about 27 inches thick, has an upper 5-inch layer of strong-brown, firm silty clay loam; a 19-inch layer of dark yellowish-brown, firm heavy silty clay loam; and a lower 3-inch layer of yellowish-brown, very friable light silt loam. The underlying material, to a depth of about 60 inches, is yellowish-brown, loose fine sandy loam.

Matapeake soils are suitable for many uses. The hazard of erosion in the sloping area is the only limitation to farming.

Typical profile of a Matapeake silt loam (in an abandoned field one-fourth mile west of the intersection

of State Route 170 and Hammonds Ferry Road at Linthicum):

Ap—0 to 10 inches, dark-brown (10YR 4/3) silt loam; weak, very fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—10 to 13 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable, slightly sticky; many fine roots; strongly acid; abrupt, smooth boundary.

B21t—13 to 18 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; many, very fine pores in peds; yellowish-red (5YR 5/6) continuous clay films on ped surfaces; strongly acid; abrupt, smooth boundary.

B22t—18 to 37 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; strong, medium, subangular blocky structure; firm, sticky and plastic; many very fine pores in peds; yellowish-red (5YR 5/6), continuous, prominent clay films on ped surfaces; some small mica flakes; strongly acid; abrupt, smooth boundary.

B3—37 to 40 inches, yellowish-brown (10YR 5/6) light silt loam; weak, fine, subangular blocky structure; very friable, slightly sticky and slightly plastic; many old worm casts; some dark-green, glauconitic particles; very strongly acid; clear, wavy boundary.

IIC—40 to 60 inches, yellowish-brown (10YR 5/8) fine sandy loam; single grain (structureless); firm in places, loose, slightly sticky; some small, olive (5Y 4/4), glauconitic particles; very strongly acid.

The A horizon is silt loam or fine sandy loam. The B2t horizon ranges from heavy silt loam to heavy silty clay loam and has a clay content that ranges from about 18 to 30 percent. The solum generally ranges from about 28 to 40 inches in thickness.

In wooded areas there is a thin, dark-brown to very dark grayish-brown A1 horizon. The B21t and B22t horizons have a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma that ranges from 4 to 6 or, in a few places, to 8. The C horizon, where present, may be silt loam or silt, and where this horizon occurs, it is essentially the same color as the Bt horizon. However, the nonconforming IIC horizon is variable in color. The IIC horizon contains gravel in places, but more commonly it is sandy loam or loamy sand. Both the C and IIC horizons are loose to very friable.

The Matapeake soils formed in the same kinds of materials as the moderately well drained Mattapex soils and the poorly drained Othello soils. The Matapeake soils are more silty throughout than the Sassafras and the Marr soils. They contain less clay in their B2 horizon than the Howell soils.

Matapeake fine sandy loam, 0 to 2 percent slopes (MkA).—This soil is level or nearly level and is mostly on the lower stream terraces of the county.

This soil is well suited to most general crops and to deep-rooted crops. It has a high available moisture capacity, and crop growth is favorable under good management. Tobacco grown on this soil is of high quality. There are few significant limitations to farming. (Capability unit I–5; woodland group 3o1)

Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded (MkB2).—This soil is gently sloping and is subject to moderate erosion. Included with this soil in mapping are some areas where the soil is uneroded or only slightly so.

This soil is well suited to most general crops and to deep-rooted crops. If properly managed, high-quality tobacco can be grown. This soil has a high available moisture capacity. Some conservation measures are needed to protect this soil from erosion. (Capability unit IIe–5; woodland group 3o1)

Matapeake silt loam, 0 to 2 percent slopes (MmA).—This soil has the profile described as typical for the series. The surface layer generally has a soft and floury feel, but in places it contains some gritty materials. Included with this soil in mapping are a few areas that have some sticky subsoil material mixed with the surface layer. Also included are some areas of soils that have a very thick, silty substratum.

This soil is well suited to general crops and to deep-rooted crops and, under proper management, it is well suited to most crops. It is suited to tobacco, but quality may not be so good as that of tobacco grown on Matapeake fine sandy loam, 0 to 2 percent slopes. This soil has a high available moisture capacity. It is easily plowed and cultivated at the proper moisture content. (Capability unit I–4; woodland group 3o1)

Matapeake silt loam, 2 to 5 percent slopes, moderately eroded (MmB2).—This soil is gently sloping and subject to moderate erosion. The surface layer has a soft and floury feel, but in some places this layer contains some gritty material. Included with this soil in mapping are some areas that are slightly eroded, and a few areas that are severely eroded. Also included are some areas of soils that have a very thick substratum.

This soil is well suited to most general crops. It is suited to tobacco, but the quality is not as good as that of tobacco grown on Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded. It has a high available moisture capacity. Some conservation measures are needed to protect this soil from further erosion. (Capability unit IIe–4; woodland group 3o1)

Matapeake silt loam, 5 to 10 percent slopes, moderately eroded (MmC2).—This soil has a severe hazard of erosion. Included with this soil in mapping are a few areas that have some sandy material in the surface layer. Also included are some areas where the subsoil is thicker than normal, and other areas where erosion has been only slight.

This soil is well suited to general crops and to deep-rooted crops. It is suited to tobacco, but the tobacco may not be of high quality. Some conservation measures are needed to control erosion. (Capability unit IIIe–4; woodland group 3o1)

Matapeake silt loam, 5 to 10 percent slopes, severely eroded (MmC3).—This soil is shallower to the underlying sandy material than the one described as typical for the Matapeake series. Most of the original surface layer has been removed through erosion, and the present surface layer contains much subsoil material. Gullies, some of them deep, have formed in places. Included with this soil in mapping are a few areas where the subsoil is thicker than described as typical for the series.

Although this soil is suited to general crops, only occasional cultivation is advisable. Under good management the soil is suited to tobacco, but quality may be low. (Capability unit IVe–3; woodland group 3o1)

Matapeake silt loam, 10 to 15 percent slopes, severely eroded (MmD3).—This soil has lost all of its original surface layer by erosion, and in many places has lost much of its subsoil. In some areas the present surface layer consists

entirely of loose sand that is the underlying material of the series. Included with this soil in mapping are some areas that are only moderately or slightly eroded. Also included are a few areas that have slopes of more than 15 percent.

This soil is not suitable for cultivated crops. Protective plants are needed to control erosion. This soil is suitable for woodland grazing and other less intensive uses. Its use for community development is severely limited. (Capability unit VIe–2; woodland group 3o1)

Matawan Series

The Matawan series consists of deep, moderately well drained soils that have a thick loamy fine sand surface layer and a fine sandy loam to sandy clay subsoil. Water moves moderately rapidly through the sandy surface layer but only moderately slowly through the finer textured subsoil. These soils are nearly level to gently sloping and are on uplands of the Coastal Plain. They formed in a sandy mantle over older sandy clay deposits. The native vegetation is upland hardwoods, but most cutover areas and abandoned fields are dominantly in Virginia pine.

In a typical profile the surface layer is yellowish-brown loamy fine sand about 20 inches thick. The subsoil is mottled, yellowish brown, firm, and about 20 inches thick. It is heavy fine sandy loam in the upper part and heavy fine sandy clay loam in the lower part. The underlying material, to a depth of about 50 inches, is mottled, gray to light-gray, very firm fine sandy clay.

The thick, sandy surface layer of Matawan soils is very easy to work. Matawan soils have a moderate to high available moisture capacity and a moderate natural fertility. Drainage by tile may be needed for growing some crops.

Typical profile of a Matawan loamy fine sand (in a field 20 feet east of State Route 178, one-fourth mile north of Severn Crossroads):

Ap—0 to 10 inches, yellowish-brown (10YR 5/4) loamy fine sand; weak, fine, granular structure; loose; few roots; strongly acid; abrupt, smooth boundary.

A2—10 to 20 inches, yellowish-brown (10YR 5/6) loamy fine sand; weak, fine, granular structure; loose; few roots; extremely acid; abrupt, smooth boundary.

B21t—20 to 30 inches, yellowish-brown (10YR 5/6) heavy fine sandy loam; few, fine, prominent mottles of light gray (5Y 6/1) in lower part; weak; medium, blocky structure; hard, firm, slightly sticky and slightly plastic; very few roots; extremely acid; gradual, wavy boundary.

IIB22t—30 to 40 inches, yellowish-brown (10YR 5/6) heavy fine sandy clay loam; many, coarse, prominent mottles of gray to light gray (5Y 6/1); weak, coarse, blocky structure; hard, firm, sticky and plastic; distinct, discontinuous clay films; strongly acid; gradual, wavy boundary.

IICg—40 to 50 inches, gray to light-gray (5Y 6/1) fine sandy clay; irregularly mottled with yellowish brown (10YR 5/4).; massive (structureless); very hard, very firm, sticky and plastic; strongly acid.

The B21 horizon ranges from heavy fine sandy loam to clay loam and becomes finer textured with depth. The IIB22t horizon ranges from sandy clay loam to sandy clay. The C horizon is heavy sandy clay loam or finer, but in places it consists of layers of clay or sandy clay stratified with layers of sandy loam or sandy clay loam.

In unplowed areas the A1 horizon is grayish brown to dark grayish brown and ranges from 4 to 6 inches in thickness. The A2 horizon has a hue that may range to 2.5Y. The B2 horizon may have a matrix hue ranging from 10YR to 5Y, a value of 5 or 6, and a chroma ranging from 4 to 6. The B2 horizon has mottling that has a value of 6 or 7 and a chroma of 1 or 2. The C horizon has a value of 6 or 7 and a chroma of 1 or 2. It has mottles that have a value of 5 or 6 and a chroma ranging from 4 to 6. The solum ranges from 29 to about 45 inches in thickness.

The Matawan soils formed in the same or similar kinds of material as the well-drained to somewhat excessively drained Muirkirk soils. The Matawan and Woodstown soils are similar in drainage, but the Matawan soils have a thicker A horizon.

Matawan loamy fine sand, 0 to 2 percent slopes (MnA).—This soil has the profile described as typical for the series. Included with this soil in mapping are some areas where the surface layer is fine sandy loam. Also included are a few areas that have some coarse sand in the surface layer and a few areas that are moderately eroded.

Seasonal wetness is normally the most serious problem of management, but drainage is not needed for some crops and for other uses. This soil has a moderate to high available moisture capacity. (Capability unit IIw–10; woodland group 2o1)

Matawan loamy fine sand, 2 to 5 percent slopes (MnB).—This soil is gently sloping and is somewhat droughty during prolonged dry periods. Included with this soil in mapping are some areas that are moderately eroded and other areas that have a surface layer that is thinner than the one described as typical for the series and is over gray clayey sand. Also included are some areas that have slopes greater than 5 percent, some areas that have a fine sandy loam surface layer, and a few other areas that have some coarse sand in the surface layer.

The hazard of erosion is generally a more important concern of management than impeded drainage. (Capability unit IIe–36; woodland group 2o1)

Mattapex Series

The Mattapex series consists of deep, moderately well drained soils through which water moves moderately slowly. These soils are nearly level to sloping and are on uplands of the Coastal Plain. They formed in a thin mantle of silt and very fine sand over older deposits of loamy and, in places, gravelly material. The native vegetation consists of mixed hardwoods.

In a typical profile the surface layer is silt loam about 12 inches thick. This layer is brown in the upper part and yellowish brown and friable in the lower part. The subsoil is firm, mottled, and about 24 inches thick. It is yellowish-brown silty clay loam in the upper part and strong-brown sandy clay loam in the lower part. The underlying material, to a depth of about 50 inches, is mottled, brownish-yellow, very friable fine sandy loam.

Mattapex soils are suited to all crops grown in the county, but wetness and impeded drainage limit their use. Planting dates may be delayed in spring, and some frost heaving may occur in winter when the soils are wet. Seasonal wetness limits the Mattapex soils for use in community development.

Typical profile of a Mattapex silt loam (in a cultivated field 200 feet west of State Route 416, one-fourth mile north of Lyons Creek):

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; weak, coarse, granular structure; soft, very friable, slightly sticky; plentiful roots; strongly acid; abrupt, smooth boundary.

A2—9 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, coarse, granular structure; slightly hard, friable, slightly sticky; many fine roots; strongly acid; clear, smooth boundary.

B21t—12 to 32 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine and medium, distinct mottles of light gray (2.5Y 7/2) in the lower 10 inches; moderate, coarse, subangular blocky structure; hard, firm, sticky and plastic; few roots; almost continuous dark yellowish-brown (10YR 4/4) clay films; very strongly acid; abrupt, smooth boundary.

IIB22t—32 to 36 inches, strong-brown (7.5YR 5/6) sandy clay loam; many, medium, distinct mottles of light gray (2.5Y 7/2) and common, medium, distinct mottles of yellowish red (5YR 4/8); weak, thin, platy and weak, medium, subangular blocky structure; hard, firm, sticky and plastic; some patchy, brown (10YR 4/3) clay films; strongly acid; clear, smooth boundary.

IIC—36 to 50 inches, brownish-yellow (10YR 6/6) fine sandy loam; many, medium, distinct mottles of light gray (2.5Y 7/2) and dark yellowish brown (10YR 4/4); stratified, and coarser textured and more sandy with increasing depth; very thin strata of fine silt; very friable; strongly acid.

The A horizon is dominantly silt loam but ranges to fine sandy loam. The B21t horizon ranges from heavy silt loam to silty clay loam. In many areas the IIB22t horizon is replaced by a B22t horizon that is silt loam or silty clay loam. The IIC horizon ranges from loamy sand to heavy sandy loam or light sandy clay loam, and in places it contains a considerable amount of fine, rounded gravel. The solum ranges from about 30 to 40 inches in thickness.

In wooded areas the A1 horizon is thin and dark, but the A2 horizon is somewhat thicker. The B2t horizon commonly is light olive brown and may have a hue of 10YR or 2.5Y. This horizon has a value ranging from 4 to 6 and a chroma ranging from 3 to 8. Mottles that have a chroma of 2 or less occur at a depth ranging within 20 to 32 inches of the soil surface. In places the lower few inches of the IIB22t or B22t horizon is firm, but in most places this horizon is more uniformly friable.

The Mattapex soils formed in the same kinds of material as the well-drained Matapeake soils and the poorly drained Othello soils. The Mattapex soils do not have as thick a solum as the Butlertown soils, and they are underlain by older, sandier materials. The Mattapex soils are more silty than the coarser textured Woodstown soils or the finer textured Keyport soils.

Mattapex fine sandy loam, 0 to 2 percent slopes (MpA).—This soil is nearly level and has a fine sandy loam surface layer. Included with this soil in mapping are some areas that have a surface layer that is thinner than normal to the underlying finer material.

This soil is suitable for most crops after drainage is improved. Drainage can be improved by using open ditches or tile. This soil is easily cultivated, and the surface layer dries more quickly in the spring than the surface layer of Mattapex silt loam, 0 to 2 percent slopes. Under good management, tobacco of medium quality can be grown. (Capability unit IIw–5; woodland group 3o2)

Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded (MpB2).—This soil is gently sloping and moderately eroded. Included with this soil in mapping are a few areas with a surface layer that is more sandy than normal, and some places that are only slightly eroded.

Erosion control is a more serious management problem than seasonal wetness because the surface water drains away readily.

Drainage may be needed for only a few crops. The surface layer of this soil dries out more quickly in the spring than the surface layer of Mattapex silt loam, 2 to 5 percent slopes, moderately eroded. Tobacco of medium quality is grown on this soil. (Capability unit IIe–36; woodland group 3o2)

Mattapex silt loam, 0 to 2 percent slopes (MrA).—This soil has the profile described as typical for the series. The surface layer, when dry, has a soft and floury feel. Included with this soil in mapping are some places where the surface layer is thinner to the underlying finer textured material than described as typical, and a few areas that are somewhat poorly drained.

Impeded drainage limits use of this moderately well drained soil for some crops. Planting is usually delayed in spring, and the soil is difficult to work when it is wet. Open ditches or tiles are needed to improve drainage. Tile may be used to intercept seepage and to drain wet spots. This soil is suited to tobacco, which is of low quality. (Capability unit IIw–1; woodland group 3o2)

Mattapex silt loam, 2 to 5 percent slopes, moderately eroded (MrB2).—This soil has a surface layer that generally has a soft and floury feel when dry, but in some places it contains coarse material and has a slightly gritty feel. Included with this soil in mapping are a few uneroded and severely eroded areas. Also included are a few areas that are somewhat wetter than described as typical for the series.

Erosion control is the most important problem of management on this soil, but drainage may be needed for certain crops. Seepage or wet spots can be drained with tile, and excess runoff can be controlled by simple conservation measures. This soil has a high available moisture capacity. (Capability unit IIe–16; woodland group 3o2)

Mattapex silt loam, 5 to 10 percent slopes, moderately eroded (MrC2).—Impeded internal drainage is a limitation in this soil, but a severe hazard of erosion is a greater concern. The original surface layer has been eroded in most places.

Included with this soil in mapping are some places in which loose, sandy materials or firm, hard, clayey materials are in the surface layer. Also included are some spots that are wetter than described as typical for the series, and a few places that are steeper. Erosion control is important in managing this soil. Seepage areas may need some tile drainage. This soil is suited to tobacco. (Capability unit IIIe–16; woodland group 3o2)

Mixed Alluvial Land

Mixed alluvial land (Mt) consists of soil materials ranging from sand to clay that occur on flood plains. These materials have been washed from many different kinds of soil on uplands. Soil characteristics change so rapidly within short distances that it is impractical to map soils of any specified series. Most of this land is level or nearly so, but some areas have slopes of as much as 5 percent.

Most areas are poorly drained and are wet during wet periods and moderately wet in drier periods. A few areas have a very sandy surface layer and are very poorly drained. Most areas are likely to be flooded frequently. Fairly large areas contain a significant amount of glauconite, or greensand.

Generally, the land is not suited to cultivated crops, but pasture plants and some hay crops can be grown if drainage and floods are reasonably controlled. Natural fertility varies greatly. (Capability unit VIw–1; woodland group 2w2)

Monmouth Series

The Monmouth series consists of deep, well-drained soils that have an olive-brown surface layer and a thick, olive-brown, moderately fine textured and fine textured, sticky subsoil. These soils formed in unconsolidated beds of fine textured and moderately fine textured sediments that are high in glauconite (greensand). Glauconite can be found in any part of the profile and makes up about 40 to 70 percent or more of the parent material. The olive colors are inherent from the glauconite parent material and do not indicate any degree of impeded drainage. The native vegetation is mixed upland hardwoods, but most areas have been cleared. Some areas are covered with second-growth hardwoods and Virginia pine.

In a typical profile the surface layer is olive-brown fine sandy loam about 9 inches thick. The subsoil, about 29 inches thick, has an upper 5-inch layer of olive-brown, friable heavy sandy clay loam; a 7-inch layer of olive-brown, friable sandy clay; and a lower 17-inch layer of olive-brown, friable to firm heavy sandy clay loam. The underlying material, to a depth of 50 inches, is black greensand pellets and olive-yellow, very friable clay.

The safe disposal of surface runoff may be a problem on Monmouth soils. Water moves moderately slowly through these soils, but internal drainage is thorough, and the water table is quite deep. The Monmouth soils have a high available moisture capacity and are highly productive under good management. They are strongly acid to very strongly acid unless limed. These soils are suited to all uses, except as limited by slope and the risk of erosion. The more sandy soils are especially good for tobacco. With the safe disposal of surface runoff, the Monmouth soils generally have few limitations for nonfarm uses. Absorptive fields for septic tanks should be large because the subsoil of the Monmouth soils absorbs and transmits water moderately slowly.

Typical profile of a Monmouth fine sandy loam (about 500 feet west of Rutland Road and three-fourths of a mile south of State Route 450) :

Ap—0 to 9 inches, olive-brown (2.5Y 4/4) fine sandy loam; upper 3 inches has weak, medium, granular structure, and lower part has weak, medium, subangular blocky structure; very friable; very strongly acid; abrupt, smooth boundary.

B21t—9 to 14 inches, olive-brown (2.5Y 4/4) heavy sandy clay loam; moderate, medium, subangular blocky structure; friable; clay films on ped faces; very strongly acid; diffuse, wavy boundary.

B22t—14 to 21 inches, olive-brown (2.5Y 4/4) sandy clay; moderate, medium to fine, angular blocky structure; friable; clay films on ped faces; very strongly acid; clear, wavy boundary.

B23t—21 to 38 inches, olive-brown (2.5Y 4/4) heavy sandy clay loam; moderate, medium, subangular and angular blocky structure; friable to firm clay films on ped faces; some iron bands in the lower part; strongly acid; abrupt, wavy boundary.

C—38 to 50 inches, black (N 2/0) greensand pellets and olive-yellow (2.5Y 6/6) clay that feels like fine sandy loam; very weak, medium to coarse, subangular blocky structure; very friable; very strongly acid.

The Ap horizon is generally fine sandy loam or loamy sand. In severely eroded areas the Ap horizon contains material from the B horizon and is clay loam. The B2 horizon ranges from heavy sandy clay loam to light clay. The B and C horizons may appear greenish, particularly when smeared or crushed.

In unplowed areas the A1 horizon is up to 2 inches thick and the A2 horizon is 7 inches thick. These A horizons have a hue of 10YR. The B2 horizon may have a hue of 10YR, 2.5Y, or 5Y. It has a value ranging from 3 to 5.

The Monmouth soils formed in materials the same as or similar to those of the moderately well drained Donlonton soils and the poorly drained Colemantown soils. The Monmouth soils are finer textured, more olive in the B horizon, and more plastic and sticky than the Collington soils, which formed in material of only moderately high glauconite content. They differ from the Howell soils in that the Howell soils lack the olive colors of the Monmouth soils and developed in materials that are low in glauconite but contain diatomaceous skeletal remains.

Monmouth loamy sand, 0 to 2 percent slopes (MuA).—This soil is nearly level and has a surface layer that is generally thicker over the underlying sandy clay material than that described as typical for the Monmouth series. Included with this soil in mapping are some places where the surface layer is 20 inches thick or more. Also included are a few moderately eroded areas.

This soil is highly desirable for growing tobacco and some other crops because it is easily worked and warms quickly in spring. Its capacity to hold moisture, however, is lower than that of Monmouth fine sandy loam, 0 to 2 percent slopes. Sandiness is a limitation in general farming. The hazard of erosion is slight. (Capability unit IIs–5; woodland group 2o2)

Monmouth loamy sand, 2 to 5 percent slopes, moderately eroded (MuB2).—This soil is gently sloping and has a thick, loose, sandy surface layer that is somewhat droughty during most of the growing season. Included with this soil in mapping are some areas where the sandy surface layer is shallow to the underlying sandy clay subsoil.

This soil is susceptible to erosion, and some conservation measures are needed. This soil produces a good quality tobacco. It is highly desirable for some other crops because it is easily worked and warms up quickly in spring. Sandiness is a limiting factor in crop growth. (Capability unit IIs–5; woodland group 2o2)

Monmouth loamy sand, 5 to 10 percent slopes, moderately eroded (MuC2).—This soil has a very loose, sandy surface layer and is sloping. Included with this soil in mapping are areas where the soil is only slightly eroded.

The erosion hazard is severe, and some conservation measures are needed. The loose, sandy surface layer is droughty during most of the growing season, but tobacco of good quality can be grown. (Capability unit IIIe–5; woodland group 2o2)

Monmouth loamy sand, 5 to 10 percent slopes, severely eroded (MuC3).—This soil is so severely eroded that most of the original thick, loose, sandy surface layer is thin to the underlying sandy clay subsoil. Gullies have formed in some areas.

The use of this soil for cultivated crops is marginal, but some hay and pasture plants can be grown safely. Erosion control is the most important concern of management. (Capability unit IVe–5; woodland group 2o2)

Monmouth loamy sand, 10 to 15 percent slopes, moderately eroded (MuD2).—This soil is moderately steep and has a thick, loose, sandy surface layer and a sandy clay subsoil. Included with this soil in mapping are some areas that are only slightly eroded. In places a few gullies have formed.

The hazard of erosion is severe because water moves rapidly through the sandy surface layer but penetrates the subsoil only moderately slowly. If the soil is cultivated, adequate conservation measures are needed for its protection. (Capability unit IVe–5; woodland group 2o2)

Monmouth loamy sand, 10 to 15 percent slopes, severely eroded (MuD3).—This soil has lost most of its original loose, sandy surface layer by erosion, and in some areas material from the sticky olive-brown subsoil is mixed into the present surface layer. Gullies, some of them deep, have formed in many places.

Sod or other protective plants should be used to protect this soil. It is generally not used for cultivation crops. If management is good, a safe use is hay or pasture. (Capability unit VIe–2; woodland group 2o2)

Monmouth fine sandy loam, 0 to 2 percent slopes (MvA).—This soil has the profile described as typical for the series. Included with this soil in mapping are a few areas that have some silty material in the surface layer. Also included are some areas that have a surface layer that is sticky when wet and a few areas that have a surface layer that is redder than described as typical for the series.

This soil is suitable for most uses and has few if any limitations. (Capability unit I–28; woodland group 2c1)

Monmouth fine sandy loam, 2 to 5 percent slopes, moderately eroded (MvB2).—This gently sloping soil has a loamy surface layer and a sandy clay subsoil. Included with this soil in mapping are areas that have some silty material in the surface layer and a few spots that have some coarser sand in the surface layer. Also included are some areas that have a surface layer that is redder than described as typical for the series. Also included are areas that are severely eroded and a few that are only slightly eroded.

This soil is well suited to tobacco, and the tobacco grown is of high quality. Erosion is a hazard, and moderate conservation practices are needed for regular cultivation. (Capability unit IIe–28; woodland group 2c1)

Monmouth fine sandy loam, 5 to 10 percent slopes, moderately eroded (MvC2).—This soil is sloping and readily eroded. Included with this soil in mapping are some areas that have a loam to silt loam surface layer. Also included are a few areas where the soil is redder than described as typical for the series, and some areas that are only slightly eroded. In a few places, some gullies have formed.

The hazard of erosion is severe because water runs rapidly through the loamy surface layer of this soil but flows only moderately slowly through the underlying sandy clay subsoil. Special conservation measures, intensively applied, are needed for safe cultivation. (Capability unit IIIe–28; woodland group 2c1)

Monmouth fine sandy loam, 10 to 15 percent slopes, moderately eroded (MvD2).—This soil is moderately steep and readily eroded. Included with this soil in mapping are a few areas in which the soil is redder than described as typical for the series. Also included are some areas that have a loam to silt loam surface layer, and a few areas that are only slightly eroded.

Even where special conservation measures are intensively applied, this soil is suitable for only occasional cultivation because of the erosion hazard. A clean-tilled crop can be safely grown about 1 year in 5 if appropriate conservation practices and good management are used. (Capability unit IVe–5; woodland group 2c1)

Monmouth fine sandy loam, 15 to 40 percent slopes (MvE).—This soil is steep and is highly susceptible to erosion. Large areas have sticky, olive-brown subsoil material mixed into the surface layer. Gullies, some of them very deep, have formed in places. Included with this soil in mapping are some areas that have a very sandy or silty surface layer, some areas that have wet spots, and a few areas where the soil is redder than described as typical for the series.

Most areas of this soil are wooded and should remain so. The cleared areas can be managed for limited grazing or forage, or they can be replanted in trees. (Capability unit VIe–2; woodland group 2c2)

Monmouth clay loam, 5 to 10 percent slopes, severely eroded (MwC3).—This soil has lost most of its original sandy surface layer through erosion, and its present surface layer is now clay loam. This layer, particularly when worked or plowed, is olive colored, firm, and sticky. It generally is in poor tilth. Included with this soil in mapping are a few areas where the surface layer is sandy clay or sandy clay loam. Gullies have formed in some places. Also included are a few areas that have profiles with redder materials than described as typical for the series.

Some conservation measures, intensively applied, are needed to check excessive soil loss. This soil is marginal for cultivated crops. (Capability unit IVe–3; woodland group 2c1)

Monmouth clay loam, 10 to 15 percent slopes, severely eroded (MwD3).—This soil is moderately steep and readily eroded. Runoff is very rapid because water cannot readily penetrate this soil. Gullies, some of them deep, have formed in some places. Included with this soil in mapping are a few areas that have a very red subsoil.

This soil is so susceptible to erosion that it is not suited to cultivated crops, even though conservation practices are used. A protective cover of plants is needed at all times. Under good management some areas may be used for grazing. (Capability unit VIe–2; woodland group 2c1)

Monmouth-Urban land complex, 0 to 5 percent slopes (MxB).—This complex consists of areas of Monmouth soils and disturbed land that is mainly of Monmouth soil material. These areas are used for community developments.

425–215—73——4

Typical Monmouth soils that have a fine sandy loam or loamy sand surface layer make up about 20 percent of the mapped area.

Original Monmouth soils that are covered with up to 18 inches of soil material, or have had as much as two-thirds of the original soil profile removed, make up about 50 percent. Monmouth soils that are covered to a depth of 18 inches or more, or have had nearly all their profile cut away, make up the remainder. The fill material has variable texture. (Capability unit and woodland group not assigned)

Monmouth-Urban land complex, 5 to 15 percent slopes (MxD).—Except for steeper slopes and a greater erosion hazard, this complex is similar to the Monmouth-Urban land complex, 0 to 5 percent slopes. The Monmouth soils in this complex have been graded, terraced, and generally rearranged for community developments. Buildings, streets, and sidewalks occupy from 15 to 30 percent of the complex.

Monmouth soils that have been slightly to severely eroded make up about 10 percent of the total area, and Monmouth soils that have been disturbed or altered by machines make up the remainder.

Monmouth soils that are covered with as much as 18 inches of soil material or have had as much as two-thirds of the soil profile removed make up about 60 percent of the acreage. Land fills 18 inches or more in depth, or places where the Monmouth soil profile has been cut away, make up about 30 percent. The surface layer of these severely disturbed Monmouth soils may be a mixture of sand, silt, and clay in any proportions. (Capability unit and woodland group not assigned)

Muirkirk Series

The Muirkirk series consists of very deep, well-drained to somewhat excessively drained soils that have a very thick, sandy surface layer and a red clay lower subsoil. These soils are nearly level to steep and are on uplands of the Coastal Plain. They formed in a fairly thick mantle of loamy sand over deposits of very old clay. The native vegetation is scrub hardwoods, but in heavily cutover areas and abandoned fields the dominant tree is Virginia pine.

In a typical profile the surface layer is loamy sand about 28 inches thick. It is olive brown in the upper part and yellowish brown in the lower part. The subsoil, about 32 inches thick, is friable, red sandy loam in the upper part and firm, red clay in the lower part.

The Muirkirk soils are easily worked and can be plowed for early crops because they have a thick sandy surface layer. This layer and the upper subsoil of Muirkirk soils are somewhat droughty during the drier seasons; however, the clayey material in the lower subsoil supplies plants with moisture during much of the growing season. These soils are suited to many crops, except as limited by a low available moisture capacity and a low natural fertility. Under good management, Muirkirk soils are well suited to truck crops. The unstable underlying clay places some restrictions on these soils for building sites, especially when the clay is very wet or after it has been disturbed by leveling or grading. Septic tanks do not function properly if they are placed in the underlying clayey material.

Typical profile of a Muirkirk loamy sand (in a cultivated field 300 feet east of Gambrills Road, and one-half mile south of New Cut Road):

Ap—0 to 10 inches, olive-brown (2.5Y 4/4) loamy sand; weak, fine, granular structure; loose; acid; abrupt, smooth boundary.

A2—10 to 20 inches, yellowish-brown (10YR 5/6) loamy sand; very weak, fine, granular structure; very friable; strongly acid; gradual, smooth boundary.

A3—20 to 28 inches, yellowish-brown (10YR 5/6) loamy sand; very weak, medium, subangular blocky structure; very friable; irregular pockets of B material in lower part; strongly acid; gradual, irregular boundary.

B21t—28 to 36 inches, red (2.5YR 4/8) sandy loam; weak, medium, blocky structure; slightly hard, friable, slightly sticky and slightly plastic; faint clay films; strongly acid; abrupt, smooth boundary.

IIB22t—36 to 60 inches, red (10R 4/6) clay; strong, fine and medium, blocky structure; very hard, firm, sticky and plastic; prominent, yellowish-red (5YR 4/6) clay films; very strongly acid.

The A horizon ranges from 21 to 31 inches in thickness. The B1 horizon, if present, is reddish loamy sand. The B21t horizon is sandy loam or light sandy clay loam. The IIB22t horizon grades gradually or abruptly into massive, red or red and white clay that is the IIC horizon.

The A2 and A3 horizons have a value ranging from 4 to 6 and a chroma ranging from 2 to 6. The B21t and IIB22t horizons have a hue of 2.5YR or 10R and a chroma ranging from 6 to 8. The IIC horizon, if present, is red or a mixture of colors. The solum is more than 59 inches thick.

The Muirkirk soils formed in material the same as or similar to that of the moderately well drained Matawan soils. The A horizon of the Muirkirk soils resembles that of the Evesboro and Galestown soils, but those soils lack the clay IIB22t horizon of Muirkirk soils. The B horizon of the Muirkirk soils is similar to that of the Christiana soils, but Muirkirk soils lack the silt loam A horizon of Christiana soils.

Muirkirk loamy sand, 0 to 5 percent slopes (MyB).—This soil has the profile described as typical for the Muirkirk series. The red clay of the subsoil tends to be unstable, especially where steep cuts or excavations are made. Included with this soil in mapping are some areas where the sandy surface layer is only 15 to 20 inches thick.

This soil is limited mainly by the sandiness and droughtiness of the thick surface layer. Erosion is also a hazard in sloping areas of this soil. (Capability unit IIs–5; woodland group 3s1)

Muirkirk loamy sand, 5 to 10 percent slopes (MyC).—This soil has a sandy surface layer and is sloping. Included with this soil in mapping are areas where the sandy surface layer is shallow to the underlying red clay.

The hazard of erosion is severe and is more of a concern in management than droughtiness in the sandy surface layer. Also, this soil is limited for community uses because the red clay of the subsoil tends to be unstable when it is wet. (Capability unit IIIe–5; woodland group 3s1)

Muirkirk loamy sand, 10 to 15 percent slopes (MyD).—This moderately steep soil erodes readily unless protected by plant cover. The underlying clay may be unstable if wet and has little resistance to shear if saturated with water during the wetter seasons. Included with this soil in mapping are some areas where the sandy surface layer is thinner than described as typical for the series. (Capability unit IVe–5; woodland group 3s1)

Muirkirk loamy sand, 15 to 30 percent slopes (MyE).—This steep soil is highly susceptible to erosion. The surface layer is very droughty during the drier summer months. The underlying clay may be unstable when wet. It has little resistance to shear if saturated with water. Entrenchments or steep cuts may cave in or collapse without warning. Included with this soil in mapping are a few areas with only a thin, sandy surface layer. Also included are a few places that have slopes over 30 percent.

A good plant cover with a deep root system is needed to protect this soil from erosion. The safest use for this soil is woodland, wildlife habitat, or recreation. (Capability unit VIIe–2; woodland group 3s2)

Muirkirk-Urban land complex, 0 to 5 percent slopes (MzB).—This complex consists of nearly level to gently sloping Muirkirk soils and disturbed land that is mainly of Muirkirk soil material. These areas have been used for community developments and occur in complex patterns. Although the individual soils can be recognized, the mapping of each soil separately is impractical.

Undisturbed Muirkirk soils average about 30 percent of each mapped area. Muirkirk soils that have been disturbed or altered by machines make up the remaining percentage.

Muirkirk soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the original soil profile removed make up about 40 percent of these areas. The surface layer in these areas may be loamy sand, red and white clay, or a mixture of sand, silt, and clay in any proportion. Land fills 18 inches or more in depth, or places where most of the Muirkirk soil has been cut away, make up about 30 percent of this unit. Here, the surface layer is a mixture of sand and clay in various proportions or a thin reddish or gray, sandy material overlying thick, red and gray clay. (Capability unit and woodland group not assigned)

Muirkirk-Urban land complex, 5 to 15 percent slopes (MzD).—Except for steeper slopes and, for the most part, a severe erosion hazard, this complex is like Muirkirk-Urban land complex, 0 to 5 percent slopes. These Muirkirk soils have been graded, terraced, and generally rearranged for community development. Buildings, streets, and sidewalks occupy 10 to 30 percent of the complex.

Muirkirk soils that are slightly to severely eroded average about 15 percent of each mapped area. Muirkirk soils that have been altered by machines make up the remainder.

The Muirkirk soils that are covered with up to 18 inches of soil material or have had as much as two-thirds of the soil profile removed make up about 55 percent of the acreage. Land fills 18 inches or more in depth, or places where the Muirkirk soil profile has been cut away, make up about 30 percent of this mapping unit. The surface layer of these very severely disturbed Muirkirk soils may be a mixture of sand and clay in any proportion or a thin layer of loose sand over a hard red clay. (Capability unit and woodland group not assigned)

Osier Series

The Osier series consists of deep, poorly drained, sandy soils on the Coastal Plain. These soils are in sandy depressions of the uplands. They formed in thick beds of sandy material that is saturated with water much of the time. The native vegetation is wetland hardwoods.

In a typical profile the surface layer is dark-gray loamy sand about 4 inches thick. The underlying material, to a depth of about 60 inches, is loose, light brownish-gray light loamy sand in the upper part and loose, streaked, light-gray to white fine sand in the lower part.

The Osier soils occur in small, widely scattered areas. When drained, these soils are generally easy to work and manage, and they can be used for farming, particularly for truck crops or home gardens. A large amount of fertilizer is generally needed. The seasonally high water table severely limits these soils as sites for buildings or septic tank filter fields.

Typical profile of Osier loamy sand (in a wooded area on the west side of Burns Crossing Road, one-half mile south of Ridgeway):

A1—0 to 4 inches, dark-gray (10YR 4/1) loamy sand; very weak, medium, granular structure; loose; abundant roots; very strongly acid; clear, smooth boundary.

C1—4 to 15 inches, light brownish-gray (2.5Y 6/2) light loamy sand; single grain; loose; common to plentiful roots; very strongly acid to extremely acid; gradual, irregular boundary.

C2g—15 to 60 inches, variable light-gray to white (5Y 7/1 to 8/1) fine sand; irregular streaks and splotches of grayish brown (2.5Y 5/2) and pale brown (10YR 6/3); single grain; loose; tends to shift or flow in lower part; extremely acid.

The C horizon ranges from sand or fine sand to light loamy sand, but in some places a IICg horizon occurs that is finer textured at a depth ranging from 4 to 6 feet.

In places where an Ap horizon occurs, it is light gray. All horizons, except the A1 horizon, have a hue ranging from 10YR to 2.5Y to 5Y and a value ranging from 6 to 8 in the matrix. All horizons have a chroma of 2 or less in the matrix. Mottles or streaks in the C horizon generally have a higher chroma than those in the profile described for the series.

The Osier soils formed in the same kind of sandy material as the somewhat excessively drained Galestown soils, the excessively drained Evesboro soils, and the moderately well drained Klej soils. The Osier soils are similar in color and drainage to the Fallsington soils, which are less sandy throughout and have a Bt horizon.

Osier loamy sand (Os).—This soil generally is nearly level, but in a few places slopes range from 1 to 5 percent. Included with this soil in mapping are some areas that have a darker, thicker surface layer than described as typical for the series.

If drained, this soil is suited to corn, soybeans, blueberries, and some truck crops. If outlets are adequate, tile drains generally function well in this soil. (Capability unit IVw–6; woodland group 2w1)

Othello Series

The Othello series consists of poorly drained, highly silty soils that have a mottled subsoil. These soils occur chiefly at low elevations, where they formed in a mantle of silt over older sediments that are dominantly sand. The native vegetation is mostly wetland hardwoods, including oaks, gums, swamp maple, and holly.

In a typical profile the surface layer is silt loam about 11 inches thick. This layer is dark grayish brown in the upper part and mottled olive gray in the lower part. The subsoil is mottled, gray or light gray and about 29 inches thick. It is friable heavy silt loam in the upper part and friable to firm light silty clay loam in the lower part.

The underlying material, to a depth of about 60 inches, is mottled, light-gray, friable fine sandy loam.

The Othello soils are easy to work at the right moisture content. Most uses require artificial drainage, particularly to lower the water table in spring. Permeability in the subsoil is moderately slow. Tile lines or ditches can be used for drainage. The Othello soils have a high available moisture capacity and are moderately to highly productive under good management. The chief limitations to use are those imposed by poor natural drainage and the seasonal high water table. Sewage disposal by septic tank is not practical.

Typical profile of Othello silt loam (in a level wooded area north of U.S. Highway No. 50, one mile west of the Bay Bridge):

A1—0 to 3 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure; soft, friable, slightly sticky; plentiful roots; very strongly acid; clear, smooth boundary.

A2g—3 to 11 inches, olive-gray (5Y 5/2) silt loam; common, medium, distinct mottles of brown (10YR 5/3) and light yellowish brown (10YR 6/4); weak, fine, granular structure; hard, friable, slightly sticky and slightly plastic; common roots; very strongly acid; clear, smooth boundary.

B21tg—11 to 25 inches, gray or light-gray (5Y 6/1) heavy silt loam; common, medium, distinct mottles of brown (10YR 5/3) and light yellowish brown (10YR 6/4); weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common roots; thin but distinct, pale-olive (5YR 6/3) clay films; extremely acid; clear, smooth boundary.

B22tg—25 to 40 inches, gray or light-gray (N 6/0) light silty clay loam; common, coarse, distinct mottles of brown (10YR 5/3); weak, medium, subangular blocky structure; hard, friable to firm, sticky and plastic; very few roots; thin, indistinct clay films; extremely acid; abrupt, smooth boundary.

IICg—40 to 60 inches, light-gray (N 7/0) fine sandy loam; abundant, very coarse, prominent mottles of strong brown (7.5YR 5/6); massive (structureless); friable; very few roots, extremely acid.

The B2t horizon ranges from heavy silt loam to silty clay loam. The average clay content in the B2t horizon is between 18 and 35 percent. The C horizon is loamy or sandy and may contain some fine, smooth pebbles. The solum ranges from about 24 to 40 inches in thickness.

The A horizon has a hue ranging from 10YR to 5Y, or neutral. The B horizon has a hue ranging from 2.5Y to 5Y, or neutral. The A1 horizon has a value of 3 to 4 and a chroma ranging from 0 to 2. The A2 horizon has a value ranging from 4 to 6 and a chroma ranging from 0 to 3. The B horizon has a matrix value of 5 or 6 and a chroma ranging from 0 to 2. Mottling has a value of 5 or 6 and a chroma ranging from 3 to 8. The C horizon has a gray matrix with high-chroma mottling, or a high-chroma matrix with gray mottling, or it may be gray without mottling.

Other poorly drained soils in Anne Arundel County are the Colemantown, Elkton, Fallsington, Osier, and Shrewsbury soils. The Othello soils have a coarser textured, less slowly permeable B horizon than the Elkton and Colemantown soils. They have a less sandy, more slowly permeable B horizon than the Fallsington and Osier soils. The Othello soils formed in the same sort of silty material as the well drained Matapeake soils and the moderately well drained Mattapex soils. They lack the glauconitic materials contained in the Colemantown and Shrewsbury soils.

Othello silt loam (Ot).—The surface layer of this nearly level soil has a soft and floury feel when dry, but in a few places it contains some gritty materials. Included with this soil in mapping are a few areas that have a subsoil that contains some sand and clay, and some other areas that have a surface layer that is sandier than the one described as typical for the series. Also included are a few areas that are shallow to the underlying sands.

Wetness is the most serious limitation in the management of this soil. The soil has severe limitations for many uses in community development. (Capability unit IIIw–7; woodland group 3w3)

Rumford Series

The Rumford series consists of deep, somewhat excessively drained soils that formed in sandy material containing some clay but little silt. These soils are nearly level to moderately steep and are on uplands of the Coastal Plain. The native vegetation is poorly developed hardwoods. Most wooded areas have been cut over many times, and Virginia pine is now the dominant tree.

In a typical profile the surface layer is loamy sand about 14 inches thick. This layer is dark grayish brown in the upper part and yellowish brown in the lower part. The subsoil is strong brown, friable, and about 18 inches thick. It is light sandy loam in the upper part and sandy loam in the lower part. The underlying material, to a depth of about 50 inches, is strong-brown, loose loamy sand.

The Rumford soils are easy to cultivate, and they warm up early in spring. Some of the earliest truck crops can be planted on them. They have a moderate available moisture capacity and a low natural fertility. Supplemental irrigation and large amounts of fertilizers are needed for full production of most crops. Rumford soils have few limitations as filter fields for septic tanks or for building sites, except where limited by slope.

Typical profile of a Rumford loamy sand (in a gently sloping cultivated area 300 feet south of Benfield Road, one-half mile west of Severna Park):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy sand; single grain (structureless); loose; plentiful roots; slightly acid; clear, smooth boundary.

A2—10 to 14 inches, yellowish-brown (10YR 5/4) loamy sand; single grain (structureless); loose; abundant roots; strongly acid; clear, smooth boundary.

B1—14 to 21 inches, strong-brown (7.5YR 5/6) light sandy loam; very weak, medium, subangular blocky structure; soft to slightly hard, friable; common roots; strongly acid; gradual, smooth boundary.

B2t—21 to 32 inches, strong-brown (7.5YR 5/6) sandy loam; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky; common roots; distinct clay bridging; strongly acid; gradual, smooth boundary.

C—32 to 50 inches, strong-brown (7.5YR 5/6) loamy sand; single grain (structureless); loose; few roots; very strongly acid.

The B2t horizon is normally sandy loam or light sandy clay loam that has an average clay content of less than 18 percent. There may be a thin, transitional B1 or B3 horizon, or both. The C horizon is sand or loamy sand that normally contains some smooth gravel. The solum generally ranges from 30 to 40 inches in thickness.

The A2 horizon has a value of 4 to 5 and a chroma of 3 to 4. The B1 and B2 horizons have a hue ranging to include 5YR. The B1 and B2 horizons have a value of 5 or 6 and a chroma of 6 or 8. The C horizon is the same color range as the B horizon; however, in some places, profiles are yellower in hue and have a higher value.

Among other similar soils, Rumford soils have coarser material throughout than the Marr and Sassafras soils. Rumford soils formed in coarser sand material and have a thicker A horizon than the Westphalia soils.

Rumford loamy sand, 0 to 2 percent slopes (RuA).—This soil has the profile described as typical for the Rumford series. The surface layer of this nearly level soil contains a considerable amount of medium and coarse sand. Included with this soil in mapping are some areas that have lost some of the original surface layer through erosion.

The use of this soil is somewhat limited by sandiness and by moderate available moisture capacity. In most places erosion is not a hazard. This soil is suited to general crops and to deep-rooted crops. Tobacco and truck crops of very high quality can be grown. Special practices are needed to maintain fertility, and irrigation is beneficial to crops in dry periods. (Capability unit IIs–4; woodland group 3o3)

Rumford loamy sand, 2 to 5 percent slopes, moderately eroded (RuB2).—This soil is gently sloping and has a surface layer that contains a considerable amount of medium and coarse sand. Included with this soil in mapping are some areas where the surface layer is thinner to the underlying sandy material than described as typical for the series.

The productivity of this sandy soil is restricted because only limited amounts of moisture and plant nutrients are available to plants. Tobacco and truck crops of very high quality can be grown if practices are used to conserve moisture and fertility, and if irrigation is used as needed. Erosion is a moderate hazard, and some erosion control practices are needed. (Capability unit IIs–4; woodland group 3o3)

Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RuC2).—This sloping soil is susceptible to erosion. The surface layer is dominantly medium and coarse sand. Some of the original surface layer has been lost through erosion. Included with this soil in mapping are a few areas where the soil is only slightly eroded.

The hazard of erosion is severe, and conservation measures are needed to control soil and water losses. Only small amounts of moisture and plant nutrients are available to plants. This soil is suited to general crops and to deep-rooted crops. Tobacco, truck crops, and other crops of high quality can be grown, but supplemental irrigation is needed. (Capability unit IIIe–33; woodland group 3o3)

Rumford loamy sand, 5 to 10 percent slopes, severely eroded (RuC3).—This soil has lost almost all of its original thick surface layer and the subsurface layer through erosion. This soil is shallow to the underlying sandy material, and the present sandy surface layer contains much strong-brown subsoil material. Gullies, some of them deep, have formed in some places.

The soil is suited only to an occasional cultivated crop. Tobacco of high quality can be grown. The erosion hazard is severe, and measures are needed to conserve both soil and moisture. (Capability unit IVe–5; woodland group 3o3)

Rumford loamy sand, 10 to 15 percent slopes, moderately eroded (RuD2).—This soil has a surface layer that is dominantly medium and coarse sand. Included with this soil in mapping are some places where the soil is only slightly eroded.

This soil is susceptible to erosion and conservation measures are needed to conserve soil and moisture where the soil is used for row crops. It has a moderate available moisture capacity and low natural fertility. (Capability unit IVe–5; woodland group 3o3)

Rumford-Urban land complex, 0 to 5 percent slopes (RyB).—This complex consists of nearly level to gently sloping Rumford soils and disturbed land that is mainly of Rumford soil material. These areas are used for community developments. The soils have been rearranged into complex patterns. Although the individual soils can be recognized, mapping them separately is impractical. Undisturbed Rumford soils make up about 30 percent of each mapped area. Rumford soils that have been disturbed or altered by machines make up the remainder. The Rumford soils that are covered with up to 18 inches of soil material, or have had as much as two-thirds of the original soil profile removed, make up about 50 percent of the original acreage. The surface layer of these areas may be loamy sand or a mixture of sand, silt, and clay in any proportion. Land fills that are 18 inches or more in depth, or places where most of the Rumford soil has been cut away, make up about 20 percent of the complex. Here, the surface layer is a mixture of sand, silt, and clay in various proportions, or loose yellow and red sand. (Capability unit and woodland group not assigned)

Rumford-Urban land complex, 5 to 15 percent slopes (RyD).—This mapping unit has steeper slopes than Rumford-Urban land complex, 0 to 5 percent slopes. Erosion is a severe hazard on these slopes. In addition to this hazard, the steepness of the slopes is a definite limitation for residential and recreational uses. This steepness limits the use of these soils for playgrounds, camp sites, roads, and streets. The Rumford soils in this complex have been graded, terraced, and generally rearranged for community developments. Buildings, streets, and sidewalks occupy from 15 to 30 percent of the complex.

The Rumford soils that have been slightly to severely eroded make up about 10 percent of each mapped area. Rumford soils that have been disturbed or altered by machines make up the remainder.

The Rumford soils that are covered with as much as 18 inches of soil material or have had as much as two-thirds of the soil profile removed make up about 60 percent of the acreage. Land fills 18 inches or more in depth, or places where the Rumford soil profile has been cut away, make up about 30 percent of this mapping unit. The surface layer of these severely disturbed Rumford soils may be a mixture of sand, silt, and clay in any proportion. (Capability unit and woodland group not assigned)

Sassafras Series

The Sassafras series consists of deep, well-drained soils on uplands that have a loamy surface layer and a yellowish-brown to strong-brown subsoil of dominantly sandy clay loam. These soils formed in beds of sandy sediments containing moderate amounts of silt and clay. The native vegetation is mostly mixed hardwoods, but Virginia pine is common in second-growth and cutover areas.

In a typical profile the surface layer is fine sandy loam about 11 inches thick. It is very dark gray in the upper part and dark grayish brown in the lower part. The subsoil, about 26 inches thick, has an upper 6-inch layer of yellowish-brown, friable fine sandy loam and a

lower 20-inch layer of strong-brown, firm sandy clay loam. The underlying material, to a depth of about 50 inches, is yellowish-brown, loose very coarse sand and small gravel.

The Sassafras soils are easy to work and warm up quickly in spring. They have a moderate to high available moisture capacity and can be highly productive under very good management. Some high-quality tobacco is grown on these soils. The Sassafras soils are suited to practically all uses, except where limited by slope and the risk of erosion. They have few limitations for building sites and as filter fields for septic tanks, except where limited by slope.

Typical profile of a Sassafras fine sandy loam (in a wooded area 50 feet east of Gambrills Road, one-half mile north of its intersection with State Route 175):

O1—1 inch to 0, litter of pine needles.
A1—0 to 2 inches, very dark gray (N 3/0) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; very strongly acid; abrupt, smooth boundary.
A2—2 to 11 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, very fine, crumb structure; very friable; many fine roots; very strongly acid; abrupt, smooth boundary.
B1—11 to 17 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium, subangular blocky structure; friable; many roots; very strongly acid; gradual, smooth boundary.
B21t—17 to 30 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, coarse, subangular blocky structure; firm, sticky and plastic; few roots; distinct clay films on ped faces; very strongly acid; gradual, wavy boundary.
B22t—30 to 37 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; distinct clay films on ped faces; very strongly acid; clear, smooth boundary.
C—37 to 50 inches, yellowish-brown (10YR 5/4) very coarse sand and small gravel; structureless; loose; few roots; very strongly acid.

The A horizon is fine sandy loam or loam. The B2t horizon is sandy clay loam or light sandy clay loam. The B2t horizon has an average clay content ranging from about 18 to 30 percent. The C horizon is coarser textured than the B horizon and commonly contains some fine, smooth pebbles. The solum ranges from about 30 to 40 inches in thickness.

The A1 horizon has a value of 3 to 4 and a chroma ranging from 0 to 2. The A2 horizon has a value of 4 to 5 and a chroma ranging from 2 to 4. The B1 and B2 horizons have a hue ranging from 5YR to 10YR, a value ranging from 4 to 6, and a chroma ranging from 4 to 6. The C horizon is similar in color to the B horizon, but it may have a higher value and a higher chroma. Unlimed profiles are strongly acid to very strongly acid throughout.

The Sassafras soils formed in material similar to that in which the moderately well drained Woodstown and poorly drained Fallsington soils formed. Among similar well-drained soils, Sassafras soils contain less silt throughout than the Matapeake soils, and they contain much less fine sand in the B horizon than the Marr and Westphalia soils.

Sassafras fine sandy loam, 0 to 2 percent slopes (SaA).—This soil has the profile described as typical for the Sassafras series. Included with this soil in mapping are a few areas where the surface layer contains a considerable amount of coarse sand. Also included are some areas that are slightly eroded, a few areas with reddish-brown, compacted sand in the subsoil, and some areas with micaceous materials throughout the profile.

This soil is well suited to most general crops and to deep-rooted crops. It has a moderate to high available moisture capacity and is easily worked. Under good management, this soil is suited to tobacco, and the tobacco grown is of high quality. Limitations to use for community development are few. (Capability unit I–5; woodland group 3o3)

Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded (SaB2).—This gently sloping soil has lost some of its original surface layer through erosion. Included with this soil in mapping are some areas where the soil is shallower to the underlying sand than described as typical for the series and areas where the surface layer contains some sticky subsoil material. Also included are a few areas where gullies have formed, some areas where the surface layer is dominantly coarse sand, and some areas where there are some micaceous materials in the profile.

This soil is well suited to most general crops and to deep-rooted crops, but because the hazard of erosion is moderate, some conservation measures are needed. Under good management, this soil is suited to most crops. The tobacco grown is of high quality. The available moisture capacity is moderate to high. During prolonged periods of drought, crops may be damaged. (Capability unit IIe–5; woodland group 3o3)

Sassafras fine sandy loam, 5 to 10 percent slopes, moderately eroded (SaC2).—This soil is susceptible to serious damage by erosion if it is cultivated, unless conservation measures are used. Included with this soil in mapping are some areas where the surface layer is dominantly coarse sand. Also included are areas where the surface layer consists of loam or silt loam, some areas where a few gullies have formed, and places where some micaceous materials are in the profile.

The soil is suited to general crops and to deep-rooted crops. Under good management, tobacco of high quality can be grown. The available moisture capacity is moderate to high. Drought may occur during long dry periods. (Capability unit IIIe–5; woodland group 3o3)

Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded (SaC3).—This soil has a surface layer that consists mostly of material from the subsoil and is strong brown. The surface layer is somewhat sticky and tends to bake or crust as it dries. Gullies have formed in many areas. Included with this soil in mapping are a few areas that have a silt loam surface layer, and some other areas that have coarser sand in the surface layer.

This soil can be used only occasionally for cultivated crops. It is suited to permanent pasture and hay. (Capability unit IVe–5; woodland group 3o3)

Sassafras fine sandy loam, 10 to 15 percent slopes, moderately eroded (SaD2).—This moderately steep soil is readily eroded if used in regular cultivation without protection. Included with this soil in mapping are some areas where the surface layer is dominantly silt or coarse sand. Also included are some areas that are only slightly eroded.

This soil can be used only occasionally for row crops. It is suitable for hay and pasture. (Capability unit IVe–5; woodland group 3o3)

Sassafras fine sandy loam, 10 to 15 percent slopes, severely eroded (SaD3).—This soil has been so severely damaged by erosion that it can no longer be safely cultivated. The surface layer is hard when dry. In places there are many gullies, some of them deep. Included with this

soil in mapping are a few areas that contain many mica flakes. Also included are areas where some silt or coarse sand is dominant in the surface layer, and a few areas that have some reddish-brown compacted material beneath the surface layer.

Permanent vegetation is needed on this soil. Its use for community development can be severely limited. (Capability unit VIe–2; woodland group 3o3)

Sassafras fine sandy loam, 15 to 40 percent slopes (SaE).—This soil is steep, sandy, and readily eroded. Included with this soil in mapping are many areas that have a reddish-brown compacted subsoil. Also included are severely eroded areas where the surface layer is mostly subsoil material. Gullies, some of them deep, have formed in places. In a few places the surface layer consists of loose coarse sand; in others there are considerable amounts of silt. There are a few wet spots and some areas with mica flakes in the soil.

This soil is not suitable for cultivation, but if grasses or legumes are well established, it can be grazed or used for hay. Limitations to use for community development are severe. (Capability unit VIe–2; woodland group 3r1)

Sassafras loam, 0 to 2 percent slopes (SfA).—This soil is nearly level and has a surface layer that consists of much smooth fine material but has a slightly gritty feel. This surface layer contains less sand than the surface layer of Sassafras fine sandy loam, 0 to 2 percent slopes. Included with this soil in mapping are some spots that have a thick, dark surface layer and a few areas that have some mica flakes.

This soil has very few limitations for use as cropland. It has moderate natural fertility and a high available moisture capacity. This soil is well suited to most general crops, and tobacco of medium quality can be grown. (Capability unit I–4; woodland group 3o3)

Sassafras loam, 2 to 5 percent slopes, moderately eroded (SfB2).—This soil has a surface layer that consists of much smooth fine material but has a slightly gritty feel, especially when wet. This layer contains less sand than the surface layer of Sassafras fine sandy loam, 0 to 2 percent slopes, and has a higher available moisture capacity. Included with this soil in mapping are some areas that are only slightly eroded and a few areas that are severely eroded. Also included are a few areas that have a thick, dark surface layer and some areas that have mica flakes in the profile.

This deep soil is well suited to most general crops, and tobacco of medium quality can be grown. The risk of erosion is moderate, and some conservation measures are needed. (Capability unit IIe–4; woodland group 3o3)

Sassafras-Urban land complex, 0 to 5 percent slopes (SnB).—This complex consists of Sassafras soils and disturbed land that is mainly of Sassafras soil material. These areas are used for community developments.

The Sassafras soils that are undisturbed make up about 25 percent of the complex. The Sassafras soils that are covered with as much as 18 inches of fill material or have had as much as two-thirds of the original soil profile removed make up about 50 percent. Fills that are 18 inches or more thick, or places where most of the Sassafras soil profile has been cut away, make up the remainder. The fill material varies in texture, but most commonly it is sandy or gravelly, or both. (Capability unit and woodland group not assigned)

Sassafras-Urban land complex, 5 to 15 percent slopes (SnD).—Except for steeper slopes, this complex is similar to Sassafras-Urban land complex, 0 to 5 percent slopes. These steeper slopes result in a definite hazard of erosion and limit the soils for use in community developments, such as septic systems, playgrounds, streets, and roads.

The Sassafras soils that are undisturbed make up about 10 percent of the complex. The Sassafras soils that are covered with as much as 18 inches of soil material or have had the original profile partly cut away make up about 50 percent. Fills 18 inches or more thick, or places where most of the Sassafras soil profile has been cut away, make up the remaining 40 percent of the mapping unit. Some uses are limited by the steeper slopes. Streets, buildings, and other structures occupy as much as 40 percent of this complex. (Capability unit and woodland group not assigned)

Shrewsbury Series

The Shrewsbury series consists of deep, poorly drained soils that have a dark yellowish-brown fine sandy loam or silt loam surface layer and an olive-gray heavy sandy clay loam subsoil. These soils are level to nearly level and are on uplands. They formed in old deposits of loamy material that contains a moderate amount of greensand. The native vegetation is mixed upland hardwoods; however, Virginia pine may be the dominant species in severely cutover areas.

In a typical profile the surface layer is silt loam about 14 inches thick. This layer is dark yellowish brown in the upper part and mottled, dark grayish brown in the lower part. The subsoil is mottled, olive gray, and about 26 inches thick. It is firm to friable heavy sandy clay loam in the upper part and friable light sandy clay loam in the lower part. The underlying material, to a depth of about 60 inches, is mottled, olive-gray, loose to very friable fine sandy loam.

The Shrewsbury soils have a water table that is at or very near the surface during wet periods and seldom falls much below a depth of 3 feet. Permeability of these soils is moderate. Artificial drainage is generally not difficult. The Shrewsbury soils have a high available moisture capacity and are moderately to rather highly productive under good management. They are very strongly acid unless limed. These soils are well suited to many crops after drainage has been established, but planting dates may be late. Wetness severely limits the use of the Shrewsbury soils as sites for permanent buildings and for disposing of sewage effluent from septic tanks.

Typical profile of Shrewsbury silt loam (in an abandoned field on the north side of an unnamed road one-half mile east of State Route 3, one mile north of its intersection with State Route 424):

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, crumb structure; slightly hard, friable, slightly plastic and slightly sticky; abundant roots; very strongly acid; clear, smooth boundary.

A2g—8 to 14 inches, dark grayish-brown (2.5Y 4/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; plentiful roots; very strongly acid; clear, smooth boundary.

B21tg—14 to 21 inches, olive-gray (5Y 5/2) heavy sandy clay loam; common, fine, prominent mottles of strong

brown (7.5YR 5/6); moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few roots; discontinuous clay films; very strongly acid; gradual, smooth boundary.

B22tg—21 to 36 inches, olive-gray (5Y 4/2) heavy sandy clay loam; common, coarse, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; hard, friable, sticky and plastic; very few roots; discontinuous clay films; abundant glauconite particles; very strongly acid; abrupt, smooth boundary.

B3g—36 to 40 inches, olive-gray (5Y 4/2) light sandy clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/8); weak, fine and medium, subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; very few roots; abundant glauconite particles; very strongly acid; abrupt, smooth boundary.

C—40 to 60 inches, olive-gray (5Y 4/2) fine sandy loam; coarse, prominent mottles of strong brown (7.5YR 5/8); single grain (structureless); loose to very friable, slightly sticky; abundant glauconite particles; very strongly acid.

The A horizon is fine sandy loam or silt loam. The B2t horizon ranges from heavy sandy loam to loam and heavy sandy clay loam. The B2t horizon has a clay content ranging from 18 to 30 percent. In some places a very thin layer containing an accumulation of soft iron is directly below the B3 horizon. The C horizon is sandy loam, fine sandy loam, or loamy sand in which much glauconite is present.

The Shrewsbury soils formed in the same kind of material as the well drained Collington soils and the moderately well drained Adelphia soils. The Shrewsbury soils are similar to the poorly drained Fallsington and Colemantown soils in many respects, but the Fallsington soils do not contain greensand and the Colemantown soils are finer textured in the B horizon.

Shrewsbury fine sandy loam (Sr).—This nearly level soil is limited in use by poor natural drainage. Included with this soil in mapping are several areas that are very poorly drained and have a darker surface layer. Also included are some areas in which the surface layer is coarser textured than fine sandy loam, and some small spots that are gravelly.

Wetness limits the use of this soil for farming (fig. 7) and is the most important concern of management. Drainage by tile or open ditches is required for growing some crops. (Capability unit IIIw–6; woodland group 2w1)

Shrewsbury silt loam (Ss).—This nearly level soil has the profile described as typical for the series. Included with this soil in mapping are a few areas that have some gritty material in the surface layer.

Wetness is the most serious problem in managing this soil. Ditches or tile can be used for drainage. If adequately drained, this soil is suited to corn and soybeans and to some hay and pasture plants. Limitations to use for community development are severe. (Capability unit IIIw–7; woodland group 2w1)

Swamp

Swamp (Sw) consists of areas of very wet land that is covered by fresh water a large part of the time. Because these areas are swampy, they have not been examined in great detail. This land consists of sand, silt, clay, gravel, muck, or peat, or a mixture of any of these materials. Some places have a thick surface layer of black organic material.

This mapping unit is level and generally wooded. It produces little usable timber and is too wet for normal woodland management. It is not used for farming and generally is suitable only as habitat for wetland wildlife. Some parts of this mapping unit that are in public parks and recreational areas might be developed for hiking, nature study, hunting, fishing, or similar activities. (Capability unit VIIw–1; woodland group not assigned)

Tidal Marsh

Tidal marsh (Tm) consists of many small and a few fairly large, level areas that are covered regularly by tidal water. In Anne Arundel County, most areas of Tidal marsh border the Chesapeake Bay and the Patuxent River, but a few areas are along secondary streams. The soil material in these areas has not been examined in detail, but it ranges from sand to clay and is mucky or peaty in some places. Most of these areas are very salty, and a few are brackish.

Tidal marsh commonly supports only grasses, sedges, and a few other herbaceous plants, but it supports shrubs in some places. Generally, there are no trees other than willows and the like. All areas of Tidal marsh are likely to be flooded by unusually high tides.

Tidal marsh is not used for farming. It does not produce crops, pasture, or timber and probably will never be reclaimed for any of these purposes. The only practical uses are as wildlife habitat and, in some channels, for fishing or boating. Some areas have been filled by dredges or other means, and others may be filled in the future. Such reclaimed areas are classified as Made land, which is discussed elsewhere in this survey. (Capability unit VIIIw–1; woodland group not assigned)

Urban Land

Urban land (Ur) consists of areas covered by pavements and buildings. Paved areas are mostly parking lots that surround the industrial plants, educational institutions, and shopping centers in the county. Most of these areas are nearly level or gently sloping, but a few have slopes of 5 to 15 percent.

The paved areas are generally designed to lead all runoff into adequate storm drainage systems, but some of these drainage systems are not properly constructed, and severe erosion of adjacent soils is caused by the runoff. (Capability unit and woodland group not assigned)

Westphalia Series

The Westphalia series consists of well-drained soils that have a fine sandy loam surface layer and are shallow to deep over sand. These soils are gently sloping to steep and are on uplands. They have a dark grayish-brown to yellowish-brown surface layer and a bright yellowish-brown subsoil. They formed in thick deposits of fine sand containing a small amount of clay. The sand particles in these soils are especially fine and uniform in size. The native vegetation consists of mixed hardwoods and Virginia pine.

In a typical profile the surface layer is fine sandy loam about 9 inches thick. It is dark grayish brown in the upper part and yellowish brown in the lower part.

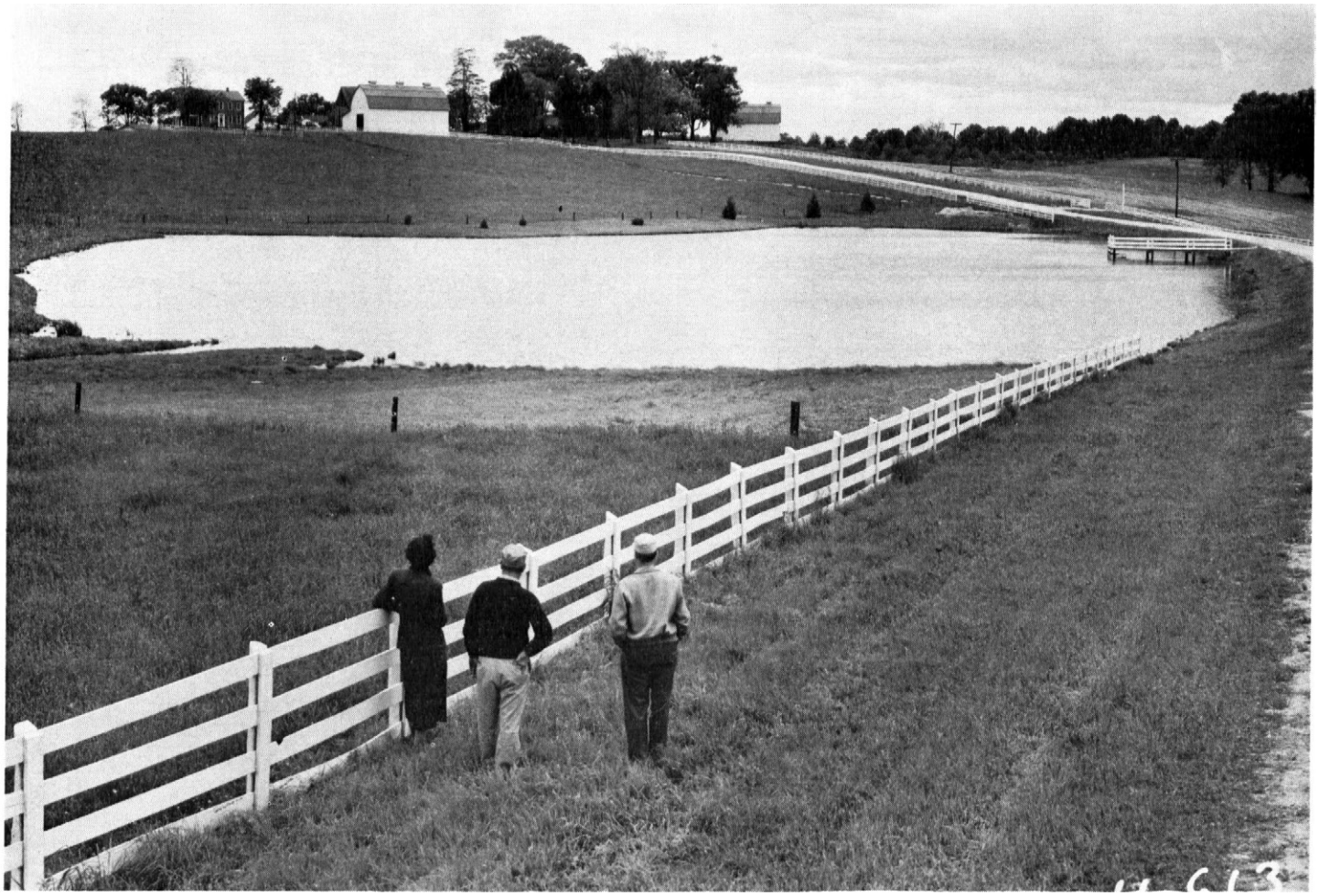

Figure 7.—**Farm pond used for fishing and boating. The soil is Shrewsbury fine sandy loam.**

The subsoil is yellowish brown and about 18 inches thick. It is friable heavy fine sandy loam in the upper part and very friable light fine sandy loam in the lower part. The underlying material, to a depth of about 60 inches, is yellow, loose loamy fine sand.

Westphalia soils are very easy to work and warm up quickly in spring. Although they have only moderate to moderately low available moisture capacity, they are productive under good management. They are prized for the production of high-quality tobacco. Westphalia soils are suited to many uses, except where limited by slope, the risk of erosion, and the limited available moisture capacity. Supplemental irrigation can be an important factor in crop growth during seasons of low or poorly distributed rainfall. Westphalia soils make good building sites and their suitability as filter fields for septic tanks is limited only by slope.

Typical profile of a Westphalia fine sandy loam (one-half mile from the east side of Polling House Road, one-half mile north of State Route 422):

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; soft, very friable; plentiful roots; very strongly acid; abrupt, smooth boundary.

A2—4 to 9 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, fine, granular structure; soft, very friable; plentiful roots; very strongly acid; clear, smooth boundary.

B2t—9 to 17 inches, yellowish-brown (10YR 5/6) heavy fine sandy loam; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky; common roots; some faint, discontinuous clay films in and around pores; strongly acid; gradual, wavy boundary.

B3—17 to 27 inches, yellowish-brown (10YR 5/8) light fine sandy loam; weak, fine to medium, subangular blocky structure; soft, very friable; common roots; strongly acid; gradual, wavy boundary.

C—27 to 60 inches, yellow (10YR 7/8) loamy fine sand; single grain (structureless); loose; few roots; very strongly acid.

The B2t horizon is fine sandy loam to heavy fine sandy loam. The clay content of the B2t horizon is greater than that of the A horizon and generally ranges from 10 to 18 percent. The C horizon ranges from fine sand to loamy fine sand and has a clay content of not more than 10 percent. Some areas have profiles that contain a few small, well-rounded, quartz pebbles. The solum ranges from 15 to 36 inches in thickness.

Plowed soils have an Ap horizon that has a somewhat higher chroma than the A1 horizon. A transitional B1 horizon is in some places. The A2 horizon has a value of 4 to 5 and a chroma ranging from 4 to 6. The B2 and B3 horizons have a hue of 10YR or 7.5YR, a value of 4 or

5, and a chroma ranging from 6 to 8. The C horizon can be the same color as the B horizon, but may have a higher value and, in some places, a hue of 2.5Y. These horizons may be variegated or streaked. The grade of structure in the B horizon is normally weak, but may be moderate in some profiles that have a thick solum or very fine sand. Unlimed profiles are strongly acid to very strongly acid.

The Westphalia soils are similar to the well-drained Marr, Sassafras, and Rumford soils. The Westphalia soils generally have a thinner solum and a coarser textured B horizon than the Marr and Sassafras soils. The Westphalia soils formed in finer sand than the Rumford and Sassafras soils.

Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded (WaB2).—This soil has the profile described as typical for the Westphalia series. The risk of erosion is moderate. Included with this soil in mapping are a few areas where the soil is shallow to the underlying sand and areas where the original surface layer is mixed with some of the yellowish-brown subsoil. Also included are some areas where the surface layer is mostly very fine sand, a few areas that are nearly level, and some areas that have been disturbed by construction machinery.

This soil is well suited to general crops and to deep-rooted crops. Tobacco of high quality can be grown. This soil may be somewhat droughty during long dry periods. It is readily eroded unless conservation measures are applied to protect it adequately. (Capability unit IIe–5; woodland group 3o3)

Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded (WaC2).—This soil is sloping and susceptible to erosion. Included with this soil in mapping are some areas where the surface layer is loamy very fine sand to very fine sand. Also included in mapping are areas that are only slightly eroded and a few areas that have been disturbed by construction machinery.

This soil is suited to general crops and to deep-rooted crops. Under good management, tobacco of high quality can be grown. The soil has moderate to moderately low available moisture capacity, and this causes it to be somewhat droughty during long dry periods. Intensive conservation measures are needed to help control erosion. (Capability unit IIIe–5; woodland group 3o3)

Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded (WaC3).—This soil has lost most of its original surface layer through erosion. Many shallow gullies and a few deep ones have formed. Included with this soil in mapping are some areas that have a large amount of very fine sand in the surface layer.

This soil can be used only occasionally for cultivated crops. Tobacco of high quality can be grown. This soil has a moderately low available moisture capacity, causing the soil to be droughty during long dry periods. Intensive conservation measures are needed to help control erosion wherever crops are grown on this soil. (Capability unit IVe–5; woodland group 3o3)

Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded (WaD3).—This soil has lost all of its original surface layer through erosion. In many places the present surface layer consists entirely of loose loamy fine sand that normally is the underlying material of the Westphalia soils. Many shallow and some deep gullies have formed. Included with this soil in mapping are a few areas that have a very fine sand surface layer. Also included are areas that are only slightly or moderately eroded.

This soil is not suitable for cultivated crops. It is suitable for woodland, grazing, or other less intensive uses. Protective vegetation is needed on this soil. (Capability unit VIe–2; woodland group 3r1)

Westphalia fine sandy loam, 20 to 50 percent slopes, severely eroded (WaE3).—This steep to very steep soil should be used only for the production of trees or for plants that provide wildlife food and protection. On a few areas gullies have formed, some of them quite deep. Included with this soil in mapping are areas where the surface layer contains large amounts of very fine sand and some areas that are only slightly or moderately eroded. (Capability unit VIIe–2; woodland group 3r1)

Woodstown Series

The Woodstown series consists of deep, moderately well drained soils that have a surface layer of brown and yellowish-brown sandy loam or loam and a subsoil of yellowish-brown sandy clay loam with some mottles of gray in the lower part. These soils occur on uplands, where they formed in sandy sediments that contain moderate amounts of silt and clay. The native vegetation is chiefly water-tolerant hardwoods, dominantly oaks.

In a typical profile the surface layer is sandy loam about 12 inches thick. This layer is brown in the upper part and yellowish brown in the lower part. The subsoil is mottled, yellowish brown, and about 22 inches thick. It is friable light sandy clay loam in the upper part and firm sandy clay loam in the lower part. The underlying material, to a depth of about 50 inches, is light brownish-gray, loose sand.

The Woodstown soils are easy to work, but they tend to be wet in the spring and planting dates may be delayed. These soils are easily drained by using ditches or tile lines wherever there are adequate outlets. The Woodstown soils have a moderate to high available moisture capacity and are moderately productive under good management. They are limited for some uses, such as building sites and filter fields for septic tanks, by seasonal wetness.

Typical profile of a Woodstown sandy loam (in a cultivated area, 1,000 feet from the west side of State Route 178, 0.6 mile south of Dorr's Corner):

Ap—0 to 8 inches, brown (10YR 5/3) sandy loam; weak, fine, granular structure; soft, very friable; abundant roots; strongly to very strongly acid; abrupt, smooth boundary.

A2—8 to 12 inches, yellowish-brown (10YR 5/4) sandy loam; weak, fine, granular structure; slightly hard, friable, slightly sticky; plentiful roots; very strongly acid; clear, wavy boundary.

B21t—12 to 25 inches, yellowish-brown (10YR 5/6) light sandy clay loam; faint mottles of strong brown (7.5YR 5/6) and few, medium, distinct mottles of light brownish gray (2.5Y 6/2) in the lower part; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common roots; thin clay films; extremely acid; clear, wavy boundary.

B22t—25 to 34 inches, yellowish-brown (10YR 5/8) sandy clay loam; common, medium, distinct mottles of light brownish gray (2.5Y 6/2) and yellowish red (5YR 4/6); moderate, medium, subangular blocky structure; hard, firm, sticky and slightly plastic; few roots; yellowish-brown (10YR 5/4) clay films; extremely acid; abrupt, smooth boundary.

IIC—34 to 50 inches, light brownish-gray (2.5Y 6/2) sand; single grain (structureless); loose; extremely acid.

The A horizon is sandy loam or loam. The B2t horizon ranges from heavy sandy loam to sandy clay loam; the sand in this horizon is dominantly medium or fine sand. The C horizon is everywhere coarser textured than the B horizon and normally is coarser textured than the A horizon. Normally, the solum ranges from about 30 to 42 inches in thickness.

All horizons have a matrix hue mainly of 10YR or 2.5Y, but a hue of 5Y is in the lower B horizon and the C horizon of some profiles. In undisturbed areas there is an A1 horizon ranging from 2 to 5 inches in thickness. The A1 horizon has a value of 3 to 4 and a chroma of 2 to 3. The A2 horizon has a value ranging from 4 to 6 and a chroma of 3 to 4. The B2t horizon has a matrix value of 5 or 6 and a matrix chroma of 6 or 8. The unmottled upper part of the B21t horizon is at least 10 inches thick. The B22t horizon is mottled with grayish colors that have a chroma of 2 or less. The B22t horizon may also have some high-chroma mottling. Some profiles have a thin, transitional B1 horizon or B3 horizon, or both. The C horizon is of uniform color or variegated and may or may not have low-chroma mottling. Unlimed profiles are very strongly acid to extremely acid throughout, and acidity commonly increases with depth.

Compared with other soils having similar drainage, Woodstown soils lack the Bx horizon of the Beltsville and the Butlertown soils, and they lack the slowly permeable, clayey B horizon of the Keyport soils. They lack the highly silty B horizon of the Mattapex soils. The Woodstown soils formed in the same kind of materials as the well-drained Sassafras soils and the poorly drained Fallsington soils.

Woodstown sandy loam, 0 to 2 percent slopes (WdA).—This soil has the profile described as typical for the Woodstown series. Included with this soil in mapping are some areas that have a surface layer that is dominantly fine sand or silty material.

If properly drained, this soil is suitable for most crops. Because this soil has moderate permeability, drainage can be improved by installing open ditches or tile. The sandy loam surface layer is easy to cultivate, and under good management, this soil is highly productive. Some areas have been used for urban purposes. (Capability unit IIw–5; woodland group 2o1)

Woodstown sandy loam, 2 to 5 percent slopes (WdB).—This soil is similar to Woodstown sandy loam, 0 to 2 percent slopes, except that it is gently sloping. Surface water drains away readily. Included with this soil in mapping are some areas that have large amounts of fine sand or silty material in the surface layer. Also included are a few areas where the soil is thinner to the underlying sand than described as typical for the series, and a few areas where gullies have formed. There are some included areas having slopes greater than 5 percent.

This soil is suited to tobacco, and tobacco of medium quality can be grown. Drainage may be needed for some crops. Some conservation measures are needed if the soil is used in regular cultivation. (Capability unit IIe–36; woodland group 2o1)

Woodstown loam, 0 to 2 percent slopes (WoA).—This nearly level soil has a surface layer that consists of much fine material, but has a slightly gritty feel. It has less sand than the surface layer of Woodstown sandy loam, 0 to 2 percent slopes. This soil has moderate natural fertility and a high available moisture capacity. Included with this soil in mapping are some areas where the surface layer is thicker and darker in color than that described as typical for the series.

If properly drained, this soil is suitable for most crops. It has slower permeability than Woodstown sandy loam, 0 to 2 percent slopes, and therefore drainage is slightly slower than on that soil. Drainage can be improved by installing open ditches or tile. Under good management the soil is moderately productive. This soil is suited to tobacco, but the quality of tobacco grown may be low, and during an excessively wet year there is a danger of crop failure. (Capability unit IIw–1; woodland group 2o1)

Woodstown loam, 2 to 5 percent slopes (WoB).—This gently sloping soil is susceptible to erosion in addition to having the limitation of excess water. Surface water drains away more readily from this soil than it does from Woodstown loam, 0 to 2 percent slopes; therefore, improvement of drainage is not as difficult. This soil has more fine material in the surface layer than Woodstown sandy loam, 0 to 2 percent slopes. Included with this soil in mapping are some areas that have a thicker and darker colored surface layer than described as typical for the series. Also included are areas where the soil is thin to the underlying sandy material and where some gullies have formed.

Under good management this soil is well suited to tobacco, but quality of tobacco grown will be low. Some conservation measures are needed if the soil is used in regular cultivation, and improved drainage is needed for some crops. (Capability unit IIe–16; woodland group 2o1)

Use and Management of the Soils

Because cropland in the county is being used extensively for building sites, streets and roads, shopping centers, and recreational areas, the use of soils in town and country planning and development is discussed first in this section. The second part gives information, mainly in tables, about the use of soils in engineering. The third part gives the system of capability classification used by the Soil Conservation Service and provides some suggestions for managing soils by capability units. Other parts discuss general management requirements, give estimates of average yields of common crops under two levels of management, and describe use of soils as woodland and for wildlife.

Town and Country Planning

The use of soils in community development is covered in three parts. The first part describes residential and related uses of the soils and gives the estimated degree and the kind of limitations of each soil in the county for specified uses. The second part provides information on the use of soils in community planning. The third part discusses the use of soils for recreational activities and rates the limitations of each soil for specified recreational uses. Much of the information in this subsection is in tables 4 and 5.

TABLE 4.—*Estimated degree and kind of*

[No estimates are given for Cut and fill land, Gravel and borrow pits, Made land, and Urban land. An asterisk in the first column indicates properties and limitations, and for this reason it is necessary to follow carefully the

Soil series and map symbols	Onsite disposal of sewage effluent (septic tanks)	Sewage lagoons
Adelphia:		
AdA, AsA	Severe: moderately slow permeability; moderately high seasonal water table.	Slight
AdB, AsB	Severe: moderately slow permeability; moderately high seasonal water table.	Moderate: slope
Beltsville: BeB2, BlB [1]	Severe: slow permeability	Moderate: slope
Bibb: Bm	Severe: moderate to slow permeability; seasonal high water table; flood hazard.[2]	Severe: flood hazard [2]
Butlertown:		
BuA	Severe: moderately slow permeability.	Slight
BuB2	Severe: moderately slow permeability.	Moderate: slope
BuC2, BuC3	Severe: moderately slow permeability.	Severe: slope
BuD3	Severe: moderately slow permeability.	Severe: slope
Chillum:		
CaB2, CbB [1]	Moderate to severe: moderately slow to moderate permeability; compact substratum.	Moderate: slope
CaC2	Moderate to severe: moderately slow to moderate permeability; compact substratum.	Severe: slope
Christiana:		
CcB2	Severe: slow permeability	Moderate: slope
CcC2, CdC3	Severe: slow permeability	Severe: slope
Coastal beaches: Ce	Severe: saline fluctuating water table; tidal flooding.[2]	Severe: very rapid permeability; tidal flooding.[2]
Codorus: Ch	Severe: flood hazard [2]	Severe: flood hazard [2]
Colemantown: Ck, Cm	Severe: moderately slow to very slow permeability; seasonal high water table.	Slight
Collington:		
CnB2	Slight	Moderate: slope
CnC2	Slight	Severe: slope
CoA, CpA	Slight	Slight
CoB2, CpB2, CpuB [1]	Slight	Moderate: slope
CoC2, CoC3	Slight	Severe: slope
CoD2, CoD3, CpuD [1]	Moderate: slope	Severe: slope
CoE	Severe: slope	Severe: slope
Comus: Cr	Severe: flood hazard [2]	Severe: flood hazard [2]

See footnotes at end of table.

limitation for community development

that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different instructions for referring to other series that appear in the first column of this table]

Sites for homes with basements (3 stories or less)	Roads and highways	Streets and parking lots	Cemeteries
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; moderately slow permeability.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table; slope.	Severe: slow permeability.
Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table; slope.	Moderate: perched water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table; slope.	Severe: slope	Moderate: perched water table; moderately slow permeability.[3]
Moderate: perched water table; slope.	Moderate: perched water table; slope.	Severe: slope	Severe: perched water table; moderately slow permeability; slope; severe erosion.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Slight.
Severe: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: slow permeability.
Severe: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability; slope.	Severe: subsoil shrinkage and instability; slope.	Severe: slow permeability.
Severe: fluctuating water table; tidal flooding; poor stability.	Severe: fluctuating water table; tidal flooding; poor stability.	Severe: fluctuating water table; tidal flooding; poor stability.	Severe: fluctuating water table; tidal flooding; extreme sandiness.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; moderately slow to very slow permeability.
Slight	Slight	Moderate: slope	Moderate: loamy sand surface.
Slight	Moderate: slope	Severe: slope	Moderate: loamy sand surface.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Slight.[3]
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.[4]
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard.

TABLE 4.—*Estimated degree and kind of*

Soil series and map symbols	Onsite disposal of sewage effluent (septic tanks)	Sewage lagoons
Croom:		
CsC2	Moderate to severe: moderate to moderately slow permeability; slope.	Severe: high gravel content; slope
CsD2, CtD [1]	Moderate to severe: moderate to moderately slow permeability; slope.	Severe: high gravel content; slope
CsE	Severe: slope	Severe: high gravel content; slope
Donlonton:		
DnA	Severe: moderately slow to slow permeability; moderately high seasonal water table.	Slight
DnB2, DuB [1]	Severe: moderately slow to slow permeability; moderately high seasonal water table.	Moderate: slope
Elkton: Ek, En	Severe: slow to very slow permeability; seasonal high water table.	Slight
*Evesboro:		
EoB, ErB	Slight [2]	Severe: rapid permeability [2]
ErC, EsC, EuC [1]	Slight to moderate: slope [2]	Severe: rapid permeability; slope [2]
EsE	Severe: slope [2]	Severe: rapid permeability; slope [2]
For Galestown part of mapping units EsC and EsE, refer to Galestown series.		
Fallsington: Fa	Severe: seasonal high water table	Moderate: moderate permeability
Galestown: GaB	Slight [2]	Severe: rapid permeability [2]
Hatboro: Ha	Severe: seasonal high water table; flood hazard.[2]	Severe: flood hazard [2]
Howell:		
HfB2, HgB2, HsB2, HtB2	Severe: slow permeability	Moderate: slope
HyC3, HzC3	Severe: slow permeability	Severe: slope
HyD3	Severe: slow permeability; slope	Severe: slope
HyE3	Severe: slow permeability; slope	Severe: slope
Keyport:		
KeA, KpA	Severe: slow permeability; moderately high seasonal water table.	Slight
KeB, KpB2, KrB [1]	Severe: slow permeability; moderately high seasonal water table.	Moderate: slope
Klej: Ks	Moderate: moderately high seasonal water table.[2]	Severe: rapid permeability [2]
Loamy and clayey land:		
LoB	Severe: moderately slow permeability.	Moderate: slope
LoC, LoD	Severe: moderately slow permeability.	Severe: slope
Marr:		
MfB2	Slight	Moderate: slope
MfC2, MfC3	Slight to moderate: slope	Severe: slope
MfD2, MfD3	Moderate to severe: slope	Severe: slope
MfE3	Severe: slope	Severe: slope

See footnotes at end of table.

limitation for community development—Continued

Sites for homes with basements (3 stories or less)	Roads and highways	Streets and parking lots	Cemeteries
Slight	Moderate: slope	Severe: slope	Moderate: moderate to moderately slow permeability; gravelly sandy loam surface.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: moderate to moderately slow permeability; gravelly sandy loam surface; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Severe: moderately slow to slow permeability.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; slope.	Severe: moderately slow to slow permeability.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; slow to very slow permeability.
Slight	Slight	Moderate: slope	Severe: loose loamy sand.
Slight to moderate: slope	Moderate: slope	Severe: slope	Severe: loose loamy sand.
Moderate to severe: slope	Severe: slope	Severe: slope	Severe: loose loamy sand; slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Slight	Slight	Moderate: slope	Severe: loose loamy sand.
Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Slight	Slight	Moderate: slope	Severe: slow permeability.
Slight to moderate: slope	Moderate: slope	Severe: slope	Severe: severely eroded; slow permeability.
Moderate: slope [5]	Moderate to severe: slope	Severe: slope	Severe: severely eroded; slow permeability; slope.
Severe: slope	Severe: slope	Severe: slope	Severe: severely eroded; slow permeability; slope.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Severe: slow permeability.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; slope.	Severe: slow permeability.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Severe: loose loamy sand.
Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: slow permeability.
Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability; slope.	Severe: slow permeability.
Slight	Slight	Moderate: slope	Slight.
Slight to moderate: slope	Moderate: slope	Severe: slope	Slight to moderate: slope.[3]
Moderate: slope [5]	Moderate to severe: slope	Severe: slope	Moderate to severe: slope.[4]
Severe: slope	Severe: slope	Severe: slope	Severe: severely eroded; slope.

TABLE 4.—*Estimated degree and kind of*

Soil series and map symbols	Onsite disposal of sewage effluent (septic tanks)	Sewage lagoons
Matapeake:		
MkA, MmA	Slight to moderate: moderate permeability.	Moderate: moderate permeability
MkB2, MmB2	Slight to moderate: moderate permeability.	Moderate: moderate permeability; slope.
MmC2, MmC3	Slight to moderate: moderate permeability.	Severe: slope
MmD3	Moderate: moderate permeability; slope.	Severe: slope
Matawan:		
MnA	Severe: moderately slow permeability; moderately high seasonal water table.	Slight [6]
MnB	Severe: moderately slow permeability; moderately high seasonal water table.	Moderate: slope [6]
Mattapex:		
MpA, MrA	Severe: moderately slow permeability; perched water table.	Slight
MpB2, MrB2	Severe: moderately slow permeability; perched water table.	Moderate: slope
MrC2	Severe: moderately slow permeability; perched water table.	Severe: slope
Mixed alluvial land: Mt	Severe: high water table; flood hazard.[2]	Severe: flood hazard [2]
Monmouth:		
MuA, MvA	Severe: moderately slow permeability.	Slight
MuB2, MvB2, MxB [1]	Severe: moderately slow permeability.	Moderate: slope
MuC2, MuC3, MvC2, MwC3	Severe: moderately slow permeability.	Severe: slope
MuD2, MuD3, MvD2, MwD3, MxD [1]	Severe: moderately slow permeability.	Severe: slope
MvE	Severe: moderately slow permeability; slope.	Severe: slope
Muirkirk:		
MyB, MzB [1]	Severe: moderately slow permeability.[2 7]	Moderate: slope [6]
MyC	Severe: moderately slow permeability.[2 7]	Severe: slope
MyD, MzD [1]	Severe: moderately slow permeability; slope.	Severe: slope
MyE	Severe: slope	Severe: slope
Osier: Os	Severe: seasonal high water table	Severe: rapid permeability
Othello: Ot	Severe: moderately slow permeability; seasonal high water table.	Slight

See footnotes at end of table.

limitation for community development—Continued

Sites for homes with basements (3 stories or less)	Roads and highways	Streets and parking lots	Cemeteries
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Slight to moderate.[3]
Moderate: slope	Moderate: slope	Severe: slope	Severe: severely eroded.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; moderately slow permeability.
Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; slope.	Moderate: moderately high seasonal water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table.	Moderate: perched water table; slope.	Moderate: perched water table; moderately slow permeability.
Moderate: perched water table.	Moderate: perched water table; slope.	Severe: slope	Moderate: perched water table; moderately slow permeability.
Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Slight	Slight	Slight	Moderate: moderately slow permeability.
Slight	Slight	Moderate: slope	Moderate: moderately slow permeability.
Slight	Moderate: slope	Severe: slope	Moderate: moderately slow permeability.[3]
Moderate: slope	Moderate: slope	Severe: slope	Moderate: moderately slow permeability; slope.[4]
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability; slope.	Severe: moderately slow permeability.
Severe: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability; slope.	Severe: slope	Severe: moderately slow permeability.
Severe: subsoil shrinkage and instability.	Moderate: subsoil shrinkage and instability; slope.	Severe: slope	Severe: moderately slow permeability.
Severe: subsoil shrinkage and instability; slope.	Severe: slope	Severe: slope	Severe: moderately slow permeability; slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; loose loamy sand.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.

TABLE 4.—*Estimated degree and kind of*

Soil series and map symbols	Onsite disposal of sewage effluent (septic tanks)	Sewage lagoons
Rumford:		
RuA	Slight	Moderate: moderately rapid permeability.
RuB2, RyB [1]	Slight	Moderate: moderately rapid permeability; slope.
RuC2, RuC3	Slight	Severe: slope
RuD2, RyD [1]	Moderate: slope	Severe: slope
Sassafras:		
SaA, SfA	Slight	Moderate: moderate permeability
SaB2, SfB2, SnB [1]	Slight	Moderate: moderate permeability; slope.
SaC2, SaC3	Slight	Severe: slope
SaD2, SaD3, SnD [1]	Moderate: slope	Severe: slope
SaE	Severe: slope	Severe: slope
Shrewsbury: Sr, Ss	Severe: seasonal high water table	Severe: moderate to rapid permeability.
Swamp: Sw	Severe: ponded [2]	Severe: ponded [2]
Tidal marsh: Tm	Severe: tidal flooding [2]	Severe: tidal flooding [2]
Westphalia:		
WaB2	Slight	Severe: moderate to moderately rapid permeability.
WaC2, WaC3	Slight to moderate: slope	Severe: moderate to moderately rapid permeability; slope.
WaD3	Moderate to severe: slope	Severe: moderate to moderately rapid permeability; slope.
WaE3	Severe: slope	Severe: moderate to moderately rapid permeability; slope.
Woodstown:		
WdA, WoA	Moderate: moderately high seasonal water table.	Moderate: moderate permeability
WdB, WoB	Moderate: moderately high seasonal water table.	Moderate: moderate permeability; slope.

[1] No estimates for Urban land part. The area is under construction, the soils have been disturbed, and properties are variable.
[2] Hazard of pollution to nearby wells, springs, streams, and other bodies and sources of water.
[3] Limitation moderate if soil is severely eroded and slope is between 5 and 10 percent.
[4] Limitation severe if soil is severely eroded and slope is more than 10 percent.

limitation for community development—Continued

Sites for homes with basements (3 stories or less)	Roads and highways	Streets and parking lots	Cemeteries
Slight	Slight	Slight	Moderate: loamy sand surface.
Slight	Slight	Moderate: slope	Moderate: loamy sand surface.
Slight Moderate: slope	Moderate: slope Moderate: slope	Severe: slope Severe: slope	Moderate: loamy sand surface. Moderate: loamy sand surface slope.
Slight Slight	Slight Slight	Slight Moderate: slope	Slight. Slight.
Slight Moderate: slope Severe: slope	Moderate: slope Moderate: slope Severe: slope	Severe: slope Severe: slope Severe: slope	Slight.[3] Moderate: slope.[4] Severe: slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: ponded	Severe: ponded [2]	Severe: ponded [2]	Severe: ponded.[2]
Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding.[2]
Slight	Slight	Moderate: slope	Slight.
Slight to moderate: slope	Moderate: slope	Severe: slope	Slight to moderate: slope.[4]
Moderate: slope [5]	Moderate to severe: slope	Severe: slope	Severe: severely eroded.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: moderately high seasonal water table. Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table. Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table. Moderate: moderately high seasonal water table; slope.	Moderate: moderately high seasonal water table. Moderate: moderately high seasonal water table.

[5] Limitation severe in urban areas and other densely built-up residential areas if the slope is more than 15 percent.
[6] Limitation slight or moderate if sandy material is removed.
[7] Severe hazard of polluting adjacent downslope areas.

TABLE 5.—*Estimated degree and kind of*

(No estimates are given for Cut and fill land, Gravel and borrow pits, Made land, and Urban land. An asterisk in the first column indicates properties and limitations, and for this reason it is necessary to follow carefully the

Soil series and map symbols	Campsites (intensive use)	
	Tents	Trailers
Adelphia:		
AdA, AsA	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.
AdB, AsB	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; slope.
Beltsville: BeB2, BlB [1]	Severe: slow permeability	Severe: slow permeability
Bibb: Bm	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Butlertown:		
BuA	Moderate: perched water table; moderately slow permeability.	Moderate: perched water table; moderately slow permeability.
BuB2	Moderate: perched water table; moderately slow permeability.	Moderate: perched water table; moderately slow permeability; slope.
BuC2, BuC3	Moderate: perched water table; moderately slow permeability; slope.	Severe: slope
BuD3	Moderate: perched water table; moderately slow permeability; slope.	Severe: slope
Chillum:		
CaB2, CbB [1]	Slight	Moderate: slope
CaC2	Moderate: slope	Severe: slope
Christiana:		
CcB2	Severe: slow permeability	Severe: slow permeability
CcC2, CdC3	Severe: moderately slow to slow permeability.	Severe: moderately slow to slow permeability; slope.
Coastal beaches: Ce	Severe: fluctuating water table; tidal flooding; extreme sandiness.	Severe: fluctuating water table; tidal flooding; extreme sandiness.
Codorus: Ch	Severe: flood hazard	Severe: flood hazard
Colemantown: Ck, Cm	Severe: seasonal high water table; moderately slow to very slow permeability.	Severe: seasonal high water table; moderately slow to very slow permeability.
Collington:		
CoA, CpA	Slight	Slight
CnB2, CoB2, CpB2, CpuB [1]	Slight	Moderate: slope
CnC2, CoC2, CoC3	Moderate: slope	Severe: slope
CoD2, CoD3, CpuD [1]	Moderate: slope	Severe: slope
CoE	Severe: slope	Severe: slope
Comus: Cr	Severe: flood hazard	Severe: flood hazard
Croom:		
CsC2	Moderate: high gravel content; moderate to moderately slow permeability; slope.	Severe: slope
CsD2, CtD [1]	Moderate: high gravel content; moderate to moderately slow permeability; slope.	Severe: slope
CsE	Severe: slope	Severe: slope
Donlonton: DnA, DnB2, DuB [1]	Severe: moderately slow to slow permeability.	Severe: moderately slow to slow permeability.

See footnotes at end of table.

limitation for specified recreational uses

that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different instructions for referring to other series that appear in the first column of this table]

Athletic fields and other intensive play areas	Parks and extensive play and picnic areas	Lawns, golf fairways, and landscaping	Paths and trails
Moderate: moderately high seasonal water table.	Slight	Slight where surface layer is silt loam, moderate where this layer is sandy loam.	Slight.
Moderate: moderately high seasonal water table; slope.	Slight	Slight where surface layer is silt loam, moderate where this layer is sandy loam.	Slight.
Severe: slow permeability	Slight	Slight	Slight.
Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Moderate: perched water table; moderately slow permeability.	Slight	Slight	Slight.
Moderate: perched water table; moderately slow permeability; slope.	Slight	Slight	Slight.
Severe: slope	Slight	Slight [2]	Slight.
Severe: slope	Moderate: slope	Severe: severely eroded	Slight.
Moderate: slope	Slight	Slight	Slight.
Severe: slope	Slight	Slight	Slight.
Severe: slow permeability	Slight	Slight	Slight.
Severe: slow permeability; slope.	Slight [4]	Slight [4]	Slight.[4]
Severe: fluctuating water table; tidal flooding; extreme sandiness.	Severe: tidal flooding; extreme sandiness.	Severe: extreme sandiness; tidal flooding.	Severe: extreme sandiness.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard.
Severe: seasonal high water table; moderately slow to very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Slight	Slight	Slight	Slight.
Moderate: slope	Slight	Slight, except moderate for loamy sand.	Slight.
Severe: slope	Slight	Slight, except moderate for loamy sand.[2]	Slight.
Severe: slope	Moderate: slope	Moderate: slope [3]	Slight.
Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard.
Severe: slope	Slight	Moderate: gravelly sandy loam.	Slight.
Severe: slope	Moderate: slope	Moderate: gravelly sandy loam; slope.	Slight.
Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: moderately slow to slow permeability.	Slight	Slight	Slight.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Campsites (intensive use)	
	Tents	Trailers
Elkton: Ek, En	Severe: seasonal high water table; slow to very slow permeability.	Severe: seasonal high water table; slow to very slow permeability.
*Evesboro:		
EoB, ErB	Moderate: loose loamy sand	Moderate: loose loamy sand; slope
ErC, EsC, EuC [1]	Moderate: loose loamy sand; slope	Severe: slope
EsE	Severe: slope	Severe: slope
(For Galestown part of EsC and EsE, see Galestown series.)		
Fallsington: Fa	Severe: seasonal high water table	Severe: seasonal high water table
Galestown: GaB	Moderate: loose loamy sand	Moderate: loose loamy sand; slope
Hatboro: Ha	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Howell:		
HfB2, HgB2, HsB2, HtB2	Severe: slow permeability	Severe: slow permeability
HyC3, HzC3	Severe: slow permeability	Severe: slow permeability; slope
HyD3	Severe: slow permeability; slope	Severe: slow permeability; slope
HyE3	Severe: slow permeability; slope	Severe: slow permeability; slope
Keyport: KeA, KeB, KpA, KpB2, KrB [1]	Severe: slow permeability	Severe: slow permeability
Klej: Ks	Moderate: moderately high seasonal water table; loose loamy sand.	Moderate: moderately high seasonal water table; loose loamy sand.
Loamy and clayey land:		
LoB	Severe: slow permeability	Severe: slow permeability
LoC	Severe: slow permeability	Severe: slow permeability; slope
LoD	Severe: slow permeability	Severe: slow permeability; slope
Marr:		
MfB2	Slight	Moderate: slope
MfC2, MfC3	Moderate: slope	Severe: slope
MfD2, MfD3	Moderate to severe: slope	Severe: slope
MfE3	Severe: slope	Severe: slope
Matapeake:		
MkA, MmA	Slight	Slight
MkB2, MmB2	Slight	Moderate: slope
MmC2, MmC3	Moderate: slope	Severe: slope
MmD3	Moderate: slope	Severe: slope
Matawan:		
MnA	Moderate: moderately high seasonal water table; moderately slow permeability.	Moderate: moderately high seasonal water table; moderately slow permeability.
MnB	Moderate: moderately high seasonal water table; moderately slow permeability.	Moderate: moderately high seasonal water table; moderately slow permeability; slope.
Mattapex:		
MpA, MrA	Moderate: perched water table; moderately slow permeability.	Moderate: perched water table; moderately slow permeability.
MpB2, MrB2	Moderate: perched water table; moderately slow permeability.	Moderate: perched water table; moderately slow permeability; slope.
MrC2	Moderate: perched water table; moderately slow permeability; slope.	Severe: slope

See footnotes at end of table.

limitation for specified recreational uses—Continued

Athletic fields and other intensive play areas	Parks and extensive play and picnic areas	Lawns, golf fairways, and landscaping	Paths and trails
Severe: seasonal high water table; slow to very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: loose loamy sand; slope.	Moderate: loose loamy sand	Severe: loose loamy sand	Moderate: loose loamy sand.
Severe: slope	Moderate: loose loamy sand	Severe: loose loamy sand	Moderate: loose loamy sand.
Severe: slope	Severe: slope	Severe: loose loamy sand; slope.	Moderate to severe: loose loamy sand; slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: loose loamy sand; slope.	Moderate: loose loamy sand	Severe: loose loamy sand	Moderate: loose loamy sand.
Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.
Severe: slow permeability	Slight	Slight	Slight.
Severe: slow permeability; slope.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer; severely eroded.	Moderate: clay loam surface layer.
Severe: slow permeability; slope.	Moderate to severe: clay loam surface layer; slope.	Severe: slope; severely eroded.	Moderate: clay loam surface layer; slope.
Severe: slow permeability; slope.	Severe: slope	Severe: slope; severely eroded.	Moderate to severe: clay loam surface layer; slope.
Severe: slow permeability	Slight	Slight	Slight.
Moderate: moderately high seasonal water table; loose loamy sand.	Moderate: loose loamy sand	Moderate: loose loamy sand	Moderate: loose loamy sand.
Severe: slow permeability	Slight	Slight to moderate: variable texture.	Slight.
Severe: slow permeability; slope.	Slight	Slight to moderate: variable texture.	Slight.
Severe: slow permeability; slope.	Moderate: slope	Moderate: slope	Slight.
Moderate: slope	Slight	Slight	Slight.
Severe: slope	Slight to moderate: slope	Slight to moderate: slope [2]	Slight.
Severe: slope	Moderate to severe: slope	Moderate to severe: slope [3]	Slight to moderate: slope.
Severe: slope	Severe: slope	Severe: slope; severely eroded	Moderate to severe: slope.
Slight	Slight	Slight	Slight.
Moderate: slope	Slight	Slight	Slight.
Severe: slope	Slight	Slight [2]	Slight.
Severe: slope	Moderate: slope	Severe: severely eroded	Slight.
Moderate: moderately high seasonal water table; moderately slow permeability.	Slight	Moderate: loamy fine sand surface layer.	Slight.
Moderate: moderately high seasonal water table; moderately slow permeability; slope.	Slight	Moderate: loamy fine sand surface layer.	Slight.
Moderate: perched water table; moderately slow permeability.	Slight	Slight	Slight.
Moderate: perched water table; moderately slow permeability; slope.	Slight	Slight	Slight.
Severe: slope	Slight	Slight	Slight.

TABLE 5.—*Estimated degree and kind of*

Soil series and map symbols	Campsites (intensive use)	
	Tents	Trailers
Mixed alluvial land: Mt	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Monmouth:		
MuA, MvA	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.
MuB2, MvB2, MxB [1]	Moderate: moderately slow permeability.	Moderate: moderately slow permeability; slope.
MuC2, MuC3, MvC2, MwC3	Moderate: moderately slow permeability; slope.	Severe: slope
MuD2, MuD3, MvD2, MwD3, MxD [1]	Moderate: moderately slow permeability; slope.	Severe: slope
MvE	Severe: slope	Severe: slope
Muirkirk:		
MyB, MzB [1]	Moderate: thick loamy sand surface; moderately slow permeability below 3 feet.	Moderate: thick loamy sand surface; moderately slow permeability below 3 feet; slope.
MyC	Moderate: thick loamy sand surface; moderately slow permeability below 3 feet; slope.	Severe: slope
MyD, MzD [1]	Moderate: thick loamy sand surface; moderately slow permeability below 3 feet; slope.	Severe: slope
MyE	Severe: slope	Severe: slope
Osier: Os	Severe: seasonal high water table	Severe: seasonal high water table
Othello: Ot	Severe: seasonal high water table	Severe: seasonal high water table
Rumford:		
RuA	Slight	Slight
RuB2, RyB [1]	Slight	Moderate: slope
RuC2, RuC3	Moderate: slope	Severe: slope
RuD2, RyD [1]	Moderate: slope	Severe: slope
Sassafras:		
SaA, SfA	Slight	Slight
SaB2, SfB2, SnB [1]	Slight	Moderate: slope
SaC2, SaC3	Moderate: slope	Severe: slope
SaD2, SaD3, SnD [1]	Moderate: slope	Severe: slope
SaE	Severe: slope	Severe: slope
Shrewsbury: Sr, Ss	Severe: seasonal high water table	Severe: seasonal high water table
Swamp: Sw	Severe: ponded	Severe: ponded
Tidal marsh: Tm	Severe: tidal flooding	Severe: tidal flooding
Westphalia:		
WaB2	Slight	Moderate: slope
WaC2, WaC3	Moderate: slope	Severe: slope
WaD3	Moderate to severe: slope	Severe: slope
WaE3	Severe: slope	Severe: slope
Woodstown:		
WdA, WoA	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table.
WdB, WoB	Moderate: moderately high seasonal water table.	Moderate: moderately high seasonal water table; slope.

[1] No estimates for Urban land part. The areas are under construction, the soils have been disturbed, and properties are variable.
[2] Limitation moderate if soil is severely eroded and slope is between 5 and 10 percent.

limitation for specified recreational uses—Continued

Athletic fields and other intensive play areas	Parks and extensive play and picnic areas	Lawns, golf fairways, and landscaping	Paths and trails
Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table: flood hazard.	Severe: high water table; flood hazard.
Moderate: moderately slow permeability.	Slight	Slight, except moderate for loamy sand.	Slight.
Moderate: moderately slow permeability; slope.	Slight	Slight, except moderate for loamy sand.	Slight.
Severe: slope	Slight	Slight, except moderate for loamy sand.[2]	Slight.
Severe: slope	Moderate: slope	Moderate: slope [3]	Slight.
Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Moderate: loamy sand surface layer; moderately slow permeability below 3 feet; slope.	Slight	Moderate: loamy sand surface layer.	Slight.
Severe: slope	Slight	Moderate: loamy sand surface layer.	Slight.
Severe: slope	Moderate: slope	Moderate: loamy sand surface layer; slope.	Slight.
Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; loose loamy sand.	Severe: seasonal high water table.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: loamy sand surface layer.	Slight	Moderate: loamy sand surface layer.	Slight.
Moderate: loamy sand surface layer; slope.	Slight	Moderate: loamy sand surface layer.	Slight.
Severe: slope	Slight	Moderate: loamy sand surface layer.[2]	Slight.
Severe: slope	Moderate: slope	Moderate: loamy sand surface layer; slope.	Slight.
Slight	Slight	Slight	Slight.
Moderate: slope	Slight	Slight	Slight.
Severe: slope	Slight	Slight [2]	Slight.
Severe: slope	Moderate: slope	Moderate: slope [3]	Slight.
Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded.
Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding.
Moderate: slope	Slight	Slight	Slight.
Severe: slope	Slight to moderate: slope	Slight to moderate: slope [2]	Slight.
Severe: slope	Moderate to severe: slope	Severe: severely eroded	Slight to moderate: slope.
Severe: slope	Severe: slope	Severe: slope; severely eroded	Moderate to severe: slope.
Moderate: moderately high seasonal water table.	Slight	Moderate: sandy loam, loam surface layer.	Slight.
Moderate: moderately high seasonal water table; slope.	Slight	Moderate: sandy loam, loam surface layer.	Slight.

[3] Limitation severe if soil is severely eroded and slope is more than 10 percent.
[4] Limitation severe if soil is severely eroded and slope is between 5 and 10 percent.

Use of soils in community planning

Anne Arundel County is rapidly becoming a part of the Washington-Baltimore metropolitan area and is under sharp pressures as it changes in character from a rural county to an urban community within the larger metropolitan complex. Farming is still important to the economy of the county, and tobacco is the most important crop. However, according to the U.S. Census of Agriculture, only 28.6 percent of the 266,880 acres of the county was being used for farming in 1964.

Present urban and suburban uses of land in the county are widely scattered. Even within many of the more concentrated urban areas, there are large open spaces; however, the Washington-Baltimore region is expected to grow from a present population of 4.3 million to 11 million within the next 35 years. Most of this growth is likely to occur in these areas surrounding the present urban areas, including a large part of Anne Arundel County.

In this county the 431 miles of shoreline on the Chesapeake Bay and the adjoining rivers and creeks, a mild climate, and large areas of gently rolling land provide an unexcelled recreational area for year-round living. This recreational feature attracts many people who seek permanent residence in the county and use the highways for commuting to places of employment in Washington or Baltimore. Fort Meade, the United States Army Military Reservation west of Odenton, and the U.S. Naval Reservation on the Severn River, with their associated permanent defense agencies, have also caused many people to seek residence in the county. This expanding population requires the construction of many additional homes, shopping centers, and highways that permanently remove the land from farming or forest uses.

Accompanying these increased uses of land are requests for information about soil and land conditions that affect nonfarm uses. The most urgent need is for information about the limitations of soils for use in the disposal of sewage effluent from septic tanks and as foundations for many kinds of buildings, mainly houses and apartment buildings. Also, information is needed about the use of soils in earthmoving and landscaping, sanitary land fills, streets and parking lots, and other uses.

Table 4 gives the estimated degree and the kind of limitations of each soil in the county for specified uses. The table can be used as a general guide by those concerned with many uses in community development. It should be particularly helpful to planning and zoning boards and commissions and to those who develop areas for residential and other community uses. In addition, it should be helpful to the individual landowner. The user is cautioned that for onsite construction, especially of large structures, more complete data should be obtained through detailed investigations. Foundation conditions should always be investigated for each site.

In table 4 the limitation of each soil in the county for specified nonfarm uses is rated *slight*, *moderate*, or *severe*. A rating of slight may indicate that the soil has no limitations, though most soils in the county are at least slightly limited in use. These ratings are made on the basis of the greatest single limitation, but more than one limitation may be listed. For example, flooding may be a severe limitation of a soil for some uses, but poor drainage may also be listed because it limits the soil for other uses.

A rating of severe for a particular use does not necessarily mean that the soil so rated cannot be put to that use. For example, a soil that has a high water table is rated severe for cemeteries, but it can be used for cemeteries if drainage is improved or the water table is lowered. A soil that has a wet, plastic, unstable substratum can be used as foundations for homes if it can be drained and stabilized, but the expense of draining and stabilizing the soil may not be justified.

Following are the main factors considered in estimating the limitations of the soils of this county for specified uses, as shown in table 4.

Onsite disposal of sewage effluent (septic tanks).—Permeability of the soil, depth to a seasonally high water table, natural drainage, depth to an impervious layer, steepness of slope, and the hazard of flooding.

Sewage lagoons.—Permeability of the soil, depth to an impervious layer, steepness of slope, hazard of flooding, and content of organic matter.

Sites for homes with basements (3 stories or less).—Depth to water table, natural drainage, steepness of slope, depth to bedrock (assuming a 6-foot basement), hazard of flooding, shrink-swell properties, and stability. (This interpretation is a general guide for homesites and does not preclude the need for detailed investigations of a construction site. Foundation conditions should always be investigated at the site because of variations within the mapping unit.)

Roads and highways.—Texture of the surface layer and subsoil, plasticity and stability of the subsoil and substratum, wetness, height of water table, susceptibility to frost action, and limitations to working the soil when it is wet or frozen.

Streets and parking lots.—Wetness and depth of water table, steepness of slope, hazard of flooding, depth to bedrock, and kind of bedrock.

Cemeteries.—Depth to water table, natural drainage, depth to impervious layer, plasticity and stability of the subsoil and substratum, degree of stoniness, hazard of flooding, and steepness of slope.

Use of the soil survey in community planning

In planning the use of soils for different kinds of community development, reliable information about the soils is needed so that the best use of each area can be determined. Generally, soils most suitable for farming are also the soils most suitable for building sites and other nonfarm uses, though some soils are more suitable for one kind of use than another. The nature of the soils therefore influences the selection of the kinds of soil that are suitable for an orderly plan for land use (figs. 8, 9, 10).

In Anne Arundel County, the soils that are well suited to farming without artificial drainage are the Chillum, Collington, Howell, Marr, Matapeake, Monmouth, Rumford, Sassafras, and Westphalia soils, especially if they are nearly level or gently sloping. Many other soils are also suited to farming if they are adequately drained or are well protected. The use of soils for farming is discussed in the section "Descriptions of the Soils," in the subsection "Capability Groups of Soils," and in other parts of this soil survey.

Figure 8.—**Filling of flood plain to increase number of houses in subdivision.**

The soils that have a limitation rating of slight for disposal of effluent from septic tanks are those soils in the Collington, Evesboro, Galestown, Marr, Rumford, Sassafras, and Westphalia series having a slope range of less than 8 to 12 percent (see table 4). This rating applies only to those soils in places where the housing density is low. Also, the limitation generally is slight for Matapeake soils having the same slope range, but it is moderate where the subsoil of these soils is heavy silty clay loam. This moderate limitation normally can be overcome by placing the disposal field in the more sandy, more permeable material below a depth of 3 to 4 feet. Only the soils just listed, therefore, are suitable for homes in places where a community sewage system is not planned, and where the disposal of sewage is to be through septic tanks. If homesites are planned in areas of other soils, a community system for disposing of sewage is needed, or a special means of disposal must be used. The soils that have slight limitations for the use of septic tanks make up about 40 percent of the county.

In the northern part of the county, there are large areas of soils that have a subsoil so unstable that limitations are very severe for building foundations and other excavations, for building roads and highways, and for the construction of streets, parking lots, and shopping centers. In these areas, building foundations settle and crack; roads settle, buckle, and warp; and entrenchments and embankments cave in or collapse without warning. These areas can be used for the aforementioned purposes, but the limitations and hazards for such use should be recognized and appropriate safeguards taken. Safeguards are particularly needed on the Christiana soils, the Muirkirk soils, and Loamy and clayey land because they have a clayey subsoil that is very unstable, especially when it is wet or has been disturbed by leveling or grading. These soils and land types make up about 7 percent of the county. They occur chiefly in the northern and western parts where most community development is taking place.

In any community, land is needed for recreational areas. The soils of the county that have only slight limitations to use for athletic fields and other nearly level intensive play areas are Collington fine sandy loam and silt loam, Matapeake fine sandy loam and silt loam, and Sassafras sandy loam and loam, all having slopes of 0 to 2 percent. These soils occupy only about 1 percent of the county. Many other soils have moderate limitations to use for intensive play areas. These soils are either too

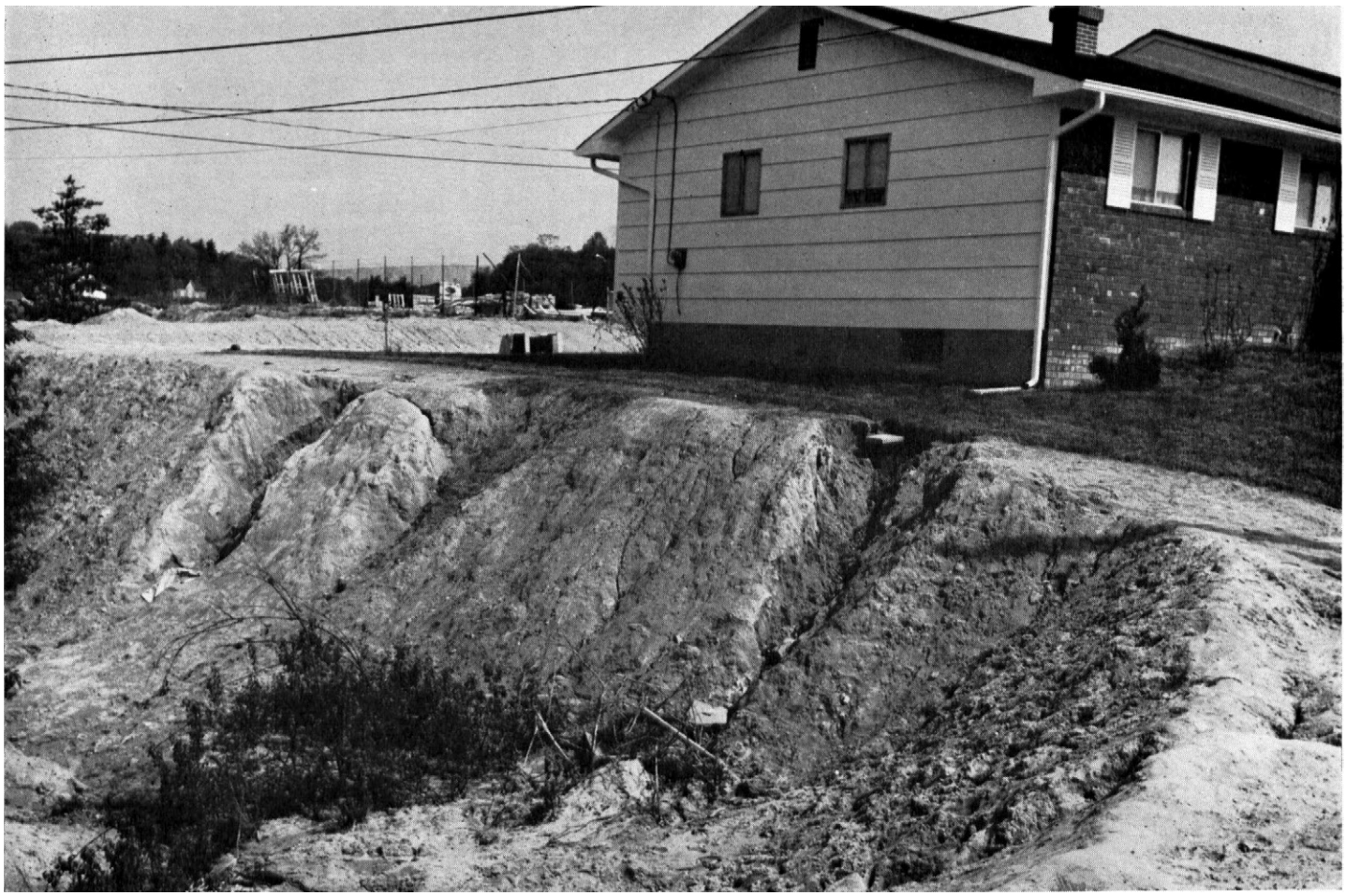

Figure 9.—**Erosion of bank caused by water from downspout and by lack of vegetation.**

sandy, too gravelly, or too fine textured to provide a good surface, or they are seasonally wet or have gentle to moderate slopes (see table 5).

Most of the well-drained soils having slopes of not more than about 15 percent have only slight limitations to use as parks and other recreational areas of low intensity. Soils on steep hillsides and on the narrow bottom lands that adjoin them are not well suited to use as farms or as building lots, but together may be useful for some kinds of recreation. These areas could well be used for parks.

Artificial ponds or small lakes are highly desirable for recreational use of the community and for their esthetic value. In the section "Engineering Uses of Soils," the suitability of the soils as sites for ponds is rated, and the types of ponds suitable for the soils are named (see table 7).

Use of soils for recreational facilities

In the eastern part of the United States, the most common outdoor recreational activities that are influenced by soils and by landforms probably are hunting, fishing, picnicking, hiking, camping, and athletic contests. Hunting and fishing are discussed in the subsection "Wildlife."

Facilities of outdoor recreation that depend a great deal on soil properties are campsites, including tents and trailers with accompanying facilities for outdoor living; athletic fields (baseball diamonds, football fields, volleyball courts) and other intensive play areas where foot traffic is heavy; parks and extensive play and picnic areas where foot traffic is not normally heavy; lawns and fairways and landscaping for constructing golf courses; and paths and trails for hiking, studying nature, or viewing scenery. Table 4 gives information that is helpful for constructing seasonal and year-round cottages, washrooms, bathhouses, picnic shelters, and service buildings.

Table 5 rates the degree and lists the kind of limitation of each soil in the county for specified recreational uses. The limitations are rated *slight*, *moderate*, and *severe*. These ratings were made on the basis of depth to the water table, wetness and natural drainage, hazard of flooding, permeability, texture (including gravel), steepness of slopes, and stability.

All of the properties named may not limit a soil for all recreational uses, but most of the properties are limiting for most uses. Also, a single property may not equally limit a soil for all recreational uses. For ex-

Figure 10.—**Culverts half filled with sediment caused by filling of flood plain and subsequent erosion of unconsolidated fills. The soil is an Evesboro loamy sand.**

ample, a slope of more than 5 percent severely limits the use of a soil for a football field because much land leveling is required. On the other hand, only slopes of more than 15 percent severely limit the use of a soil for campsites and picnic areas, and even the steepest slopes do not limit the use of a soil for some kind of parks.

A soil may be severely limited for some specified use and yet be put to that use. For example, soils severely limited in their use for paths and trails may be used for them if a better alternative route is not available, or if the severely limited route is more scenic or otherwise more desirable. The severely limited route, however, may require more preparation and maintenance.

Engineering Uses of Soils [3]

In this subsection the physical properties of the soils of the county are related to problems of engineering. The properties of the soils were estimated on the basis of information obtained (1) by examining the soils closely in the field and evaluating their characteristics as they apply to engineering needs and (2) by analyzing the results of tests made on samples taken from horizons of selected soil series in various counties of Maryland, Pennsylvania, and Virginia. On the basis of the estimated physical properties, interpretations were made that will be helpful to those who use the soils of Anne Arundel County for engineering purposes.

Among the soil properties most important in engineering are permeability, shear strength, density, shrink-swell potential, available moisture capacity, grain-size distribution, plasticity, and reaction. Also important is the depth to water table.

With the use of the soil map for identification, the engineering interpretations in this subsection 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 that involve heavy loads or where the excavations are deeper than the depths of layers here reported, normally not greater than 5 feet. Even in these situations, the soil map is useful for planning more detailed field investigations

[3] This subsection prepared with the assistance of JON V. DEGROOT, civil engineer, Soil Conservation Service.

and for suggesting the kinds of problems that may be expected.

This survey contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, commercial, residential, recreational, and other sites.
2. Make preliminary estimates of engineering properties of soils in planning drainage and irrigation systems, farm ponds and reservoirs, diversion terraces, and structures for soil and water conservation.
3. Make preliminary evaluations of ground and soil conditions that will aid in selecting locations for highways, airports, cables, sewage and other pipelines, and in planning detailed investigations at the selected locations.
4. Locate probable sand and gravel deposits 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 clay deposits for use with other materials in dams and the like, and for the fabrication of brick or other ceramic products.
7. Correlate performance of engineering structures with soil mapping units to develop information that will be useful in designing and maintaining engineering structures and installations.
8. Determine the suitability of soil mapping units for cross-county movement of vehicles and construction equipment.
9. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be readily used by engineers.
10. Develop preliminary estimates for design or construction purposes based on soil conditions pertaining to a particular area.

Much of the information in this subsection is in tables 6 and 7. Table 6 gives the estimated engineering properties of the soils in the county. Table 7 gives estimates of the suitability of the soils as engineering materials and engineering interpretations of the soils of the county.

Some of the terms used by soil scientists may not be familiar to engineers. Other terms, though familiar, may have a special meaning in soil science. Most of the terms used in this subsection and other special terms are defined in the Glossary.

Generally, all mapping units in the county contain small amounts of other soils that are not practical to separate at this scale of mapping. To determine inclusions and extent, refer to the mapping unit descriptions in the section "Descriptions of the Soils."

Estimated engineering properties

Table 6 shows some estimated soil properties that are important in engineering. In the first column are listed the soil series and symbols for most of the soils that are shown on the soils map. Cut and fill land, Gravel and borrow pits, Made land, Mixed alluvial land, Swamp, Tidal marsh, and Urban land have such variable characteristics that they are not listed in this table. Table 6 also gives the depth to seasonal high water table and the thickness and depth from the surface of the textural materials in the specific soil profiles described in the section "Descriptions of the Soils." In the table, however, horizons have been combined and do not coincide exactly with those in the section "Descriptions of the Soils." The thickness of the surface layer given in table 6 applies only to soils that are slightly or moderately eroded. The surface layer of severely eroded soils is thinner or may be completely removed, and the underlying horizons are closer to the surface than is indicated in the table. Also the thickness given in the table for the mapping units that include Urban land applies only to the part of an Urban land complex that is undisturbed. Urban land is in complexes that are listed in the table under appropriate soil series.

This table also gives the engineering classification of the significant horizons of each soil. Two systems of engineering classification are used for each soil texture. They are the system adopted by the American Association of State Highway Officials (AASHO) (*1*) and the Unified system (*10*).

In the classification system used by the American Association of State Highway Officials, the soil material is classified according to its engineering properties, based on performance in highways, into seven principal groups, designated as A–1 through A–7. In the system developed by the Corps of Engineers, U.S. Army, the soils are classified on the basis of texture and plasticity and on their performance as material for engineering construction. They are designated by pairs of letters, for example, SC and SM.

The permeability of a soil horizon is the rate at which water moves through undisturbed soil material. It depends largely on the texture and the structure of the soil.

Available moisture capacity (also termed available water capacity) is the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. In table 6 it is expressed as inches of water per inch of soil.

Reaction is expressed in numerical terms of pH. It is the normal reaction for that soil when it is unlimed. Soils that have been limed have higher pH values, particularly in the surface layer and upper part of the subsurface layer.

Optimum moisture is the moisture content in percent at which the soil material can be compacted by standard methods to maximum density, or unit weight.

Maximum density is expressed in pounds per cubic foot and, as listed in table 6, is the density that can be expected when soil material is compacted by standard procedures at optimum moisture content. For soils in Anne Arundel County, the range in dry density can be designated as *low*, 91 to 100 pounds per cubic foot; *medium*, 101 to 110 pounds; *high*, 111 to 120 pounds; and *very high*, 120 pounds or more.

Shrink-swell potential indicates the change in volume that occurs with a change in moisture content. It is estimated primarily on the basis of the kind and amount of clay present.

Corrosivity, as used in table 6, indicates the potential danger to uncoated metal or concrete structures through chemical action that dissolves or weakens the structural material. Structural materials may corrode when buried in soil, and a given material corrodes in some kinds of soil more rapidly than in others. Extensive installations that intersect soil boundaries or soil horizons are more likely to be damaged by corrosion than are installations entirely in one kind of soil or soil horizon.

Engineering interpretations

In table 7 the properties of the soils are interpreted according to their effect on engineering work. The interpretations are for relatively undisturbed soils of their respective series. In the complexes that include Urban land, the Urban land is so variable that meaningful interpretations cannot be made without an investigation on the site. Assistance in making these investigations can be obtained from the local office of the Soil Conservation Service or from the University of Maryland, College of Agriculture.

In table 7 the soils are interpreted for soil features affecting winter grading, susceptibility to frost action, and their suitability as a source of topsoil, sand, gravel, or road fill (fig. 11, 12, p. 88). The suitability of soil material for road fill largely depends on the density that can be obtained by compaction. Density affects the rigidity, flexibility, and load-bearing properties of the soil as subgrade fill for paved roads and as surfacing material for unpaved roads. Shrinks-swell (see table 6) is also a factor in evaluating soil material for road fill.

Table 7 lists the specific soil characteristics that affect certain engineering practices. For a particular practice, these characteristics may be favorable or unfavorable, but the characteristics that are unfavorable, or that limit the use of the soil for the specific practice, are the ones generally listed. Those who use this table should determine the specific suitability and limitation of the soil at the site of the proposed engineering work.

A soil that is suitable for one engineering purpose may be poor or even unsuitable for some other uses. For example, Elkton silt loam has very low seepage and is well suited as a site for a pond or reservoir, but it is unsuitable as a source of sand. On the other hand, the Galestown soils are a fair source of sand, but they are subject to excessive seepage and generally are not suitable as a site for a reservoir.

Figure 11.—**Washout of newly placed road fill.**

TABLE 6.—*Estimated*

[No estimates are given for Cut and fill land, Gravel and borrow pits, Made land, Mixed alluvial land, Swamp, Tidal marsh, and Urban column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping other series that appear in the first column of this table. The symbol <means less than; the symbol > means more than]

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification			Percentage passing sieve—	
			Dominant USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
	Feet	*Inches*					
Adelphia: AdA, AdB, AsA, AsB.	2–4	0–14	Sandy loam or silt loam	SM, ML, CL	A–2, A–4	100	98–100
		14–35	Sandy clay loam	SM, SC, CL	A–4, A–6	98–100	98–100
		35–60	Sandy loam	SM, SC, CL	A–2, A–4	95–100	95–100
Beltsville: BeB2, BlB[1]	[2] 1½–2½	0–15	Silt loam	ML, CL	A–4, A–6	95–100	95–100
		15–40	Silty clay loam (fragipan).	ML, CL	A–6, A–7	95–100	95–100
		40–60	Gravelly sandy loam	SM, GM, GC	A–1, A–2	40–60	30–40
Bibb: Bm	0–1	0–36	Silt loam	ML, CL	A–4, A–6	95–100	90–100
		36–50	Silty clay	CL	A–7	85–100	75–100
Butlertown: BuA, BuB2, BuC2, BuC3, BuD3.	[2] 2–4	0–20	Silt loam	ML	A–4	95–100	85–100
		20–33	Silty clay loam	CL	A–6	95–100	90–100
		33–42	Silt loam (fragipan)	ML, CL	A–4, A–6	95–100	90–100
		42–60	Sandy loam	SM	A–2, A–4	90–100	90–100
Chillum: CaB2, CaC2, CbB[1]	>4	0–16	Silt loam	ML	A–4	95–100	95–100
		16–27	Silty clay loam	CL	A–6	95–100	95–100
		27–60	Gravelly sandy loam	GM, SM	A–2	40–70	35–60
Christiana: CcB2, CcC2	>4	0–8	Silt loam	ML	A–4	100	100
		8–120	Clay	CH, CL	A–6, A–7	100	100
CdC3	>4	0–120	Clay	CL, CH	A–6, A–7	100	100
Coastal beaches: Ce	1–10	0–120	Sand	SP	A–3	95–100	95–100
Codorus: Ch	[3] 1½–2	0–60	Silt loam	ML	A–4	95–100	90–100
Colemantown: Ck, Cm	[4] 0–1	0–5	Sandy loam or silt loam	SM, ML	A–4	95–100	95–100
		5–32	Sandy clay	SC, CL	A–6, A–7	95–100	95–100
		32–60	Sandy clay loam	SC, CL	A–6	90–100	85–100
Collington: CnB2, CnC2	>4	0–17	Loamy sand	SM	A–2	100	100
		17–40	Sandy clay loam	SC, CL	A–4, A–6	100	100
		40–60	Sandy loam	SM, SC	A–2, A–4	90–100	85–100
CoA, CoB2, CoC2, CoC3, CoD2, CoD3, CoE, CpA, CpB2, CpuB,[1] CpuD.[1]	>4	0–8	Fine sandy loam or silt loam.	SM, ML	A–4	100	100
		8–32	Sandy clay loam	SC, CL	A–6	100	100
		32–60	Fine sandy loam	SM	A–2, A–4	95–100	90–100
Comus: Cr	[3] >4	0–30	Silt loam, loam	ML	A–4	100	100
		30–60	Gravelly sandy loam	SM	A–2	70–90	60–80
Croom: CsC2, CsD2, CsE, CtD.[1]	>4	0–10	Gravelly sandy loam	GM, GC	A–1, A–2	50–70	40–60
		10–20	Gravelly sandy clay loam	GM, GC, CL	A–4, A–6	45–80	40–70
		20–60	Gravelly sand	GP, GM	A–1, A–2, A–4.	50–90	40–90
Donlonton: DnA, DnB2, DuB.[1]	1½–2	0–13	Fine sandy loam	SM, ML	A–4	90–100	90–100
		13–41	Clay loam, sandy clay loam.	CL, CH	A–6, A–7	95–100	95–100
		41–60	Sandy clay loam	SC	A–2, A–6	95–100	95–100

See footnotes at end of table.

engineering properties

land. The soils in Anne Arundel County are deep enough over bedrock that bedrock does not affect their use. An asterisk in the first units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to

Percentage passing sieve—Continued		Permeability	Available moisture capacity	Unlimed reaction	Moisture-density data		Shrink-swell potential	Corrosivity	
No. 40(0.42 mm.)	No. 200 (0.074 mm.)				Optimum moisture	Maximum dry density		Uncoated steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Percent*	*Lbs. per cubic foot*			
98–100	25–75	0. 20–6. 3	0. 12–0. 24	4. 0–5. 0			Low	Low	High
95–100	40–75	0. 20–2. 0	0. 18–0. 24	4. 5–5. 0	12–18	111–120	Low	Moderate	High.
95–100	30–55	0. 63–6. 3	0. 08–0. 12	4. 0–5. 0	12–18	111–120	Low	Moderate	High.
95–100	75–90	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0			Low	Moderate	High.
95–100	85–95	<0. 20	0. 12–0. 18	4. 0–5. 0	10–15	111–120	Low to moderate.	Moderate	High.
20–35	15–35	0. 63–6. 3	0. 08–0. 12	4. 0–5. 0	10–15	111–125	Low	Moderate	High.
85–100	70–90	0. 20–2. 0	0. 12–0. 24	4. 0–5. 0	12–18	101–120	Low	High	High.
70–100	60–90	<0. 20	0. 15–0. 20	4. 0–5. 0	15–22	91–110	Moderate	High	High.
80–100	75–100	0. 63–6. 3	0. 18–0. 24	4. 5–5. 5			Low	Moderate	High.
85–100	75–100	0. 63–2. 0	0. 18–0. 24	4. 5–5. 5	14–18	101–110	Low	Moderate	High.
85–100	75–100	0. 20–0. 63	0. 18–0. 24	4. 5–5. 5	14–18	101–110	Low	Moderate	High.
60–70	30–40	0. 63–2. 0	0. 12–0. 24	4. 5–5. 5	10–18	101–120	Low	Moderate	High.
90–100	50–90	0. 63–2. 0	0. 18–0. 27	4. 5–5. 0			Low	Low	Moderate.
90–100	70–90	0. 63–2. 0	0. 18–0. 24	4. 5–5. 0	12–18	101–120	Low to moderate.	Moderate	High.
30–60	20–30	0. 63–2. 0	0. 08–0. 12	4. 0–5. 0	10–15	111–130	Low	Low	High.
95–100	55–90	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0			Low	Moderate	High.
95–100	90–100	<0. 20	0. 18–0. 24	4. 0–5. 0	18–24	91–100	Moderate	High	High.
95–100	90–100	<0. 20	0. 18–0. 24	4. 0–5. 0	18–24	91–100	Moderate	High	High.
40–90	0–5	>6. 3	<0. 06	5. 0–8. 0	9–15	91–110	Low	High	High.
80–95	75–90	0. 63–2. 0	0. 18–0. 24	4. 5–5. 5	16–20	101–110	Low	Moderate	High.
90–100	45–90	0. 20–2. 0	0. 12–0. 24	4. 0–5. 0			Low to moderate.	High	High.
90–100	45–100	<2. 0	0. 18–0. 24	4. 0–5. 0	16–24	101–110	Moderate	High	High.
60–90	45–60	0. 20–0. 63	0. 12–0. 24	4. 0–5. 0	10–20	101–125	Low to moderate.	High	High.
50–75	15–35	2. 0–6. 3	0. 06–0. 12	4. 0–5. 0			Low	Moderate	High.
80–90	40–70	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	12–18	111–125	Low	Moderate	High.
60–70	10–40	0. 63–6. 3	0. 08–0. 18	4. 0–5. 0	10–14	101–125	Low	Moderate	High.
70–100	40–90	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0			Low	Moderate	High.
80–90	40–70	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	12–18	111–125	Low to moderate.	Moderate	High.
70–85	20–45	0. 63–2. 0	0. 08–0. 18	4. 0–5. 0	10–14	111–125	Low	Moderate	High.
85–100	70–90	0. 63–2. 0	0. 18–0. 24	4. 5–5. 0	12–18	101–110	Low	Moderate	Moderate.
35–50	15–30	0. 63–6. 3	0. 08–0. 12	4. 5–5. 0	10–15	110–120	Low	Moderate	Moderate.
20–35	5–35	0. 63–6. 3	0. 08–0. 12	4. 0–5. 0			Low	Low	High.
35–65	35–60	0. 20–0. 63	0. 12–0. 18	4. 0–4. 5	8–15	121–135	Low	Low	High.
30–60	5–45	>6. 3	0. 08–0. 12	4. 0–4. 5	10–15	111–130	Low	Low	High.
70–85	40–55	0. 63–2. 0	0. 12–0. 24	4. 0–5. 0			Low	High	High.
95–100	70–80	<0. 20	0. 18–0. 27	4. 0–5. 0	14–24	101–110	Moderate	High	High.
80–90	20–50	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	10–14	111–125	Low	Moderate	High.

TABLE 6.—*Estimated*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification			Percentage passing sieve—	
			Dominant USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
	Feet	*Inches*					
Elkton:							
Ek	0–1	0–13	Sandy loam	SM, ML	A–4	90–100	90–100
		13–45	Clay	CL	A–6, A–7	95–100	95–100
		45–60	Silty clay loam	ML, CL	A–6, A–7	90–100	85–100
En	0–1	0–15	Silt loam	ML, CL	A–4, A–6	95–100	95–100
		15–55	Silty clay, silty clay loam	CL	A–6, A–7	95–100	95–100
*Evesboro:							
EoB, EsC, EsE, EuC [1] For Galestown part of EsC and EsE, see Galestown series.	>4	0–60	Loamy sand	SM, SP–SM	A–2, A–3	100	95–100
ErB, ErC	>4	0–40	Loamy sand	SM, SP–SM	A–2, A–3	95–100	95–100
		40–120	Sandy clay	SC	A–2, A–6	95–100	95–100
Fallsington: Fa	0–1	0–14	Sandy loam	SM, ML	A–2, A–4	95–100	95–100
		14–36	Sandy clay loam	SC, CL	A–2, A–6	95–100	95–100
		36–50	Gravelly loamy sand	GP, SP, SM	A–1, A–2	35–100	25–75
Galestown: GaB	>4	0–60	Loamy sand	SM, SP–SM	A–2, A–3	100	95–100
Hatboro: Ha	[3] 0	0–36	Silt loam, silty clay loam, loam.	ML	A–4	95–100	90–100
		36–50	Fine sandy loam	SM	A–2, A–4	90–100	80–100
Howell:							
HfB2, HgB2, HsB2, HtB2	>3	0–16	Fine sandy loam	SM, ML	A–4	95–100	95–100
		16–60	Silty clay	CL, MH	A–6, A–7	95–100	95–100
HyC3, HyD3, HyE3, HzC3	>3	0–16	Clay loam	CL	A–6, A–7	95–100	95–100
		16–60	Silty clay	CL, MH	A–6, A–7	95–100	95–100
Keyport:							
KeA, KeB	1½–2½	0–9	Sandy loam	SM	A–2, A–4	90–100	90–100
		9–55	Clay	CL, CH, MH	A–6, A–7	95–100	95–100
KpA, KpB2, KrB [1]	1½–2½	0–9	Silt loam	ML, CL	A–4, A–6	95–100	95–100
		9–55	Clay, silty clay	CL, CH, MH	A–6, A–7	95–100	95–100
Klej: Ks	1–2½	0–50	Loamy sand	SP–SM	A–2, A–3	95–100	95–100
Loamy and clayey land: LoB, LoC, LoD.	>4	0–10	Variable				
		10–72	Clay	CH	A–7	90–100	90–100
Marr: MfB2, MfC2, MfC3, MfD2, MfD3, MfE3.	>4	0–13	Fine sandy loam	SM, ML	A–4	100	100
		13–34	Sandy clay loam	SC, CL	A–4, A–6	100	100
		34–50	Very fine sandy loam	ML	A–4	95–100	90–100
Matapeake: MkA, MkB2, MmA, MmB2, MmC2, MmC3, MmD3.	>4	0–13	Silt loam or fine sandy loam.	SM, ML	A–4	100	95–100
		13–37	Silty clay loam	CL	A–6, A–7	100	95–100
		37–60	Fine sandy loam	SM, ML	A–4	90–100	85–100

See footnotes at end of table.

engineering properties—Continued

Percentage passing sieve—Continued		Permeability	Available moisture capacity	Unlimed reaction	Moisture-density data		Shrink-swell potential	Corrosivity	
No. 40(0.42 mm.)	No. 200 (0.074 mm.)				Optimum moisture	Maximum dry density		Uncoated steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Percent*	*Lbs. per cubic foot*			
70–85	40–55	0. 63–2. 0	0. 12–0. 24	4. 0–5. 0			Low	High	High.
90–100	70–100	<0. 20	0. 18–0. 24	4. 0–5. 0	16–24	101–110	Moderate	High	High.
60–100	55–100	0. 20–0. 63	0. 12–0. 24	4. 0–5. 0	10–20	101–125	Low to moderate.	High	High.
90–100	60–90	0. 20–2. 0	0. 18–0. 27	4. 0–5. 0			Low to moderate.	High	High.
90–100	70–100	<0. 20	0. 18–0. 24	4. 0–5. 0	16–24	101–110	Moderate	High	High.
50–75	5–25	>6. 3	<0. 06	4. 0–5. 0	10–14	101–115	Low	Very low	High.
50–75	5–25	>6. 3	<0. 06	4. 0–5. 0	10–14	101–115	Low	Very low	High.
80–90	20–55	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	10–14	111–125	Low	High	High.
60–70	30–55	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0			Low	High	High.
80–90	20–55	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	10–14	111–125	Low	High	High.
20–60	0–10	>6. 3	<0. 06	4. 0–5. 0	8–12	101–125	Low	Very low	High.
50–75	10–25	>6. 3	<0. 06	4. 0–5. 0	10–14	101–115	Low	Very low	High.
85–100	60–75	0. 20–0. 63	0. 18–0. 27	4. 5–5. 5	15–23	101–110	Low	High	High.
75–100	30–50	0. 63–6. 3	0. 06–0. 10	4. 0–5. 0	10–14	101–110	Low	High	High.
70–85	40–55	0. 20–2. 0	0. 18–0. 24	4. 0–5. 5			Low	Moderate	High.
90–100	75–100	<0. 20	0. 18–0. 27	4. 0–5. 0	12–18	101–110	Low to moderate.	High	High.
90–100	70–80	<0. 20	0. 18–0. 27	4. 0–5. 0	12–18	101–110	Low to moderate.	High	High.
90–100	60–100	<0. 20	0. 12–0. 27	4. 0–5. 0	12–18	101–110	Low	High	High.
60–70	30–40	0. 63–2. 0	0. 12–0. 24	4. 0–5. 0			Low	High	High.
95–100	80–100	<0. 20	0. 18–0. 27	4. 0–5. 0	14–24	101–110	Moderate	High	High.
90–100	65–100	0. 20–2. 0	0. 18–0. 27	4. 0–5. 0			Low	High	High.
95–100	80–100	<0. 20	0. 18–0. 27	4. 0–5. 0	14–24	101–110	Moderate	High	High.
50–75	10–20	>6. 3	0. 06–0. 08	4. 0–5. 0	8–12	101–110	Low	Moderate	High.
							Low	Low to moderate.	High.
90–100	60–90	0. 20–6. 3	0. 06–0. 27	4. 0–5. 0	8–24	91–110	Moderate	Moderate to high.	High.
70–100	40–90	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0			Low	Moderate	High.
90–100	40–70	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	12–18	111–125	Low to moderate.	Moderate	High.
85–100	50–65	0. 63–2. 0	0. 08–0. 18	4. 0–5. 0	10–14	111–125	Low	Moderate	High.
70–100	40–100	0. 63–2. 0	0. 12–0. 27	4. 0–5. 0	10–17		Low	Low	High.
90–100	80–100	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	8–18	101–125	Low to moderate.	Moderate	High.
70–85	40–55	0. 63–6. 3	0. 10–0. 24	4. 5–5. 0	10–18	101–125	Low	Low	High.

TABLE 6.—*Estimated*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification			Percentage passing sieve—	
			Dominant USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
	Feet	*Inches*					
Matawan: MnA, MnB	2–3	0–20	Loamy fine sand	SM, SP-SM	A–2	100	95–100
		20–50	Fine sandy loam, sandy clay, sandy clay loam.	SC, CL	A–2, A–4, A–6, A–7	100	95–100
Mattapex: MpA, MpB2, MrA, MrB2, MrC2.	1½–2½	0–12	Fine sandy loam or silt loam.	SM, ML	A–4	95–100	95–100
		12–36	Silty clay loam	CL	A–6, A–7	95–100	95–100
		36–50	Fine sandy loam	SM	A–2, A–4	95–100	95–100
Monmouth: MuA, MuB2, MuC2, MuC3, MuD2, MuD3.	>4	0–17	Loamy sand	SM	A–2	95–100	95–100
		17–38	Clay loam	CL	A–6, A–7	95–100	95–100
		38–50	Sandy clay	SC, CL	A–6, A–7	95–100	95–100
MvA, MvB2, MvC2, MvD2, MvE.	>4	0–9	Fine sandy loam	SM, ML	A–4	95–100	95–100
		9–50	Sandy clay loam, sandy clay, clay.	CL	A–6, A–7	95–100	95–100
MwC3, MwD3, MxB,[1] MxD.[1]	>4	0–40	Clay loam	CL	A–6, A–7	95–100	95–100
		40–72	Sandy clay	SC, CL	A–6, A–7	95–100	95–100
Muirkirk: MyB, MyC, MyD, MyE, MzB, MzD.[1]	>4	0–28	Loamy sand	SM	A–2	95–100	95–100
		28–36	Sandy loam	SM, SC	A–2, A–4	95–100	95–100
		36–60	Clay	CH	A–7	100	100
Osier: Os	0	0–15	Loamy sand	SM	A–2, A–3	95–100	95–100
		15–60	Sand	SM	A–2	95–100	95–100
Othello: Ot	0–1	0–11	Silty loam	ML, CL	A–4, A–6	95–100	95–100
		11–40	Silt clay loam, silt loam	CL	A–6	95–100	90–100
		40–60	Fine sandy loam	SM	A–2, A–4	85–100	80–100
Rumford: RuA, RuB2, RuC2, RuC3, RuD2, RyB[1], RyD.[1]	>4	0–14	Loamy sand	SM	A–2	95–100	95–100
		14–32	Sandy loam	SM, SC	A–2, A–4	95–100	95–100
		32–50	Loamy sand	SM	A–2	95–100	95–100
Sassafras: SaA, SaB2, SaC2, SaC3, SaD2, SaD3, SaE, SfA, SfB2, SnB,[1] SnD.[1]	>4	0–17	Loam or fine sandy loam	SM, ML	A–2, A–4	95–100	70–95
		17–37	Sandy clay loam	SM, SC, ML, CL	A–2, A–4, A–6	95–100	85–100
		37–50	Sand and gravel	SM, SP-SM	A–1, A–2	90–100	80–100
Shrewsbury: Sr, Ss	0–1	0–14	Fine sandy loam	SM, ML	A–4	95–100	95–100
		14–40	Sandy clay loam	SM, SC	A–4, A–6	95–100	95–100
		40–60	Fine sandy loam	SM, SC, ML	A–4	95–100	95–100
Westphalia: WaB2, WaC2, WaC3, WaD3, WaE3.	>4	0–9	Fine sandy loam	SM	A–2, A–4	95–100	95–100
		9–27	Heavy fine sandy loam	SC, ML, CL	A–2, A–4, A–6	95–100	95–100
		27–60	Loamy fine sand	SM	A–2, A–4	95–100	95–100
Woodstown: WdA, WdB, WoA, WoB.	1½–2½	0–12	Sandy loam or loam	SM, ML	A–2, A–4	95–100	95–100
		12–34	Sandy clay loam	SC, CL	A–6	95–100	95–100
		34–50	Sand	SP-SM, SM, SC	A–2, A–3, A–4	95–100	95–100

[1] No estimates for Urban land part. The areas are under construction, the soils have been disturbed, and properties are variable.
[2] Perched water table.

engineering properties—Continued

Percentage passing sieve—Continued		Permeability	Available moisture capacity	Unlimed reaction	Moisture-density data		Shrink-swell potential	Corrosivity	
No. 40(0.42 mm.)	No. 200 (0.074 mm.)				Optimum moisture	Maximum dry density		Uncoated steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Percent*	*Lbs. per cubic foot*			
60–100	10–30	2. 0–6. 3	0. 06–0. 12	4. 0–5. 0	10–14	101–110	Low	Low	High.
75–90	30–60	0. 2–0. 63	0. 18–0. 24	4. 0–5. 0	8–14	111–125	Low	Moderate	High.
90–100	45–90	0. 20–2. 0	0. 18–0. 27	4. 5–5. 5			Low	Moderate	Moderate.
90–100	70–100	0. 20–0. 63	0. 18–0. 24	4. 5–5. 5	12–18	101–120	Low to moderate.	High	High.
75–90	20–45	0. 63–6. 3	0. 06–0. 18	4. 0–5. 0	10–15	111–125	Low	High	High.
50–75	15–35	2. 0–6. 3	0. 06–0. 08	4. 5–5. 5			Low	Moderate	Moderate.
90–100	70–80	0. 20–0. 63	0. 18–0. 24	4. 5–5. 5	12–18	115–131	Moderate	Moderate	Moderate.
90–100	45–60	0. 63–2. 0	0. 12–0. 18	4. 5–5. 5	10–14	111–125	Moderate	Moderate	Moderate.
75–100	40–55	0. 63–2. 0	0. 12–0. 18	4. 5–5. 5			Low	Moderate	Moderate.
90–100	70–80	0. 20–0. 63	0. 18–0. 24	4. 5–5. 5	12–18	115–130	Moderate	Moderate	Moderate.
90–100	70–80	0. 20–0. 63	0. 18–0. 24	4. 5–5. 5	12–18	115–130	Moderate	Moderate	Moderate.
90–100	45–60	0. 63–2. 0	0. 12–0. 18	4. 5–5. 5	10–14	111–125	Moderate	Moderate	Moderate.
50–75	15–35	2. 0–6. 3	<0. 06	4. 0–5. 5	10–14	101–110	Low	Low	High.
75–95	30–50	0. 63–2. 0	0. 12–0. 18	4. 0–5. 5	12–18	111–120	Low	Moderate	High.
90–100	80–100	<0. 20	0. 18–0. 24	4. 0–5. 5	18–24	91–100	Moderate	High	High.
50–75	10–25	0. 63–6. 3	0. 06–0. 08	4. 0–5. 5	8–12	101–110	Low	High	High.
60–90	15–30	>6. 3	<0. 06	4. 0–5. 5	8–12	91–100	Low	High	High.
80–100	70–90	0. 20–2. 0	0. 18–0. 27	4. 0–5. 0			Low	High	High.
85–100	70–100	0. 20–0. 63	0. 18–0. 24	4. 0–5. 0	12–18	111–120	Low to moderate.	High	High.
70–85	15–40	0. 63–6. 3	0. 06–0. 12	4. 0–5. 0	10–14	111–125	Low	High	High.
50–85	15–35	2. 0–6. 3	0. 06–0. 08	4. 0–5. 0			Low	High	High.
65–75	10–40	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0	7–18	111–125	Low	High	High.
50–85	15–35	2. 0–6. 3	0. 06–0. 12	4. 0–5. 0	10–15	101–110	Low	High	High.
20–75	20–60	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0			Low	Low	High.
80–90	40–70	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	7–18	111–125	Low	Low	High.
30–80	10–25	2. 0–6. 3	<0. 08	4. 0–5. 0	9–15	101–125	Low	Low	High.
70–100	40–90	2. 0–6. 3	0. 12–0. 24	4. 0–5. 0			Low	High	High.
75–100	40–75	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	10–14	111–125	Low	High	High.
50–100	35–50	0. 63–6. 3	0. 06–0. 10	4. 0–5. 0	10–14	101–125	Low	High	High.
95–100	25–50	2. 0–6. 3	0. 12–0. 18	4. 0–5. 0			Low	Low	High.
95–100	25–75	0. 63–2. 0	0. 18–0. 24	4. 5–5. 0	10–15	105–120	Low	Low	High.
95–100	20–50	2. 0–6. 3	0. 08–0. 12	4. 5–5. 0	10–17	101–115	Low	High	High.
75–95	30–75	0. 63–2. 0	0. 12–0. 18	4. 0–5. 0			Low	Low	High.
75–100	35–65	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	7–18	111–125	Low	Moderate	High.
40–70	10–40	2. 0–6. 3	0. 06–0. 08	4. 0–5. 0	9–15	101–120	Low	Moderate	High.

[3] Flooded.
[4] Ponded.

TABLE 7.—*Engineering*

[No interpretations are given for Coastal beaches, Gravel and borrow pits, Cut and fill land, Made land, Mixed alluvial land, Swamp, or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Adelphia: AdA, AdB, AsA, AsB	Poor trafficability; seasonal high water table.	Severe	Good	Poor	Unsuited	Good	Seasonal high water table at a depth of 2 to 4 feet; good stability.
Beltsville: BeB2, BlB [2]	Poor trafficability; perched water table.	Severe	Fair	Poor to unsuited.	Poor	Poor	Perched water table at a depth of 1½ to 2½ feet; fair stability.
Bibb: Bm	Poor trafficability; seasonal high water table; flood hazard.	Severe	Fair	Unsuited	Locally fair to good below depth of 3 feet.	Poor above depth of 3 feet; good below, in some places.	Seasonal high water table at a depth of 0 to 1 foot; poor stability; flood hazard.
Butlertown: BuA, BuB2, BuC2, BuC3, BuD3.	Fair trafficability; perched water table.	Severe	Good	Unsuited	Unsuited	Fair to poor.	Perched water table at a depth of 2 to 4 feet; fair stability.
Chillum: CaB2, CaC2, CbB [2]	Good trafficability.	Moderate	Good	Unsuited	Good for dirty gravel.	Good	Features generally favorable.
Christiana: CcB2, CcC2, CdC3	Poor trafficability; plastic materials.	Moderate	Fair	Unsuited	Unsuited	Very poor	Plastic materials; trenches tend to cave or collapse when wet.

See footnotes at end of table.

interpretations

Tidal marsh, and Urban land. An asterisk in the first column indicates that at least one mapping unit in this series is made up of two it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
High water table at a depth of 2 to 4 feet; good stability; severe frost action.	Moderately low seepage in subsoil; moderately rapid seepage in substratum.	Good stability; highly erodible; high maximum density.	Moderate permeability; highly erodible; moderately well drained; seasonal high water table.	Moderate available moisture capacity; moderate infiltration; moderately well drained.	Seasonal high water table; good stability; highly erodible.	Seasonal high water table; highly erodible; moderate available moisture capacity.	Excavated and impounded.
Perched water table at a depth of 1½ to 2½ feet; fair stability; severe frost action.	Low seepage in subsoil; moderate seepage in substratum.	Fair stability; highly erodible; high maximum density.	Slow permeability; highly erodible; moderately well drained; perched water table.	Moderate to high available moisture capacity; moderate infiltration; moderately well drained.	Seepage above fragipan; fair stability; highly erodible.	Seepage above fragipan; highly erodible; moderate to high available moisture capacity.	Impounded.
Seasonal high water table at a depth of 0 to 1 foot; poor stability; severe frost action; flood hazard.	Moderate to low seepage; constant water source.	Poor stability; moderately erodible; low to high maximum density.	Moderate to slow permeability; moderately erodible; poorly drained; seasonal high water table.	Moderate to high available moisture capacity; moderately slow infiltration; poorly drained.	Nearly level; short slopes.	Nearly level; short slopes.	Impounded and/or excavated.
Perched water table at a depth of 2 to 4 feet; fair stability; severe frost action.	Moderately low seepage in subsoil; moderate seepage in substratum.	Fair stability; highly erodible; moderate maximum density.	Moderately slow permeability; highly erodible; moderately well drained; perched water table.	High available moisture capacity; moderate infiltration; moderately well drained.	Perched water table; fair stability; highly erodible.	Perched water table; highly erodible; high available moisture capacity.	Impounded.
Good stability; moderate frost action.	Moderately low seepage in subsoil; moderately high seepage in substratum.	Good stability; moderately erodible; high maximum density.	Well drained---	High available moisture capacity; moderate infiltration.	Good stability; moderately erodible.	Moderately erodible; high available moisture capacity.	Impounded.
Poor stability; moderate frost action; plastic materials.	Low seepage---	Poor stability; highly erodible; low maximum density.	Well drained---	High available moisture capacity; slow infiltration.	Poor stability; highly erodible.	Highly erodible; high available moisture capacity.	Impounded.

TABLE 7.—*Engineering*

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Codorus: Ch	Poor to very poor trafficability; seasonal high water table; flood hazard.	Severe	Fair to good.	Unsuited	Unsuited	Poor	Seasonal high water table at a depth of 1½ to 2 feet; poor stability; flood hazard.
Colemantown: Ck, Cm	Very poor trafficability; plastic subsoil.	Severe	Poor to fair.	Unsuited	Unsuited	Fair to poor.	Seasonal high water table at a depth of 0 to 1 foot; poor stability; plastic subsoil.
Collington: CnB2, CnC2, CoA, CoB2, CoC2, CoC3, CoD2, CoD3, CoE, CpA, CpB2, CpuB, CpuD. (Urban land in mapping units CpuB and CpuD consists of Collington soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Moderate	Generally good but fair for CnB2, CnC2.	Unsuited	Unsuited	Good to fair.	Features generally favorable.
Comus: Cr	Fair to poor trafficability; flood hazard.	Moderate	Good	Poor	Unsuited	Generally poor above depth of 3 feet; good to fair below.	Flood hazard
Croom: CsC2, CsD2, CsE, CtD (Urban land in mapping unit CtD consists of Croom soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Moderate	Poor	Fair	Good source of dirty gravel.	Excellent	Features generally favorable.
Donlonton: DnA, DnB2, DuB (Urban land in mapping unit DuB consists of Donlonton soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Poor trafficability; plastic subsoil; seasonal high water table.	Severe	Fair	Unsuited	Unsuited	Poor	Seasonal high water table at a depth of 1½ to 2 feet; plastic subsoil; poor stability.

See footnotes at end of table.

interpretations—Continued

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
Seasonal high water table at a depth of 1½ to 2 feet; poor stability; severe frost action; flood hazard.	Moderately low seepa e	Poor stability; moderately erodible; medium maximum density.	Moderate permeability; moderately erodible; moderately well drained; seasonal high water table.	Moderate to high available moisture capacity; moderate infiltration; moderately well drained.	Nearly level; short slopes.	Seasonal high water table at a depth of 1½ to 2 feet; moderately erodible; moderate to high available moisture capacity.	Impounded or excavated.
Seasonal high water table at a depth of 0 to 1 foot; poor stability; severe frost action; plastic subsoil.	Low seepage---	Poor stability; highly erodible; medium maximum density.	Moderately slow to very slow permeability; highly erodible; poorly drained; seasonal high water table.	High available moisture capacity; slow infiltration; poorly drained.	Seasonal high water table; poor stability; highly erodible.	Seasonal high water table at a depth of 0 to 1 foot; highly erodible; high available moisture content.	Excavated.
Good stability; moderate frost action.	Moderately slow subsoil seepage to moderately rapid in substratum.	Good stability; moderately erodible; high to very high maximum density.	Well drained---	High available moisture capacity; moderate to moderately rapid infiltration.	Good stability; moderately erodible.	Moderately erodible; high available moisture capacity.	Impounded.
Poor stability; moderate frost action; flood hazard.	Moderate seepage.	Poor stability; moderately erodible; medium to high maximum density.	Well drained---	High available moisture capacity; moderate infiltration.	Nearly level; short slopes.	Moderately erodible; high available moisture capacity.	Impounded.
Very good stability; moderate frost action.	High seepage---	Very good stability; moderately erodible; very high maximum density.	Well drained---	Low available moisture capacity; moderate infiltration.	Very good stability; moderately erodible.	Moderately erodible; low available moisture capacity.	Impounded but subject to seepage.
Seasonal high water table at a depth of 1½ to 2 feet; plastic subsoil; poor stability; severe frost action.	Low seepage---	Poor stability; highly erodible; medium maximum density.	Moderately slow to slow permeability; highly erodible; moderately well drained; seasonal high water table.	High available moisture capacity; slow infiltration; moderately well drained.	Seasonal high water table at a depth of 1½ to 2 feet; poor stability; highly erodible.	Seasonal high water table at a depth of 1½ to 2 feet; highly erodible; high available moisture capacity.	Excavated or impounded.

TABLE 7.—*Engineering*

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Elkton: Ek, En	Very poor trafficability; plastic subsoil; seasonal high water table.	Severe	Poor to fair.	Unsuited	Unsuited	Poor to fair.	Seasonal high water table at a depth of 0 to 1 foot; plastic subsoil; poor stability.
*Evesboro: EoB, ErB, ErC, EsC, EsE, EuC. (For interpretations of Galestown soils in the mapping unit EsC and EsE refer to the Galestown soil series. Urban land in mapping unit EuC consists of Evesboro soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Slight	Poor	Fair to good.	Unsuited	Fair; good if soil binder is added.	Loose sand; trenches subject to caving.
Fallsington: Fa	Poor trafficability; seasonal high water table.	Severe	Fair	Fair	Poor to unsuited.	Fair to good.	Seasonal high water table at a depth of 0 to 1 foot; trenches subject to caving; running sand in substratum.
Galestown: GaB	Good trafficability.	Slight	Poor	Fair to good.	Unsuited	Fair; good if soil binder is added.	Loose sand; trenches subject to caving.
Hatboro: Ha	Poor trafficability; seasonal high water table; flood hazard.	Severe	Fair	Unsuited	Fair to unsuited.	Poor	Seasonal high water table at a depth of 0 feet; flood hazard.
Howell: HfB2, HgB2, HsB2, HtB2, HyC3, HyD3, HyE3, HzC3.	Fair trafficability.	Moderate	Good	Unsuited	Unsuited	Poor	Seasonal high water table below depth of 3 feet.

See footnotes at end of table.

interpretations—Continued

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
Seasonal high water table at a depth of 0 to 1 foot; plastic subsoil; poor stability; severe frost action.	Low seepage---	Poor stability; highly erodible; medium maximum density.	Slow to very slow permeability; highly erodible; poorly drained; seasonal high water table.	High available moisture capacity; slow infiltration; poorly drained.	Seasonal high water table at a depth of 0 to 1 foot; poor stability; highly erodible.	Seasonal high water table at a depth of 0 to 1 foot; highly erodible; high available moisture capacity.	Excavated or impounded.
Fair stability; loose sand.	High to excessive seepage.	Fair stability; medium to high maximum density.	Well drained to excessively drained.	Very low to moderate available moisture capacity; very rapid infiltration.	Fair stability; subject to wind erosion.	Subject to wind erosion; very low to moderate available moisture capacity.	Impounded; may need sealing.
Seasonal high water table at a depth of 0 to 1 foot; severe frost action; running sand substratum.	Moderate seepage in subsoil to high in substratum.	Fair to good stability; moderately erodible; high to very high maximum density.	Moderate permeability; moderately erodible; poorly drained; seasonal high water table at a depth of 0 to 1 foot.	Moderate to high available moisture capacity; moderate infiltration; poorly drained.	Nearly level; short slopes.	Seasonal high water table at a depth of 0 to 1 foot; moderately erodible; moderate to high available moisture capacity.	Excavated or impounded.
Fair stability; loose sand.	High to excessive seepage.	Fair stability; medium to high maximum density.	Somewhat excessively drained.	Low to moderate available moisture capacity; very rapid infiltration.	Fair stability; subject to wind erosion.	Subject to wind erosion; low to moderate available moisture capacity.	Impounded; may need sealing.
Seasonal high water table at a depth of 0 feet; severe frost action; flood hazard.	Moderately low seepage.	Poor stability; highly erodible; medium maximum density.	Moderately slow permeability; highly erodible; poorly drained; seasonal high water table.	Moderate to high available moisture capacity; moderately slow infiltration; poorly drained.	Nearly level; short slopes.	Seasonal high water table; highly erodible; moderate to high available moisture capacity.	Impounded or excavated.
Seasonal water table below depth of 3 feet; poor to fair stability; moderate frost action.	Low seepage---	Poor to fair stability; highly erodible; medium maxium density.	Well drained---	High available moisture capacity; moderately slow infiltration.	Seasonal water table below depth of 3 feet; poor to fair stability; highly erodible.	Seasonal water table below depth of 3 feet; highly erodible; high available moisture capacity.	Impounded.

TABLE 7.—*Engineering*

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Keyport: KeA, KeB, KpA, KpB2, KrB. (Urban land in mapping unit KrB consists of Keyport soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Poor trafficability; plastic materials.	Severe	Fair	Unsuited	Unsuited	Poor	Seasonal high water table at a depth of 1½ to 2½ feet; plastic materials; poor to fair stability.
Klej: Ks	Fair to good trafficability; seasonal high water table.	Moderate to slight.	Poor	Fair to good.	Unsuited	Fair	Seasonal high water table at a depth of 1 to 2½ feet; trenches subject to caving.
Loamy and clayey land: LoB, LoC, LoD.	Fair trafficability.	Moderate to severe.	Poor	Unsuited	Unsuited	Very poor	Plastic materials; poor stability.
Marr: MfB2, MfC2, MfC3, MfD2, MfD3, MfE3.	Good trafficability.	Moderate	Good	Unsuited	Unsuited	Fair to good.	Features generally favorable.
Matapeake: MkA, MkB2, MmA, MmB2, MmC2, MmC3, MmD3.	Fair trafficability.	Moderate	Good	Poor	Unsuited	Fair to good.	Features generally favorable.
Matawan: MnA, MnB	Fair trafficability; seasonal high water table.	Severe	Fair	Unsuited	Unsuited	Fair to good.	Seasonal high water table at a depth of 2 to 3 feet; seepage plane above moderately plastic subsoil.

See footnotes at end of table.

interpretations—Continued

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
Seasonal high water table at a depth of 1½ to 2½ feet; plastic materials; poor to fair stability; severe frost action.	Low seepage	Poor to fair stability; highly erodible; medium maximum density.	Slow permeability; highly erodible; moderately well drained; seasonal high water table at a depth of 1½ to 2½ feet.	Moderate to high available moisture capacity; moderate to slow infiltration; moderately well drained.	Seasonal high water table at a depth of 1½ to 2½ feet; poor to fair stability; highly erodible.	Seasonal high water table at a depth of 1½ to 2½ feet; highly erodible; moderate to high available moisture capacity.	Excavated.
Seasonal high water table at a depth of 1 to 2½ feet; fair stability; moderate frost action.	High seepage	Fair stability; medium maximum density.	Rapid to very rapid permeability; ditches will cave; moderately well drained; seasonal high water table.	Very low to moderate available moisture capacity; moderately rapid infiltration; moderately well drained.	Nearly level; short slopes.	Seasonal high water table; very low to moderate available moisture capacity.	Excavated.
Plastic materials; poor stability; moderate to severe frost action.	Low seepage	Poor stability; highly erodible; low maximum density.	Well drained	Moderate to high available moisture capacity; slow to moderate infiltration.	Poor stability; highly erodible.	Highly erodible; moderate to high available moisture capacity.	Impounded.
Good stability; moderate frost action.	Moderately slow subsoil seepage to moderately rapid in substratum.	Good stability; highly erodible; high to very high maximum density.	Well drained	High available moisture capacity; moderate infiltration.	Good stability; highly erodible.	Highly erodible; high available moisture capacity.	Impounded.
Fair to good stability; moderate frost action.	Moderately low seepage in subsoil to high in substratum.	Fair to good stability; moderately erodible; medium to very high maximum density.	Well drained	High available moisture capacity; moderate infiltration.	Fair to good stability; moderately erodible.	Moderately erodible; high available moisture capacity.	Impounded.
Seasonal high water table at a depth of 2 to 3 feet; fair to good stability; severe frost action.	Low seepage	Fair to good stability; moderately erodible; medium to very high maximum density.	Moderately slow permeability; moderately erodible; moderately well drained; seasonal high water table at a depth of 2 to 3 feet.	Moderate to high available moisture capacity; moderate to rapid infiltration; moderately well drained.	Seasonal high water table at a depth of 2 to 3 feet; fair to good stability; moderately erodible.	Seasonal high water table at a depth of 2 to 3 feet; moderately erodible; moderate to high available moisture capacity.	Excavated or impounded.

TABLE 7.—*Engineering*

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Mattapex: MpA, MpB2, MrA, MrB2, MrC2.	Poor trafficability; perched water table.	Severe	Good	Poor to unsuited.	Unsuited	Fair	Seasonal high water table at a depth of 1½ to 2½ feet.
Monmouth: MuA, MuB2, MuC2, MuC3, MuD2, MuD3, MvA, MvB2, MvC2, MvD2, MvE, MwC3, MwD3, MxB, MxD. (Urban land in mapping units MxB and MxD consists of Monmouth soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Fair to poor trafficability; plastic materials.	Moderate	Good	Unsuited	Unsuited	Fair to good.	Features generally favorable.
Muirkirk: MyB, MyC, MyD, MyE, MzB, MzD. (Urban land in mapping units MzB and MzD consists of Muirkirk soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Slight	Poor	Fair to poor.	Unsuited	Fair above depth of 3 feet; very poor below.	Poor stability.
Osier: Os	Fair trafficability; seasonal high water table.	Severe	Very poor.	Fair	Unsuited	Fair	Seasonal high water table at a depth of 0 feet; trenches subject to caving; running sand.
Othello: Ot	Poor trafficability; seasonal high water table.	Severe	Fair	Poor	Unsuited	Fair	Seasonal high water table at a depth of 0 to 1 foot; trenches subject to caving; running sand in substratum.

See footnotes at end of table.

interpretations—Continued

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
Seasonal high water table at a depth of 1½ to 2½ feet; fair stability; severe frost action.	Moderately low seepage in subsoil to high in substratum.	Fair stability; highly erodible; medium to high maximum density.	Moderately slow permeability; highly erodible; moderately well drained; seasonal high water table at a depth of 1½ to 2½ feet.	High available moisture capacity; moderate infiltration; moderately well drained.	Seasonal high water table at a depth of 1½ to 2½ feet; fair stability; highly erodible.	Seasonal high water table at a depth of 1½ to 2½ feet; highly erodible; high available moisture capacity.	Excavated and impounded.
Good stability; moderate frost action.	Low seepage---	Good stability; highly erodible; high to very high maximum density.	Well drained---	High available moisture capacity; moderate infiltration.	Good stability; highly erodible.	Highly erodible; high available moisture capacity.	Impounded.
Poor stability; slight frost action.	High seepage, to very low in substratum.	Poor stability; medium to high maximum density.	Well drained to somewhat excessively drained.	Low available moisture capacity; rapid infiltration.	Poor stability; moderately erodible.	Moderately erodible; low available moisture capacity.	Impounded.
Seasonal high water table at a depth of 0 feet; severe frost action.	High seepage--	Poor stability; medium to low maximum density.	Rapid permeability; poorly drained; seasonal high water table.	Very low to moderate available moisture capacity; rapid infiltration; poorly drained.	Nearly level; short slopes.	Seasonal high water table; very low to moderate available moisture capacity.	Excavated.
Seasonal high water table at a depth of 0 to 1 foot; poor stability; severe frost action.	Moderately low seepage in subsoil, to high in substratum.	Poor stability; highly erodible; high maximum density.	Moderately slow permeability; highly erodible; poorly drained; seasonal high water table at a depth of 0 to 1 foot.	High available moisture capacity; moderate infiltration; poorly drained.	Nearly level; short slopes.	Seasonal high water table at a depth of 0 to 1 foot; highly erodible; high available moisture capacity.	Excavated.

TABLE 7.—*Engineering*

Soil series and map symbols	Soil features affecting winter grading	Susceptibility to frost action	Suitability as source of—				Soil features that affect—
			Topsoil [1]	Sand	Gravel	Road fill	Pipeline construction and maintenance
Rumford: RuA, RuB2, RuC2, RuC3, RuD2, RyB, RyD. (Urban land in mapping units RyB and RyD consists of Rumford soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Slight	Fair	Poor to fair:	Unsuited	Fair to good.	Fair stability; sandy substratum tends to cave.
Sassafras: SaA, SaB2, SaC2, SaC3, SaD2, SaD3, SaE, SfA, SfB2, SnB, SnD. (Urban land in mapping units SnB and SnD consists of Sassafras soils that have been disturbed in construction; properties are highly variable and cannot be estimated accurately.)	Good trafficability.	Slight	Good	Fair to poor.	Fair to unsuited.	Good	Features generally favorable.
Shrewsbury: Sr, Ss	Poor trafficability; seasonal high water table.	Severe	Fair	Poor	Unsuited	Fair	Seasonal high water table at a depth of 0 to 1 foot; trenches subject to caving.
Westphalia: WaB2, WaC2, WaC3, WaD3, WaE3.	Good trafficability.	Moderate	Fair to good.	Poor to fair.	Unsuited	Fair to good.	Fair stability; sandy substratum tends to cave.
Woodstown: WdA, WdB, WoA, WoB.	Fair trafficability; seasonal high water table.	Severe	Good	Fair to poor.	Unsuited	Good	Seasonal high water table at a depth of 1½ to 2½ feet; trenches subject to caving.

[1] Applies to the A horizon or top 10 inches, whichever is less. All severely eroded phases should be considered a poor source of topsoil.

interpretations—Continued

Soil features that affect—Continued							Suitable type of pond
Road or highway location	Sites for ponds or reservoirs	Embankments	Drainage systems	Irrigation	Terraces or diversions	Grassed waterways	
Features generally favorable.	Moderate seepage in subsoil, to high in substratum.	Fair stability; high to very high maximum density.	Well drained to excessively drained.	Moderate to high available moisture capacity; rapid infiltration.	Fair stability; low erodibility.	Low erodibility; moderate to high available moisture capacity.	Impounded.
Features generally favorable.	Moderate seepage in subsoil, to high in substratum.	Good stability; moderately erodible; high to very high maximum density.	Well drained---	Moderate to high available moisture capacity; moderate to moderately rapid infiltration.	Good stability; moderately erodible.	Moderately erodible; moderate to high available moisture capacity.	Impounded.
Seasonal high water table at a depth of 0 to 1 foot; fair to good stability; severe frost action.	Moderate seepage in subsoil, to high in substratum.	Fair to good stability; moderately erodible; high to very high maximum density.	Moderate to rapid permeability; moderately erodible; poorly drained; seasonal high water table at a depth of 0 to 1 foot.	High available moisture capacity; moderate infiltration; poorly drained.	Nearly level; short slopes.	Nearly level; short slopes.	Excavated or impounded.
Fair stability; moderate frost action.	Moderate seepage in subsoil, to high in substratum.	Poor stability; highly erodible; medium to high maximum density.	Well drained---	Moderate to moderately low available moisture capacity; moderate to moderately rapid infiltration.	Features generally favorable.	Features generally favorable.	Impounded.
Seasonal high water table at a depth of 1½ to 2½ feet; good stability; severe frost action.	Moderate seepage in subsoil, to high in substratum.	Good stability; moderately erodible; high to very high maximum density.	Moderate permeability; moderately erodible; moderately well drained; seasonal high water table at a depth of 1½ to 2½ feet.	Moderate to high available moisture capacity; moderate to moderately rapid infiltration; moderately well drained.	Features generally favorable.	Features generally favorable.	Impounded and/or excavated.

[2] No estimates for Urban land part. The areas are under construction, the soils have been disturbed, and properties are variable.

Figure 12.—Mulch has been cut in to provide protection in winter.

The choice of a soil suitable for the laying and maintaining of a pipeline is determined primarily by the natural stability of the soil, by the height and seasonal fluctuation of the water table, and by the potential of the soil to corrode pipes. If the water table is high, laying pipe for sewer, water, or gas is difficult because dewatering is necessary, but it is dangerous because ditchbanks are likely to collapse. Ditchbanks are unstable in some soils, even when the soil is not very wet and the water table is not high. Particularly unstable in Anne Arundel County are the Christiana soils, the Muirkirk soils, and the miscellaneous land type, Loamy and clayey land.

The choice of a soil on which to build roads or highways is affected primarily by stability of the soil, by the height and seasonal fluctuation of the water table, by the number and duration of floods, and by the severity of frost action. Stability is especially important for roads under heavy loads or pressure. The degree of slope and changes in slope are also important considerations.

The choice of a site for a pond or reservoir depends largely on the amount or rate of seepage that can be expected, particularly at the bottom of the reservoir. The amount of seepage is determined by the fine or coarse material on the reservoir floor and sides, and whether it has been sufficiently compacted. Most subsoil material can be so compacted that seepage is low or very low. In many places the substratum, or material under the subsoil, is of coarser texture than the subsoil and permits greater losses by seepage. The most nearly ideal soil for the floor of a pond or reservoir is one that permits very low seepage or has a high natural water table. Also desirable for ponds is a constant or reliable source of water from the ground water, from runoff, or from a stream. Such a source is especially necessary if seepage or other losses are high.

The choice of a soil for embankments is affected by stability, erodibility, and the probable maximum density. The maximum density to which soil material can be compacted in a dam or fill particularly affects the strength and permeability of the structure. Most earth dams allow some loss by seepage. Some soils can be easily compacted to a high or very high density, but others cannot.

The ease or difficulty with which a soil can be drained is determined mainly by the permeability of the least permeable soil layer, which normally is in the subsoil; by the height and fluctuation of the water table; and by the erodibility of the bottom and banks of ditches and canals. Soils that have been compacted by heavy loads, by machinery, or by other means, especially when the

soils were wet, are less permeable, and are more difficult to drain than the same soils in their natural condition.

Features that affect the design of an irrigation system are the rate at which water infiltrates the soil, the capacity of the soil to retain moisture, and the degree of natural drainage. Soils that have impeded drainage should be thoroughly drained artificially before an irrigation system is installed or used. In Anne Arundel County, only overhead, or sprinkler, irrigation is considered. Surface or flood irrigation by ditches or conduits has not been used.

In planning and designing terraces and diversions, the stability and the erodibility of a soil are of special concern. These features, as well as the available moisture capacity and natural fertility of the surface soil, strongly influence the design of waterways through fields and the kinds of grasses or other plants used in waterways.

Both excavated and impounded ponds are common in the county. An excavated pond generally is one that is dug out in level or nearly level terrain. A soil suitable for an excavated pond has a high water table. A high water table is particularly important for ponds that are filled by seepage and receive little surface runoff from the surrounding area. On sloping soils, water is impounded by constructing a low dam across a drainageway. The floor of the pond and the dam should consist of material that has a low seepage rate, and the size of the watershed, or runoff area, should be adequate for the size and for the purpose of the pond. If the watershed is too small, little water will be impounded and the water level may be drastically lowered during dry seasons. If the watershed is too large, runoff from intensive storms may overtop or even destroy the dam if improperly designed and cause serious damage downstream.

Some soils of the county are suited to either an excavated or an impounded pond. Other soils are suited to a combination of the two and require some excavation and an impounding dam as well.

Capability Groups of Soils

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

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

In the capability system, all kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

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 moderate limitations that reduce the choice of plants or that require moderate conservation practices.

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. (None in Anne Arundel County.)

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Anne Arundel 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 indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

Capability Units are soil groups within the subclasses. 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 IIIe–5. 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 each subclass.

In the following pages the capability units in Anne Arundel County are described and suggestions for the use and management of the soils are given. The units are not numbered consecutively, because a statewide system is used for numbering in Maryland and not all of the units in the system are represented in this county. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series are in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I–4

This unit consists of nearly level, uneroded soils of the Collington, Matapeake, and Sassafras series. These soils are on uplands and are deep, well drained, and medium textured. They formed in unconsolidated materials of the Coastal Plain. Permeability is moderate. Collington soils have a high available moisture capacity and a high natural fertility. Sassafras soils have a moderate to high available moisture capacity and a moderate natural fertility. Matapeake soils have a high available moisture capacity and a moderate natural fertility.

The soils in this unit are well suited to general crops and deep-rooted crops. Under proper management, they are suited to corn, wheat, hay, and pasture. They are also suited to tobacco, but tobacco of higher quality probably can be grown on soils having a sandier surface layer.

These soils can be safely tilled year after year, but the use of cropping systems that include untilled crops is a good practice. Contour farming and grassed waterways are used to control excess water on long slopes. The turning under of crop residue improves soil structure. A winter cover crop is needed when these soils are not in a crop that lasts through winter.

CAPABILITY UNIT I–5

This unit consists of nearly level soils of the Collington, Matapeake, and Sassafras series. These soils are on uplands and are deep, well drained, and moderately coarse textured. They formed in sediments of the Coastal Plain. Permeability is moderate. These soils have a high available moisture capacity, except the Sassafras soils, which have a moderate to high available moisture capacity. All the soils are easily tilled.

If properly managed, these soils are well suited to truck crops, corn, hay, and pasture. They are among some of the best soils in Maryland for producing high-quality tobacco.

On these soils a winter cover crop should follow each cultivated crop. Contour farming and grassed waterways are used to control runoff on long slopes.

CAPABILITY UNIT I–6

The only soil in this unit is Comus silt loam. This soil is on flood plains and is deep and well drained. Although erosion commonly is not a hazard, this soil is subject to occasional flooding and streambank cutting and material is deposited as overwash from higher areas or, in some places, by floodwater. This soil is moderately permeable and has a high available moisture capacity and natural fertility. It is medium acid. Also, this soil is strongly influenced by micaceous materials.

This soil is suited to many kinds of crops. It is especially well suited to corn, hay, and pasture. It is also suited to tobacco, and tobacco of medium quality can be grown.

Winter cover crops are needed after row crops are harvested, and grasses or legumes are needed for at least 1 year in every 3 or 4 years. Crop residue disked into the soil improves tilth, and waterways kept in sod help to control runoff. Interceptor ditches along the base of the slopes or diversion terraces higher up the slopes can be used to control runoff from higher adjacent soils. Ditches should be kept clean of trash.

CAPABILITY UNIT I–28

The only soil in this unit is Monmouth fine sandy loam, 0 to 2 percent slopes. This soil is on uplands and is deep, well drained, and moderately coarse textured. It formed in glauconitic sand and silt, locally called greensand. Permeability is moderately slow. Although this soil is nearly level, runoff tends to be rapid because the subsoil absorbs rainwater and snowmelt moderately slowly. It has a high available moisture capacity and a high natural fertility.

This soil is suited to many kinds of crops. It is especially well suited to tobacco, corn, hay, and pasture.

On this soil, a good practice is to follow each cultivated crop with a winter cover crop. Waterways should be kept in sod because runoff tends to be rapid. An occasional crop strip, interceptor ditch, or diversion terrace is needed, even where the slopes are most nearly level.

CAPABILITY UNIT IIe–4

This unit consists of gently sloping, moderately eroded soils of the Collington, Matapeake, and Sassafras series. These soils are on uplands and are deep, well drained, and medium textured. Areas are included, particularly in undisturbed woodland, where there is little or no erosion. These soils formed in unconsolidated materials of the Coastal Plain. They are moderate in permeability and they have a moderate to high available moisture capacity and moderate natural fertility, except for the Collington soils, which have high natural fertility.

The soils in this unit are well suited to general crops and to deep-rooted crops, but they erode readily where they are not protected by vegetation. Under proper management, the soils are suited to corn, wheat, hay, and pasture. They are also suited to tobacco, but tobacco of higher quality can be grown on soils having a sandier surface layer.

These soils should be tilled on the contour, and contour strips are needed in fields having long slopes. Diversion terraces may be needed to protect the soils, and sod is needed in waterways. The use of a cropping system that includes hay at least 1 year in 3 or 4 is desirable, and the use of a winter grain or a cover crop following each row crop is a good practice. These soils are easily tilled, and crops respond well to fertilizer. Rotation grazing is beneficial where these soils are used for pasture. These soils are suited to orchards where air drainage is adequate.

CAPABILITY UNIT IIe–5

This unit consists of gently sloping, moderately eroded soils of the Collington, Marr, Matapeake, Sassafras, and Westphalia series. These soils are deep, well drained, and

moderately coarse textured. They are strongly acid to very strongly acid and have a high available moisture capacity, except for Westphalia soils, which have a moderate to moderately low moisture capacity, and Sassafras soils, which have a moderate to high available moisture capacity. All the soils in the unit have moderate to high natural fertility. Permeability is moderate to moderately rapid in the Westphalia soils and moderate in the other soils. The soils in this unit have a fine sandy loam surface layer and are easily tilled.

If properly managed, these soils are well suited to truck crops, corn, small grain, hay, pasture, and fine-quality tobacco.

On the soils in this unit, a small grain or a winter cover crop should follow each row crop. Because the soils erode readily unless they are protected, a plant cover is needed most of the time. During long dry periods, these soils may be somewhat droughty. Contour farming in strips is advisable (fig. 13). Diversion terraces that have a safe outlet are needed on long slopes to intercept surface runoff, and sod is needed in natural drainageways.

CAPABILITY UNIT IIe–13

This unit consists of gently sloping, mostly moderately eroded soils of the Beltsville and Keyport series. These soils are moderately well drained and medium textured, and they have a slowly permeable subsoil. They have a moderate to high available moisture capacity, have moderate natural fertility, and are strongly acid to extremely acid. Internal drainage is slow.

These soils are suited to corn, soybeans, hay other than alfalfa, and pasture. They are also suited to tobacco, but the quality tends to be low.

Although the soils in this unit are saturated during some wet periods, protection against erosion is more important than improvement of drainage. Unless excess water is removed early in spring, planting will be delayed. On the other hand, crops may be damaged in dry periods. Planting crops that are subject to damage by frost heaving is not a good practice. Contour strips supplemented by diversion terraces and sodded waterways help to control runoff and erosion.

CAPABILITY UNIT IIe–16

This unit consists of gently sloping, slightly to moderately eroded soils of the Adelphia, Butlertown, Mattapex, and Woodstown series. These soils are deep, moderately well drained, and medium textured. They are strongly acid to extremely acid and have a moderate to high available moisture capacity and moderate natural fertility. Permeability is moderately slow in the Butlertown and Mattapex soils and moderate in Adelphia and Woodstown soils. The water table is seasonally high and perched in the Butlertown and Mattapex soils. Butlertown soils have a brittle layer in the lower subsoil.

The soils in this unit are suited to general farm crops, hay, and pasture, but impeded drainage and a seasonally high water table somewhat limit their use for deep-rooted crops.

These soils need a cropping system that includes a hay crop at least once every 4 years. A winter cover crop or a crop of small grain is also needed after each row crop is harvested. Although drainage is impeded in these soils, protection from erosion is more important than improvement of drainage. Farming in graded strips helps to control excess water. Natural waterways should be kept in sod. Diversions may be used on long slopes to protect these soils from erosion or to improve drainage. Tile drainage is suitable. Planting and cultivating on these soils are generally somewhat late in spring because moisture is excessive.

CAPABILITY UNIT IIe–28

This unit consists of gently sloping, moderately eroded soils of the Howell and Monmouth series. These soils are on uplands and are deep, well drained, and moderately coarse textured. They are strongly acid to extremely acid and have a high available moisture capacity. Permeability is moderately slow in the Monmouth soils and slow in the Howell soils. Runoff is rapid, and the hazard of erosion is severe.

The soils of this unit are suited to general crops and to deep-rooted crops. If properly managed, they are suited to tobacco, truck crops, corn, small grain, hay, and pasture. The tobacco grown is normally of high quality. A rotation is desirable.

Contour stripcropping, diversion terraces, and sodded waterways are needed to help control erosion.

CAPABILITY UNIT IIe–29

This unit consists of Howell silt loam, 2 to 6 percent slopes, moderately eroded, and Howell silt loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded. Included are some wooded areas that are only slightly eroded. These soils are on uplands and are deep, well drained, medium textured, and extremely acid. Permeability is slow, but internal drainage is good. These soils have a high available moisture capacity.

The soils in this unit are suited to corn, small grain, hay, pasture, and tobacco. The quality of the tobacco grown, however, tends to be low.

A good cropping system is desirable to help prevent erosion on these soils. Clean-tilled crops should be planted only once in every 3 years because runoff is rapid and erosion is likely. Contour stripcropping, diversion terraces, and sodded waterways are needed to help control erosion.

CAPABILITY UNIT IIe–36

This unit consists of gently sloping soils of the Adelphia, Donlonton, Keyport, Matawan, Mattapex, and Woodstown series. These soils are on uplands and are deep, moderately well drained, moderately coarse textured, and strongly acid to extremely acid. Matawan soils have a thick surface layer that is sandier than the surface layer of the other soils. The hazard of erosion is slight to moderate, and permeability is moderate to slow. These soils have a moderate to high available moisture capacity and moderate natural fertility.

The soils of this unit are well suited to corn, soybeans, small grain, and hay. They should be farmed in graded rows, or in graded strips of row crops that are alternated with close-growing crops.

Although these soils have impeded drainage, controlling erosion is generally more important than improving the drainage. Surface drainage can be improved and erosion controlled by farming in graded strips and by

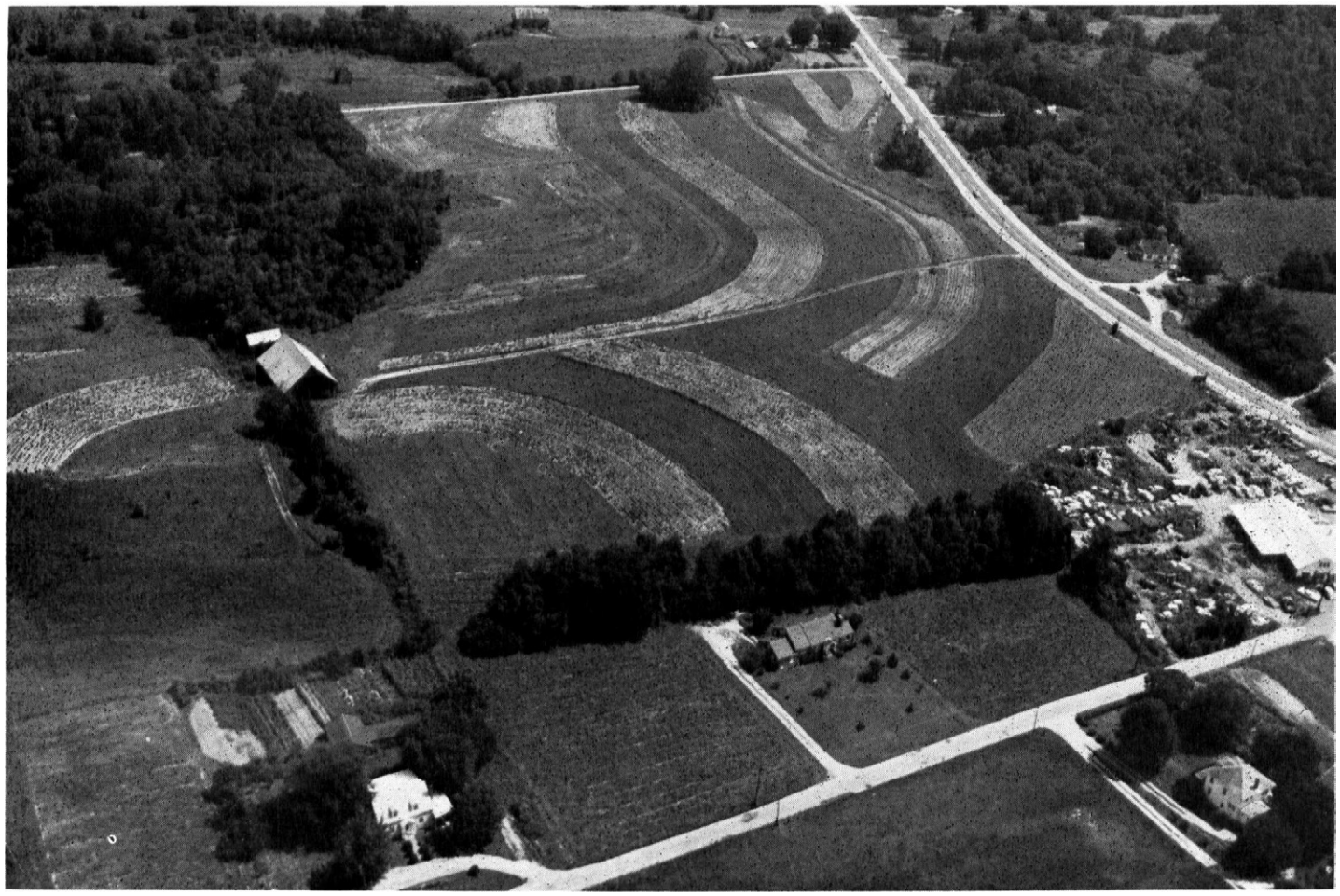

Figure 13.—Contour stripcropping.

using diversion terraces to intercept runoff and to control washing on long slopes. Drainageways should be kept in sod. The use of cultivated crops for more than 2 out of every 3 years is not a good practice. Cover crops are needed if row crops are not followed by small grain.

CAPABILITY UNIT IIe-42

The only soil in this unit is Christiana silt loam, 2 to 5 percent slopes, moderately eroded. This soil is on uplands and is deep, well drained, and medium textured. Its subsoil of unstable clay is moderately slowly permeable or slowly permeable. Internal drainage is good because cracks generally form in the unstable clay. This soil is very strongly acid in unlimed areas. It has a high available moisture capacity and moderate natural fertility. The surface layer is difficult to work where it has been compacted by the use of heavy machinery. Wetness may delay plowing in spring.

If properly managed, this soil is suited to corn, small grain, hay, and pasture.

This soil can benefit by the use of a winter cover crop or a small grain to follow row crops. Tillage should be kept to a minimum. Graded contour strips, sodded waterways, and on long slopes, diversion terraces help to control excess runoff and erosion. Where practical, crop residue should be kept on or near the surface by mixing only part of it into the soil.

CAPABILITY UNIT IIw-1

This unit consists of deep, nearly level soils of the Adelphia, Butlertown, Mattapex, and Woodstown series. These soils are on uplands and are moderately well drained and medium textured. Permeability is moderate or moderately slow, and the water table is seasonally high but is perched in the Butlertown and Mattapex soils. The soils in this unit have a moderate to high available moisture capacity and moderate natural fertility, and they are strongly acid to extremely acid.

The soils in this unit are suited to corn, soybeans, small grain, and pasture. They are also suited to hay plants that are not subject to damage by frost heaving. A good cropping system should include a small grain that follows a row crop, unless a winter cover crop is used.

The most serious problem of management on these soils is the improvement of drainage. Open ditches or diversion terraces can be used. Tile can be used to intercept water from seepage and to drain wet spots. Turning

under crop residue and keeping tillage to a minimum improve tilth. On long slopes, row crops should be grown in graded strips. Excess water can delay spring cultivation.

CAPABILITY UNIT IIw–5

This unit consists of deep, nearly level soils of the Adelphia, Mattapex, and Woodstown series. These soils are on uplands and are moderately well drained, moderately coarse textured, and strongly acid to extremely acid. Permeability is moderate to moderately slow, and the water table is seasonally high but is perched in the Mattapex soils. The soils in this unit have a moderate to high available moisture capacity and a moderate natural fertility.

These soils are well suited to corn, soybeans, small grain, hay, and pasture. They are also well suited to truck crops if artificial drainage is installed.

A suitable cropping system should include a hay crop. A good practice is to follow each row crop by a winter cover crop or by a small grain crop. These soils can be safely cultivated for 2 or 3 years in succession if cover crops are used. The most serious problem of management is the improvement of drainage. Ditches can be used, and tile is suitable, particularly in smaller areas.

CAPABILITY UNIT IIw–7

The only soil in this unit is Codorus silt loam. This soil formed in alluvium and is deep, moderately well drained to somewhat poorly drained, and medium textured. The water table is seasonally high. The Codorus soil is on flood plains and is occasionally flooded. It has a moderate to high available moisture capacity and is moderately productive if properly managed. Unlimed areas are strongly acid.

The soil in this unit is suited to general farm crops, hay, and pasture. Drainage is the most serious problem of management when these crops are grown because of the seasonal high water table and the risk of flooding. Most areas of this soil are in hardwoods.

For improving drainage, V-type ditches or tile drains are suitable. Ditches are needed to intercept runoff and seepage from the higher adjacent soils. Sodded waterways are used to dispose of runoff.

CAPABILITY UNIT IIw–8

The only soil in this unit is Keyport silt loam, 0 to 2 percent slopes. This soil is on uplands and is moderately well drained, medium textured, and strongly acid. Permeability is slow. This soil has a moderate to high available moisture capacity and moderate natural fertility.

This soil is suited to corn, soybeans, small grain, pasture, and hay other than alfalfa. Crops that are damaged by frost heaving are not well suited to this soil.

A suitable cropping system is one that includes a hay crop. The improvement of drainage in this soil, particularly early in spring, generally is the most serious problem of management. This soil can be worked within only a narrow range of moisture content. The use of heavy machinery tends to compact the surface layer. Ditches are more suitable than tile for the removal of excess water, because permeability is so slow that tile does not function properly.

CAPABILITY UNIT IIw–9

This unit consists of nearly level soils of the Donlonton and Keyport series. These soils are moderately well drained, moderately coarse textured, and strongly acid to very strongly acid. Permeability is slow or moderately slow, and even though water moves through these soils slowly, runoff is slow because the soils are nearly level. The available moisture capacity is high in the Donlonton soils and moderate to high in the Keyport soils. Natural fertility is moderate.

The soils in this unit are well suited to most crops, but their use is limited by impeded drainage. Drainage is commonly improved by using random field ditches, but random tile lines can be used where the sandy loam or fine sandy loam surface layer is 24 inches thick or more above the subsoil.

Row crops can be safely grown for 2 years in succession if a cover crop, commonly hay, is grown after each row crop. In a field having long, very gentle slopes, farming should be in graded rows, which can be supplemented, where needed, with diversion terraces. Seepage or runoff from any adjacent higher soils should be intercepted and diverted to safe outlets.

CAPABILITY UNIT IIw–10

The only soil in this unit is Matawan loamy fine sand, 0 to 2 percent slopes. This soil is deep, is moderately well drained, and has a thick sandy surface layer. Permeability is moderately slow in the subsoil, but the movement of water is moderately rapid to rapid through the surface layer. This soil has a moderate to high available moisture capacity and is extremely acid unless limed.

This soil is generally suited to row crops, small grain, hay, and pasture, but drainage in this soil needs to be improved for most of these crops. Tile is suitable for draining this soil.

A good cropping system should include a hay crop. If small grain is not planted, a winter cover crop is needed after the row crop is harvested. This soil can be somewhat droughty during long dry periods, and when such a dry period occurs, supplemental irrigation can be used to help crop growth. Crop residue disked into the soil helps to supply organic matter.

CAPABILITY UNIT IIs–4

This unit consists of deep, nearly level to gently sloping soils of the Collington and Rumford series. These soils are on uplands and are well drained to excessively drained. They have a thick, rapidly permeable surface layer of loamy sand that is underlain by a finer textured, moderately to moderately rapidly permeable subsoil. Most of the gently sloping areas are moderately eroded. These soils have a moderate to high available moisture capacity and are strongly acid to very strongly acid. The Rumford soils have low natural fertility, whereas the natural fertility of the Collington soils is somewhat higher.

The soils of this unit are suited to general crops and to deep-rooted crops. Tobacco and truck crops of high quality can be grown. It is a good practice to follow a row crop with a cover crop or a winter crop of small grain.

Supplemental irrigation is desirable on the soils of this unit because they are droughty during the drier

periods in summer. In unusually dry periods, irrigation can be essential. Adequate plant cover is needed to protect the loose loamy sand surface layer from blowing during the windy spring months. Droughtiness and low fertility are the major problems of management on these soils, but control of erosion is also important. Contour stripcropping helps to control erosion and to conserve moisture. Waterways should be kept in sod and crop residue returned to the soil.

CAPABILITY UNIT IIs–5

This unit consists of nearly level and gently sloping soils of the Monmouth and Muirkirk series. These soils are on uplands and are deep, well drained, and coarse textured. The Monmouth soils are moderately eroded where they are gently sloping. All the soils are strongly acid to very strongly acid, and they are rapidly permeable to a depth of 31 inches. Below this depth, permeability is moderate to slow. The thick surface layer does not retain moisture well. The Muirkirk soils have low natural fertility, whereas the natural fertility of Monmouth soils is somewhat higher.

These soils are suited to general crops and to deep-rooted crops. Tobacco of high quality can be grown. It is a good practice to follow each row crop with a cover crop or winter crop of small grain.

These sandy soils are droughty during summer, and therefore supplemental irrigation is desirable. During the driest periods, irrigation can be essential. During spring, proper plant cover is needed to protect the loose surface layer from blowing. Droughtiness and low fertility are the major problems of management on these soils, but the control of erosion is also important. Contour stripcropping, diversion terraces, and sodded waterways are needed to help to control erosion and to conserve moisture. All crop residue should be disked into the soil.

CAPABILITY UNIT IIs–7

The only soil in this unit is Chillum silt loam, 2 to 6 percent slopes, moderately eroded. This soil is on uplands and is well drained, medium textured, and moderately deep to sand and gravel. This soil has a very firm and brittle substratum that limits the depth to which the roots of most deep-rooted plants can penetrate. This soil is moderately permeable and is very strongly acid. It has moderate natural fertility and a high available moisture capacity.

The soil of this unit is suited to tobacco and to general crops, hay, and pasture. It is not suited to plants that require a very deep root zone.

A winter cover crop should be grown when the soil is not in a winter crop of small grain or grass. This soil may be somewhat droughty during long dry periods because the effective root depth is limited by the very firm substratum. During such times, crops are benefited by supplemental irrigation. Careful management is needed to conserve moisture, increase fertility, and reduce damage from erosion. Contour stripcropping, using diversion terraces on long slopes, and keeping waterways in sod are some of the conservation practices needed to control erosion. Crop residue should be disked into the soil.

CAPABILITY UNIT IIIe–4

The only soil in this unit is Matapeake silt loam, 5 to 10 percent slopes, moderately eroded. This soil is on uplands and is deep, well drained, and medium textured. It is strongly acid to very strongly acid and has a high available moisture capacity and moderate natural fertility. Permeability is moderate.

If properly managed, this soil is well suited to truck crops, corn, small grain, hay, and pasture. It is also suited to tobacco but the quality of the crop grown is low or medium.

A good cropping system should include a hay crop. Soil losses by erosion are reduced if a clean-tilled crop is grown not more than once in 4 to 5 years. Contour stripcropping, diversion terraces, and sodded waterways also help to check erosion.

CAPABILITY UNIT IIIe–5

This unit consists of sloping, mostly moderately eroded soils of the Collington, Marr, Monmouth, Muirkirk, Sassafras, and Westphalia series. These soils are on uplands and are deep, are well drained, and, except for the coarse textured Monmouth and Muirkirk soils, are moderately coarse textured. These soils are strongly to very strongly acid. They have a moderate to high available moisture capacity and moderate fertility, except for the Muirkirk soil, which is low in both natural fertility and available moisture capacity. Permeability ranges from moderate to slow in the Muirkirk soil to moderate to moderately rapid in the Westphalia soil. The Monmouth and Muirkirk soils have a thicker, sandier surface layer than the other soils in this unit.

If properly managed, these soils are suited to truck crops, corn, small grain, hay, and pasture. Also, tobacco of high quality can be grown.

A suitable cropping system is one that includes a hay crop. These soils are somewhat droughty during long dry periods. Contour stripcropping, diversion terraces, and sodded waterways help to control erosion and to conserve moisture. Crop residue should be returned to the soil.

CAPABILITY UNIT IIIe–7

The only soil in this unit is Chillum silt loam, 6 to 12 percent slopes, moderately eroded. It is on uplands and is moderately deep to sand and gravel, well drained, and medium textured. It has a very firm and brittle substratum that limits the depth to which the roots of most deep-rooted plants can penetrate. Permeability is moderate. This soil is very strongly acid and has a high available moisture capacity and moderate natural fertility.

The soil in this unit is suited to general crops, hay, pasture, and tobacco. A suitable cropping system should include a hay crop.

The restricted depth of root penetration influences management and use of this soil, but the hazard of erosion is severe, and the control of erosion is generally a more serious management problem. This soil should be farmed in contour strips or graded strips, and waterways should be kept in sod. Diversion terraces are needed on long slopes in some places. Crop residue should be disked into the soil.

CAPABILITY UNIT IIIe-9

The only soil in this unit is Croom gravelly sandy loam, 5 to 10 percent slopes, moderately eroded. This soil is on uplands and is shallow to moderately deep to a firm layer of sand and gravel, well drained, and moderately coarse textured. This soil has an extremely hard subsoil. It has a low available moisture capacity, is low in natural fertility, and is strongly acid.

This soil is fairly well suited to general crops, particularly to crops that do not require a deep root zone. Tobacco and other crops of high quality can be grown, but because this soil is droughty, irrigation is needed. A suitable cropping system is one that includes a hay crop.

Although this soil is droughty and has low fertility, the most serious problem of management is the control of erosion. Cultivation should be on the contour, and runoff should be controlled by diversion terraces. Waterways should be kept in sod. Cover crops and other sources of organic matter should be used.

CAPABILITY UNIT IIIe-16

This unit consists of moderately sloping, moderately eroded soils of the Butlertown and Mattapex series. These soils are on the uplands and are deep, moderately well drained, and medium textured. They are moderately slowly permeable. These soils have a high available moisture capacity, are moderate in natural fertility, and are strongly acid to very strongly acid. The Butlertown soil has a slightly compacted layer in the lower subsoil.

If properly managed, the soils in this unit are well suited to general farm crops, hay, and pasture. Crops readily damaged by frost heaving are not well suited to these soils.

A suitable cropping system is one that includes a hay or a pasture crop. These soils have impeded drainage and are slow to warm in the spring, but erosion control is the most critical management problem. Graded contour strips help to control runoff, which causes erosion. On long slopes, diversions are used to check erosion and improve drainage. Waterways should be kept in sod. Tile systems are suitable for draining these soils.

CAPABILITY UNIT IIIe-28

The only soil in this unit is Monmouth fine sandy loam, 5 to 10 percent slopes, moderately eroded. This soil is on uplands and is deep, well drained, moderately coarse textured, and strongly acid to very strongly acid. It has a clayey subsoil that is moderately slow in permeability. Runoff is rapid. This soil has a high available moisture capacity and high natural fertility.

This soil is well suited to orchards. If well managed, it is suited to truck crops, corn, small grain, hay, tobacco, and pasture. The tobacco grown is generally of high quality.

Erosion is a serious hazard unless this soil is carefully protected. Contour stripcropping, diversion terraces, and sodded waterways help to control erosion.

CAPABILITY UNIT IIIe-33

This unit consists of sloping, moderately eroded soils of the Collington and Rumford series. These soils are on uplands and are deep, well drained to excessively drained, and coarse textured. They have moderate to moderately rapid permeability. They have a loamy sand surface layer as much as 20 inches thick. This layer is rapidly permeable but does not retain moisture well. The Rumford soil has a low natural fertility, whereas the natural fertility of the Collington soil is somewhat higher.

The soils in this unit are suited to general crops and to deep-rooted crops. Tobacco and truck crops of high quality can be grown.

A suitable cropping system is one that includes a hay crop. These soils are subject to erosion by water and also to blowing by wind if they are dry and unprotected. Soil and water are conserved by farming on the contour and by keeping the soils in permanent vegetation. Supplemental irrigation is generally needed if crops of high value, such as truck crops and tobacco, are grown.

CAPABILITY UNIT IIIe-42

This unit consists of gently sloping Loamy and clayey land and a sloping, moderately eroded Christiana soil. These mapping units are on uplands and are deep, well drained, and medium textured. They have a clay subsoil that is unstable and moderately slow to slow in permeability. The soils in this unit have a high available moisture capacity and moderate natural fertility. They are very strongly acid. The surface layer is easily compacted by heavy machinery and is not easily worked when it is too wet or too dry.

If properly managed the soils in this unit are fairly well suited to general crops.

In a good cropping system, row crops should be followed by small grain or a cover crop, and then by hay or pasture. Because these soils are highly susceptible to erosion, only the minimum of tillage needed for good management and weed control should be used. Contour strips on all slopes and diversions on long slopes are needed to control runoff. Sodded waterways help to dispose of excess water. Crop residue should be left on the surface of the soil or partly turned under.

CAPABILITY UNIT IIIw-6

This unit consists of nearly level and gently sloping soils of the Colemantown, Fallsington, and Shrewsbury series. These soils are deep and moderately coarse textured. They are poorly drained. Permeability ranges from moderately slow to slow in the Colemantown soils to moderate to rapid in the Shrewsbury soils. The water table is at or near the surface in winter and spring, and it seldom falls to much below a depth of about 3 feet in any season. These soils are very strongly acid to extremely acid. They have a high available moisture capacity, except for the Fallsington soils, which have a moderate to high available moisture capacity. All the soils are moderate in natural fertility.

The soils in this unit are suited to corn, soybeans, and some hay and pasture plants if artificial drainage is adequate.

These soils can be cropped almost continuously if cover crops are used and crop residue is returned to the soil. Tile or ditches are suitable for drainage where suitable outlets are available. Runoff from the higher adjacent areas should be intercepted and diverted to safe outlets.

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CAPABILITY UNIT IIIw-7

This unit consists of nearly level and gently sloping soils of the Bibb, Colemantown, Hatboro, Othello, and Shrewsbury series. These soils are deep and medium textured. They are poorly drained and have moderate to very slow permeability. The water table is at or near the surface in winter and early in spring, and it seldom falls to much below 3 feet of the surface in any season. The Bibb and Hatboro soils are on flood plains and are subject to flooding. Soils in this unit are strongly acid to very strongly acid. They have a moderate to high available moisture capacity and moderate natural fertility.

The soils in this unit are suited to corn, soybeans, and to hay and pasture plants if adequate artificial drainage is used. Small grain is seldom grown.

These soils are only slightly susceptible to erosion, and they can be kept in row crops for several years if cover crops are grown. Ditches or tile can be used for draining these soils. In areas where the Bibb and Hatboro soils are subject to frequent flooding, their use is limited mainly to grazing, woodland, wildlife habitat, or recreational use.

CAPABILITY UNIT IIIw-9

The only soil in this unit is Elkton silt loam. This soil is on flats of uplands and is nearly level, poorly drained, and medium textured. It has a clayey subsoil and is slow to very slowly permeable. This soil has a high available moisture capacity and moderate natural fertility. It is extremely acid. The water table is at or near the surface most of the year, and it seldom falls below a depth of about 3 feet.

The soil in this unit is suited to corn, soybeans, and less commonly, to hay or pasture if it is drained.

Draining this soil so that cultivated crops can be grown is difficult. Tile is unsuitable for drainage, and ditches must be closely spaced. Interceptor ditches may be needed to control runoff from adjacent higher areas. Level areas of this soil without adequate outlets may be temporarily ponded.

CAPABILITY UNIT IIIw-10

The only soil in this unit is Klej loamy sand. This soil is deep, nearly level, and moderately well drained. It is coarse textured throughout. This soil may be droughty during dry periods in summer, even though the water table is seasonally high. It has a very low to moderate available moisture capacity and low natural fertility, and it is extremely acid. Water moves rapidly to very rapidly through this soil when the water table is low.

If adequately drained, the soil in this unit is suited to corn, soybeans, truck crops, and many other crops. During periods of drought, however, supplementary irrigation may be needed.

This soil needs good management, including heavy fertilization. Row crops can be safely grown year after year if winter cover crops are seeded. This soil is easy to drain and is especially suited to tile drains.

CAPABILITY UNIT IIIw-11

The only soil in this unit is Elkton sandy loam. This soil is poorly drained and is on uplands. It is extremely acid and has a thick surface layer and a slowly to very slowly permeable, clayey subsoil. Water moves moderately rapidly through the surface layer. This soil has a high available moisture capacity.

The soil in this unit is suited to crops that can be planted late, such as soybeans, certain truck crops, and some hay and pasture plants. Undrained areas are normally used for grazing or as woodland.

This soil can be used for row crops year after year, if a winter cover crop is used. It is moderately productive under proper management. Ditches can be used to improve drainage. Diversions are needed on long slopes. Waterways should be kept in sod. It is a good practice to keep grazing animals off pastures in spring and fall when the soil is wet.

CAPABILITY UNIT IIIs-1

The only soil in this unit is Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes. This soil is deep, nearly level to gently sloping, and has a very droughty surface layer and subsoil. It has a moisture-retention layer of moderately fine textured materials in the substratum. These finer textured materials retain some moisture for plant roots during the drier months of the growing season. This soil is strongly acid and is rapidly to very rapidly permeable above the finer textured materials in the substratum. It has a low natural fertility.

The soil in this unit is well suited to truck crops. Tobacco of good quality can be grown.

The surface layer of this soil is very susceptible to blowing and needs to be protected by a plant cover. Proper management includes using a close-growing crop in a rotation, planting crops in strips that are crosswise to the direction of the prevailing winds, and establishing windbreaks. Organic matter should be supplied by plowing crop residue into the surface layer. Supplemental irrigation is needed during the drier months.

CAPABILITY UNIT IVe-3

This unit consists of moderately sloping Loamy and clayey land and moderately sloping, severely eroded soils of the Christiana, Howell, Matapeake, and Monmouth series. These soils are strongly acid to extremely acid. The subsoil is exposed at the surface, and some gullies have formed. Permeability is moderate to slow.

The soils in this unit are suited to general crops, but they cannot be safely cultivated unless the cropping system includes row crops no more often than 1 year in 5. Under intensive management, these soils are suited to truck crops, tobacco, and other crops, but the tobacco grown may be of low quality. These soils are well suited to permanent hay and pasture, and to orchards if they are kept well sodded.

The main conservation practices needed for these soils are contour cultivation, stripcropping that includes buffer strips, minimum tillage, management of crop residue, and terracing in some places. Waterways should be closely spaced and kept in sod.

CAPABILITY UNIT IVe-5

This unit consists of moderately steep, moderately eroded soils and sloping, severely eroded soils of the Collington, Marr, Monmouth, Muirkirk, Rumford, Sassafras, and Westphalia series. These soils are deep, well drained, and coarse textured or moderately coarse

textured. They are on uplands. Permeability is slow to moderately rapid. The soils are strongly acid to very strongly acid and have a low to high available moisture capacity and natural fertility.

Under good management, the soils in this unit are well suited to most general crops but are limited to only occasional cultivation. A good cropping system must include keeping clean-tilled crops to a minimum and growing a row crop not more than once in 5 years. Tobacco of high to medium quality can be grown. Permanent hay and pasture, as well as orchards kept in sod, are well suited.

The hazard of erosion is severe, and extensive conservation practices are needed. Among these practices are contour cultivation, contour stripcropping that includes buffer strips, management of crop residue, and minimum tillage. Diversion terraces are needed in places, and all waterways should be kept in sod.

CAPABILITY UNIT IVe–7

The only soil in this unit is Croom gravelly sandy loam, 10 to 15 percent slopes, moderately eroded. This soil is well drained. It has an extremely hard gravelly sandy loam subsoil that limits the root depth of plants. It is strongly acid and has low natural fertility and available moisture capacity. The hazard of erosion is severe.

The soil in this unit is suited to general crops, hay, and pasture, but it is strongly limited in use for cultivated crops.

It is not a good practice to plant a row crop more often than once in 5 years. Farming in narrow contour strips, diversion terraces, and sodded waterways should be used to control erosion. Crop residues should be disked into the soil. Supplemental irrigation is beneficial during dry periods.

CAPABILITY UNIT IVe–9

The only soil in this unit is Butlertown silt loam, 5 to 10 percent slopes, severely eroded. This soil is on uplands and is medium textured and moderately well drained. Permeability is moderately slow. This soil is strongly acid and has a high available moisture capacity and moderate natural fertility.

The soil in this unit is suited to hay and pasture. It is not well suited to alfalfa and other crops that can be damaged by frost heaving. Tilled crops such as corn should not be planted more often than once in 5 years, and in the interval periods, hay, small grain, pasture, and other close-growing plants should be grown.

Internal drainage is impeded on this soil, but the control of erosion is the most serious problem of management. Diversions with crop strips between them help to control runoff and erosion and help to provide the drainage needed during wet periods. Waterways should be kept in permanent, well-managed sod. Compaction is likely if this soil is worked with heavy machinery or if grazing is permitted when the soil is wet. Compaction increases the difficulty of tillage and hinders plant growth.

CAPABILITY UNIT IVw–6

The only soil in this unit is Osier loamy sand. This soil is poorly drained and is on flats of uplands and in depressions. Permeability is rapid. The water table is at or near the surface much of the year unless the soil is artificially drained. In areas not drained, water stands on the surface after heavy rains and during spring and winter. This soil is very strongly acid and has a very low to moderate available moisture capacity and low natural fertility.

Unless drained, the soil in this unit is of little use for farming. If adequately drained, it is suitable for corn, soybeans, blueberries, garden crops, and some truck crops.

Drainage is not difficult if adequate outlets are provided. Ditchbanks tend to cave in and fill the ditches with sand, but tile drains generally function very well. Large amounts of fertilizer are needed for almost any kind of crop, but applications of lime should be in numerous small quantities to avoid crop burning. Lime is not needed for blueberries. Irrigation of this soil is beneficial during dry periods. The cost of irrigation is justified if truck crops and other crops of high value are grown.

CAPABILITY UNIT IVs–1

This unit consists of nearly level to sloping soils of the Evesboro and Galestown series. These soils are deep, droughty, and sandy; they are on uplands. The sloping Evesboro soils have a moisture-retention layer in the substratum. Permeability is rapid to very rapid in all these soils. They have a low to moderate available moisture capacity and low natural fertility, and they are strongly acid to very strongly acid.

The soils in this unit are not particularly suited to farming, but they are suited to most deep-rooted crops. They are also suited to shallow-rooted crops if supplemental irrigation is available when needed.

Large amounts of fertilizer are needed for nearly all crops, but applications of lime should be carefully applied to avoid crop burning. It is economically feasible to grow only crops of high cash value, such as tobacco and some truck crops, because the costs of production are usually high. The tobacco grown is generally of high quality. A permanent cover of vegetation is needed to prevent water erosion and soil blowing. Contour or straight field strips are needed to help control erosion, and where possible, crop rows should be at right angles to the prevailing wind. Crop residue should be returned to the soil. Animal manure and other organic materials should be used if they are available.

CAPABILITY UNIT VIe–2

This unit consists of Loamy and clayey land and soils of the Butlertown, Collington, Howell, Marr, Matapeake, Monmouth, Sassafras, and Westphalia series. Most of these soils are moderately steep or steep and are moderately eroded or severely eroded. The soils in this unit are deep and well drained. Other characteristics of these soils vary, but most of them are strongly acid to extremely acid. This capability unit is one of the most extensive in the county.

Unless management is intensive, the soils in this unit are not suited to cultivation, because they are too steep and too erodible. They are suited to pasture, woodland, wildlife habitat, and well-sodded orchards.

The cost of applying the conservation measures needed for safely cultivating these soils may not be economically feasible. These measures include the use of contour farming and the use of many diversions, sodded grassways,

and buffer strips. In addition, measures must be applied to prevent overgrazing, which damages sod and promotes erosion.

CAPABILITY UNIT VIw–1

Only Mixed alluvial land is in this unit. This land type is nearly level and poorly drained, and it is on the flood plains of streams throughout the county. It is extremely acid in most areas but is variable in most other characteristics. This land contains glauconitic materials in some areas and is somewhat more fertile than similar soils that lack this mineral.

Areas of this land that are not protected from flooding are suited to woodland and wildlife habitat. Areas that are protected from flooding and artificially drained are suitable for good pasture and some hay. The hazard of flooding is so severe that growing cultivated crops is not feasible.

Open ditches can be used to improve drainage of this land and also to intercept water from adjacent uplands. Dikes can be used to protect this land from flooding, but they are not economically feasible for use in farming.

CAPABILITY UNIT VIIe–2

This unit consists of steep Loamy and clayey land and steep to very steep soils of the Croom, Howell, Marr, Muirkirk, and Westphalia series. These soils are on uplands and are well drained and generally severely eroded. Other characteristics of these soils vary.

The soils in this unit are so steep or so severely eroded that they are not suited to tilled crops. Suitable safe uses are woodland and parks and other recreational areas. Some areas probably can be pastured and used for limited grazing if overgrazing is prevented. Under especially good management, these soils can grow a limited amount of hay.

CAPABILITY UNIT VIIw–1

Only Swamp is in this unit. This land type varies in texture and may be sand, silt, clay, muck, or any mixture of these materials. The surface is covered by water most or all of the time.

Swamp is so wet and its reclamation is so impractical and expensive that use for farming is not likely. Some timber or other woodland products may be obtained. Swamp is suited as a habitat for some kinds of wildlife, and it can be used as a recreational area.

CAPABILITY UNIT VIIs–1

This unit consists of moderately sloping and steep soils of the Evesboro and Galestown series. These soils are on uplands and are deep, well drained to excessively drained, very sandy, and strongly acid to very strongly acid. Permeability is rapid to very rapid. They have a very low to low available moisture capacity and low natural fertility.

The soils in this unit are not suited to general cultivation, because they are droughty, are sloping to steep, and do not retain plant nutrients well. In a few areas, however, growing crops in home gardens and other local places may be justified by the high value of the crops. These soils are suited to woodland, limited grazing, and wildlife habitat.

CAPABILITY UNIT VIIIw–1

Only Tidal marsh is in this unit. It is subject to flooding at regular intervals by saline tidewater. It is not suited to crops or pasture and does not support trees. Tidal marsh is suitable for wildlife habitat and for recreational activities, such as bird watching and other types of nature observation.

CAPABILITY UNIT VIIIs–2

This unit consists of Coastal beaches that border the Chesapeake Bay. These nearly level, sandy areas are washed with saline water during storms and spring tides. They have no farm use but serve as recreational and wildlife areas.

CAPABILITY UNIT VIIIs–4

Only Gravel and borrow pits is in this unit. This land type has been stripped of soil material by the mining of gravel or by the removing of other material, such as clay and ironstone, for road fill or other uses.

The land in this unit is not suited to farming, but woodland products in limited quantities can be produced if trees are planted in suitable areas.

Some areas can be made into ponds, and other areas may be used as building sites, but the suitability of each area for any use can be determined only by a careful onsite investigation.

General Management Requirements

Some of the basic management practices for the soils of Anne Arundel County are discussed in this subsection. These practices are not intended as a guide to the management of farm soils in any particular field or other area. However, some practices considered necessary on all the soils are reviewed and the kinds of management that may be necessary on some soils or groups of soils are discussed. These general practices include soil amendments, cropping systems, tillage, crop residue management, drainage, and irrigation. Tobacco is the most important crop in Anne Arundel County. Other major crops are corn, soybeans, small grain, and hay.

Soil amendments

The soils of Anne Arundel County are acid, and some are extremely acid. While a number of the soils are of moderate inherent fertility, some of them are low to very low in plant nutrients. Therefore, most crops grown in the county will require fertilizers and lime. The amount of lime and the kind and amount of fertilizers 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 or wishes to operate, and by studying the records of previous management practices, especially the results obtained from chemical tests of the soils. For assistance in determining the specific needs of the soils for lime and fertilizer for any particular crops, the county extension agent should be contacted. This agent can arrange to have soils tested at the Soil Testing Laboratory of the University of Maryland.

Different soils require different amounts of lime. For example, a well-drained, sandy soil may require 1 ton of lime per acre, but a dark-colored, wet, clayey soil

may need as much as 5 tons per acre. Using too much lime, particularly on a sandy soil, should be avoided even more carefully than using too little. Most soils of Anne Arundel County need from 2 to 3 tons of lime per acre.

When fields are in cultivated crops year after year, the soils become deficient in nitrogen, phosphorus, and potassium unless these elements are replenished regularly. Unlike phosphorus and potassium, nitrogen does not come from the mineral part of the soil. Nitrogen compounds are produced by legume plants, but more commonly the nitrogen is supplied in the fertilizer.

Nitrogen fertilizer is needed for all crops except legumes, and some legumes benefit from additional nitrogen. Some nitrogen in plants is returned to the soil in plant residues, but most of it is removed in the crops that are harvested. Plant residues, when decomposed to form organic matter, improve the available water capacity and the tilth of the soil. This, in turn, helps to reduce the susceptibility of the soils to erosion.

Manure furnishes nitrogen, organic matter, and smaller amounts of other plant nutrients. The amount of manure and the kinds and amounts of commercial fertilizer to be used depend upon the kind of crop to be grown. Small grain needs a complete fertilizer in addition to a topdressing of nitrogen. Generally, nitrogen for corn is supplied as a sidedressing. Legumes need phosphorus and potassium when they are seeded, and later as a topdressing. Some truck crops may need several applications of fertilizer, either nitrogen alone or a complete fertilizer.

Cropping systems

A good cropping system helps to maintain organic matter in the soil and helps to prevent the loss of soil material through erosion. One good system consists of growing a legume or a green-manure crop before a corn crop. If the legume or green manure is plowed under, nitrogen and organic matter are added to the soil. As a result, the corn that follows generally produces a higher yield and is better able to withstand dry weather. The green-manure crop also makes the soil less susceptible to erosion.

Tobacco is a problem crop in soil conservation because it is a clean-cultivated row crop. Continuous tobacco production on sloping soils commonly results in serious water erosion and soil blowing. Cropping systems that include a cover crop help to control this erosion. A cover crop also helps to hold some fertilizer nutrients that would otherwise be leached from the soil.

Generally, the hazard of erosion by water on level or nearly level soils is only slight, and cropping systems may not be strictly necessary for erosion control. If these nearly level soils are suited to cultivated crops, they can be used continuously without an erosion hazard. However, a cover crop between successive row crops keeps the soils in better physical condition and generally more productive.

Soybeans can make the surface of the soil especially susceptible to erosion and generally should not be planted on soils in capability subclass IVe.

In addition to controlling erosion, a good cropping system helps to control weeds, the spread of insects, and to some degree, plant diseases. It helps to slow the loss of plant nutrients and to prevent the formation of plow pans in soils.

Residue management

Plant residue consists of the parts of plants left in the field after harvesting the crop. The amount of plant residue varies greatly with the kind of crop, the growth or yield of the crop, and the purpose for which the crop is grown. A cover crop or green-manure crop is generally all residue. A hay crop is cut and removed, leaving only the stubble; however, if a hay crop is grown for seed only, and the seed is combined in the field, most of the plant material other than seed is left in the field. If a corn crop is grown for grain only, the leaves and stalks may either be removed or left as a residue in the field to be incorporated into the soil at the next plowing.

All plant material in a crop not needed for harvest should be left in the field. Because it remains on the surface, this plant material is excellent protection against erosion, and usually it should remain on the surface until plowing is necessary. When this residue is turned under, it improves soil structure by increasing the organic-matter content of the soil.

Leaving crop residue on the soil and turning it under so that it remains on or near the surface are valuable practices to help check erosion, in addition to promoting soil aeration and moisure infiltration. Thus, when corn is grown continuously, the leaving of residue decreases the amount of soil lost by erosion by 10 to nearly 25 percent, depending upon the yield level of the corn and the kind of tillage practices followed.

In long rotations, the leaving of residue from corn or other row crops and the straw from small grain decreases erosion losses by 3 to 5 percent.

On light sandy soils, the residue left on the surface controls soil blowing and thus helps to keep sandy soils from becoming detached and blown away by wind.

Tillage practices

In this subsection tillage practices that are commonly used on the soils of Anne Arundel County are discussed. How tillage is performed is important because tillage breaks down the structure of the soils, promotes the loss of organic matter, and increases the hazard of erosion. Unless soils are kept in good tilth, they do not produce favorable yields.

On all soils in the county, tillage should be limited to that needed for preparing a good seedbed, for cultivating the seedlings, and for assisting crops to mature. Keeping tillage to a minimum is effective in reducing erosion and the breakdown of soil structure.

The continued use of heavy machinery to cultivate corn, soybeans, or other crops compacts many kinds of soil and makes them difficult to work. Compaction is more likely to occur on the Colemantown, Elkton, and other poorly drained, medium-textured to fine-textured soils. If the soil is a little too wet when the machines are used, the damage is more serious. Good soil structure can be restored and tillage made easier by adding organic matter and growing sod crops.

Tillage on the contour is needed on sloping soils in capability subclasses IIe, IIIe, and IVe that are suit-

able for cultivation but that are susceptible to erosion. If row crops, or clean-tilled crops, are grown on the sloping soils in subclasses IIIe and IVe, the row crops should be in contour strips that are alternated with strips of close-growing, untilled crops.

Soil specialists have determined that tilling sloping soils on the contour decreases the amount of soil lost through erosion during a crop year by 20 to 40 percent, as compared with tillage not on the contour. They have also determined that stripcropping on the contour decreases the amount of soil lost through erosion by about 60 to 75 percent, as compared with tillage not on the contour and without field strips.

In a single field, a suitable cropping system can be used if the crops making up the system are alternated, or staggered, on the various strips. The strips should be narrower on the steeper slopes than on the less sloping ones. Assistance in planning and laying out the cropping strips can be obtained through the local office of the Soil Conservation Service.

Estimated Yields

The soils of Anne Arundel County vary in productivity. Some soils consistently produce high yields of cultivated crops. Others, though suitable for cropping, produce lower yields. Some soils are better suited to less intensive use.

Estimates of yields of specified general crops on most soils in the county, under two levels of management, are shown in table 8. Cut and fill land, Gravel and borrow pits, Made land, Swamp, Tidal marsh, and Urban land are not listed, because they are not suitable for cultivation. Yields are not listed for Loamy and clayey land, because they are so variable that yields cannot be accurately estimated. In columns A are estimated average yields per acre obtained under the management commonly used in the county. In columns B are estimated average acre yields under improved management. The yields and quality of tobacco also are given in the table. Nearly all tobacco in the county is grown under a high level of management.

According to the reports of the U.S. Census of Agriculture, the average yield of tobacco per acre in Anne Arundel County in 1964 was 1,017 pounds. Other average yields reported were 55 bushels of corn, 22 bushels of wheat, 14 bushels of soybeans, and 2.0 tons of hay.

To obtain the estimated yields shown in columns B of table 8 most, if not all, of the following practices are needed.

1. Contour tillage, stripcropping, terracing, minimum tillage, or similar measures are used where needed to help control erosion; the soils that need drainage are drained; excess water is disposed of safely; and irrigation is supplied to the soils that need it.

TABLE 8.—*Estimated average yields per acre of principal crops*

[Yields in columns A are those obtained under management commonly used in the county; those in columns B, under improved management. Absence of figure indicates crop is not suited to the soil specified or is not commonly grown on it. The symbol < means less than; the symbol > means more than]

Soil	Corn		Wheat		Soybeans		Clover hay		Tall-grass pasture		Tobacco	
	A	B	A	B	A	B	A	B	A	B	Yields	Quality
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Lbs.*	
Adelphia sandy loam, 0 to 2 percent slopes	55	115	25	45	20	44	1. 6	3. 0	80	230	1, 100–1, 500	Medium.
Adelphia sandy loam, 2 to 5 percent slopes	55	115	25	45	20	44	1. 6	3. 0	80	230	1, 100–1, 500	Medium.
Adelphia silt loam, 0 to 2 percent slopes	55	115	25	45	20	40	1. 6	3. 5	80	230	1, 500	Low.
Adelphia silt loam, 2 to 5 percent slopes	55	115	25	45	20	40	1. 6	3. 5	80	230	1, 500	Low.
Beltsville silt loam, 2 to 5 percent slopes, moderately eroded	45	90	20	40	20	35	1. 2	3. 0	65	170	1, 100–1, 500	Low.
Bibb silt loam	50	110	25	35	25	35	1. 7	2. 6	85	200		
Butlertown silt loam, 0 to 2 percent slopes	60	130	20	44	20	44	1. 2	3. 5	80	260	>1, 800	Low.
Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	60	130	25	44	20	44	1. 6	3. 5	80	260	>1, 800	Low.
Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	55	120	22	40	22	40	1. 5	3. 5	80	260	>1, 600	Low.
Butlertown silt loam, 5 to 10 percent slopes, severely eroded	50	105					1. 5	3. 0	75	230		
Butlertown silt loam, 10 to 15 percent slopes, severely eroded							1. 5	3. 0	75	230		

See footnote at end of table.

TABLE 8.—*Estimated average yields per acre of principal crops*—Continued

Soil	Corn		Wheat		Soybeans		Clover hay		Tall-grass pasture		Tobacco	
	A	B	A	B	A	B	A	B	A	B	Yields	Quality
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Lbs.*	
Chillum silt loam, 2 to 6 percent slopes, moderately eroded	65	125	25	45	25	45	1. 8	3. 3	90	250	1, 100–1, 800	Low.
Chillum silt loam, 6 to 12 percent slopes, moderately eroded	60	115	22	40	------	------	1. 7	3. 1	85	230	1, 100–1, 700	Low.
Christiana silt loam, 2 to 5 percent slopes, moderately eroded	45	115	15	40	15	40	1. 3	3. 1	65	230	700–1, 100	Low.
Christiana silt loam, 5 to 10 percent slopes, moderately eroded	40	105	13	35	------	------	1. 2	2. 9	60	210	700–1, 100	Low.
Christiana clay, 5 to 10 percent slopes, severely eroded	35	90	12	30	------	------	1. 1	2. 8	55	210	700–1, 100	Low.
Codorus silt loam	105	135	30	40	30	40	2. 8	3. 5	145	270	----------	
Colemantown sandy loam	40	95	13	30	13	30	1. 1	3. 0	65	170	----------	
Colemantown silt loam	40	95	13	30	13	30	1. 1	3. 0	65	170	----------	
Collington loamy sand, 2 to 5 percent slopes, moderately eroded	40	100	14	40	14	40	1. 2	3. 0	60	230	1, 100–1, 500	Very high.
Collington loamy sand, 5 to 10 percent slopes, moderately eroded	35	95	13	35	------	35	1. 1	3. 5	60	270	1, 100–1, 500	Very high.
Collington fine sandy loam, 0 to 2 percent slopes	65	130	25	50	20	45	1. 7	3. 5	90	270	1, 100–1, 900	High.
Collington fine sandy loam, 2 to 5 percent slopes, moderately eroded	65	130	25	50	20	45	1. 7	3. 5	90	270	1, 100–1, 800	High.
Collington fine sandy loam, 5 10 percent slopes, moderately eroded	60	120	22	45	------	------	1. 6	3. 5	85	270	1, 100–1, 700	High.
Collington fine sandy loam, 5 to 10 percent slopes, severely eroded	50	100	20	40	------	------	1. 4	3. 0	70	200	1, 100–1, 500	High.
Collington fine sandy loam, 10 to 15 percent slopes, moderately eroded	55	105	20	40	------	------	1. 5	3. 0	75	230	1, 100–1, 500	High.
Collington fine sandy loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	1. 2	3. 0	60	180	----------	
Collington fine sandy loam, 15 to 40 percent slopes	------	------	------	------	------	------	1. 3	2. 7	65	200	----------	
Collington silt loam, 0 to 2 percent slopes.	65	130	25	50	25	45	1. 8	3. 5	90	255	>1, 500	Low.
Collington silt loam, 2 to 5 percent slopes, moderately eroded	65	130	25	50	25	45	1. 8	3. 5	90	255	>1, 500	Low.
Comus silt loam	110	140	35	45	35	45	2. 8	3. 5	140	270	----------	
Croom gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	18	90	10	25	10	25	. 8	2. 8	40	130	<900	High.
Croom gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	11	75	6	18	------	------	. 6	2. 6	30	120	<800	High.
Croom gravelly sandy loam, 15 to 40 percent slopes	------	------	------	------	------	------	------	------	30	100	----------	
Donlonton fine sandy loam, 0 to 2 percent slopes	60	115	20	40	20	40	1. 6	3. 0	80	230	1, 100–1, 500	Medium.
Donlonton fine sandy loam, 2 to 5 percent slopes, moderately eroded	60	115	20	40	20	40	1. 6	3. 0	80	230	1, 100–1, 500	Medium.
Elkton sandy loam	40	90	13	30	13	35	. 8	2. 2	60	160	----------	
Elkton silt loam	45	95	13	30	13	35	1. 1	3. 0	65	170	----------	
Evesboro loamy sand, 0 to 6 percent slopes	20	90	9	25	9	25	. 6	1. 5	35	90	1, 100–1, 200	Very high.

See footnote at end of table.

TABLE 8.—*Estimated average yields per acre of principal crops*—Continued

Soil	Corn		Wheat		Soybeans		Clover hay		Tall-grass pasture		Tobacco	
	A	B	A	B	A	B	A	B	A	B	Yields	Quality
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Lbs.*	
Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes	20	95	9	30	9	30	.6	2.0	35	90	1,250	Very high.
Evesboro loamy sand, clayey substratum, 5 to 10 percent slopes	20	75	------	------	------	------	------	2.0	------	145	1,000	Very high.
Evesboro and Galestown loamy sands, 6 to 12 percent slopes	------	------	------	------	------	------	------	------	------	80	----------	
Evesboro and Galestown loamy sands, 12 to 40 percent slopes	------	------	------	------	------	------	------	------	------	80	----------	
Fallsington sandy loam	55	120	14	35	14	35	1.4	3.0	75	200	----------	
Galestown loamy sand, 0 to 5 percent slopes	20	90	9	27	9	27	.6	1.5	35	90	700–1,200	Very high.
Hatboro silt loam	75	120	20	40	20	40	2.7	3.3	135	260	----------	
Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded	60	115	20	44	20	44	1.7	3.1	85	240	1,100–1,500	High.
Howell fine sandy loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	60	115	20	44	20	44	1.7	3.1	85	240	1,100–1,500	High.
Howell silt loam, 2 to 6 percent slopes, moderately eroded	65	125	25	45	25	45	1.8	3.3	90	260	>1,500	Low.
Howell silt loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	65	125	25	45	25	45	1.8	3.3	90	260	>1,500	Low.
Howell clay loam, 6 to 12 percent slopes, severely eroded	50	105	20	35	------	------	1.5	3.0	75	230	700–1,000	Low.
Howell clay loam, 12 to 20 percent slopes, severely eroded	------	------	------	------	------	------	1.2	3.0	70	210	----------	
Howell clay loam, 20 to 40 percent slopes, severely eroded	------	------	------	------	------	------	1.2	2.5	60	200	----------	
Howell clay loam, shaly subsoil, 6 to 12 percent slopes, severely eroded	50	105	20	35	------	------	1.5	3.0	75	230	700–1,000	Low.
Keyport sandy loam, 0 to 2 percent slopes	40	90	13	35	13	35	1.1	3.0	55	200	1,000–1,700	Medium.
Keyport sandy loam, 2 to 5 percent slopes	40	95	13	40	13	40	1.1	3.0	55	200	1,000–1,700	Medium.
Keyport silt loam, 0 to 2 percent slopes	55	100	20	35	20	35	1.8	3.2	85	210	1,100–1,700	Low.
Keyport silt loam, 2 to 5 percent slopes, moderately eroded	55	100	20	40	20	40	1.8	3.2	85	210	1,100–1,700	Low.
Klej loamy sand	40	100	13	30	13	30	1.1	2.7	55	170	700–1,500	Medium.
Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded	65	130	20	50	20	45	1.7	3.1	85	230	1,100–1,500	High.
Marr fine sandy loam, 6 to 12 percent slopes, moderately eroded	60	120	18	45	------	------	1.6	3.0	80	230	1,100–1,500	High.
Marr fine sandy loam, 6 to 12 percent slopes, severely eroded	45	95	16	35	------	------	1.4	3.0	70	200	1,100–1,500	High.
Marr fine sandy loam, 12 to 20 percent slopes, moderately eroded	45	95	16	35	------	------	1.4	3.0	70	200	1,100–1,500	High.
Marr fine sandy loam, 12 to 20 percent slopes, severely eroded	------	------	------	------	------	------	1.2	2.5	60	200	----------	
Marr fine sandy loam, 20 to 35 percent slopes, severely eroded	------	------	------	------	------	------	1.3	2.6	65	210	----------	
Matapeake fine sandy loam, 0 to 2 percent slopes	70	130	22	44	20	44	1.7	3.5	85	255	1,100–1,600	High.
Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	70	130	22	44	20	44	1.7	3.5	85	255	1,100–1,600	High.

See footnote at end of table.

TABLE 8.—*Estimated average yields per acre of principal crops*—Continued

Soil	Corn		Wheat		Soybeans		Clover hay		Tall-grass pasture		Tobacco	
	A	B	A	B	A	B	A	B	A	B	Yields	Quality
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Lbs.*	
Matapeake silt loam, 0 to 2 percent slopes	75	140	27	50	25	45	1. 8	3. 5	90	255	>1, 900	Low.
Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	75	140	27	50	25	45	1. 8	3. 5	90	255	>1, 900	Low.
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	70	130	22	44	25	40	1. 7	3. 5	85	255	>1, 600	Low.
Matapeake silt loam, 5 to 10 percent slopes, severely eroded	55	110	20	40	------	------	1. 5	3. 0	75	230	>1, 500	Low.
Matapeake silt loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	1. 6	3. 0	80	230	>1, 500	Low.
Matawan loamy fine sand, 0 to 2 percent slopes	55	110	20	40	20	40	1. 5	2. 8	75	230	700–1, 800	Medium.
Matawan loamy fine sand, 2 to 5 percent slopes	55	115	20	40	20	40	1. 5	3. 0	75	200	700–1, 800	Medium.
Mattapex fine sandy loam, 0 to 2 percent slopes	60	125	20	40	20	40	1. 6	3. 5	80	230	1, 100–1, 900	Medium.
Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	60	125	20	40	20	40	1. 6	3. 5	80	230	1, 100–1, 900	Medium.
Mattapex silt loam, 0 to 2 percent slopes	70	135	27	45	27	45	1. 7	3. 5	85	240	>1, 900	Low.
Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	70	135	27	45	27	45	1. 7	3. 5	85	240	>1, 900	Low.
Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	60	125	22	40	25	40	1. 7	3. 5	80	240	>1, 600	Low.
Mixed alluvial land	------	------	------	------	------	------	------	2. 0	------	160	----------	
Monmouth loamy sand, 0 to 2 percent slopes	60	110	20	45	20	40	1. 5	2. 7	85	230	1, 800	High.
Monmouth loamy sand, 2 to 5 percent slopes, moderately eroded	55	100	20	40	20	40	1. 3	2. 7	85	230	1, 600	High.
Monmouth loamy sand, 5 to 10 percent slopes, moderately eroded	50	90	18	35	------	35	1. 3	2. 7	85	230	1, 600	High.
Monmouth loamy sand, 5 to 10 percent slopes, severely eroded	45	80	18	35	------	------	1. 3	2. 7	85	230	1, 350	High.
Monmouth loamy sand, 10 to 15 percent slopes, moderately eroded	45	80	18	35	------	------	1. 3	2. 7	85	230	1, 350	High.
Monmouth loamy sand, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	1. 2	1. 8	80	170	----------	High.
Monmouth fine sandy loam, 0 to 2 percent slopes	65	130	22	50	20	45	1. 7	3. 1	85	230	1, 100–1, 900	High.
Monmouth fine sandy loam, 2 to 5 percent slopes, moderately eroded	65	130	22	50	20	45	1. 7	3. 1	85	230	1, 100–1, 800	High.
Monmouth fine sandy loam, 5 to 10 percent slopes, moderately eroded	60	120	22	45	------	------	1. 6	3. 0	80	230	1, 100–1, 700	High.
Monmouth fine sandy loam, 10 to 15 percent slopes, moderately eroded	50	100	17	35	------	------	1. 5	3. 0	75	230	1, 100–1, 500	High.
Monmouth fine sandy loam, 15 to 40 percent slopes	------	------	------	------	------	------	------	------	------	------	----------	
Monmouth clay loam, 5 to 10 percent slopes, severely eroded	50	115	20	35	------	------	1. 5	3. 0	75	230	1, 100–1, 900	Low.
Monmouth clay loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	------	------	1. 2	2. 8	70	210	----------	
Muirkirk loamy sand, 0 to 5 percent slopes	40	110	14	35	12	35	1. 1	2. 7	55	190	700–1, 100	High.
Muirkirk loamy sand, 5 to 10 percent slopes	35	100	12	30	------	------	1. 0	2. 5	50	190	700–1, 100	High.
Muirkirk loamy sand, 10 to 15 percent slopes	30	95	12	30	------	------	1. 0	2. 5	50	190	700–1, 100	High.

See footnote at end of table.

TABLE 8.—*Estimated average yields per acre of principal crops*—Continued

Soil	Corn		Wheat		Soybeans		Clover hay		Tall-grass pasture		Tobacco	
	A	B	A	B	A	B	A	B	A	B	Yields	Quality
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Lbs.*	
Muirkirk loamy sand, 15 to 30 percent slopes							1. 0	2. 5	50	180		
Osier loamy sand	25	70	10	25	10	25	. 8	2. 4	45	180		
Othello silt loam	55	115	20	40	20	40	1. 7	3. 2	85	240		
Rumford loamy sand, 0 to 2 percent slopes	40	110	14	45	12	40	1. 9	3. 0	45	230	700–1, 350	Very high.
Rumford loamy sand, 2 to 5 percent slopes, moderately eroded	40	110	14	45	12	40	1. 9	3. 0	45	230	700–1, 350	Very high.
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	35	100	13	40			1. 8	3. 0	40	230	700–1, 200	Very high.
Rumford loamy sand, 5 to 10 percent slopes, severely eroded	30	90	13	35			1. 7	3. 0	25	200	700–1, 100	Very high.
Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	30	90	13	35			1. 8	3. 0	40	230	700–1, 100	Very high.
Sassafras fine sandy loam, 0 to 2 percent slopes	70	130	22	50	20	45	1. 7	3. 1	85	230	1, 100–1, 900	High.
Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded	70	130	22	50	20	45	1. 7	3. 1	85	230	1, 100–1, 800	High.
Sassafras fine sandy loam, 5 to 10 percent slopes, moderately eroded	65	120	20	45			1. 6	2. 9	80	230	1, 100–1, 700	High.
Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded	50	100	18	35			1. 4	3. 0	70	200	1, 100–1, 500	High.
Sassafras fine sandy loam, 10 to 15 percent slopes, moderately eroded	50	90					1. 4	3. 0	70	200	1, 100–1, 500	High.
Sassafras fine sandy loam, 10 to 15 percent slopes, severely eroded							1. 0	2. 0	70	200		
Sassafras fine sandy loam, 15 to 40 percent slopes							1. 0	2. 0	70	200		
Sassafras loam, 0 to 2 percent slopes	70	130	22	50	20	45	1. 5	3. 0	70	230	1, 900	
Sassafras loam, 2 to 5 percent slopes, moderately eroded	70	130	22	50	20	45	1. 5	3. 0	70	230	1, 800	
Shrewsbury fine sandy loam	50	105	14	30	14	30	1. 4	2. 9	75	200		
Shrewsbury silt loam	55	115	15	35	15	35	1. 5	2. 9	75	200		
Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	65	130	25	50	22	45	1. 7	3. 1	85	230	1, 100–1, 500	Very high.
Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	60	115	18	45			1. 6	3. 0	80	230	1, 100–1, 400	Very high.
Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	45	95	16	30			1. 4	3. 0	70	200	1, 100–1, 400	Very high.
Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded							1. 2	2. 5	60	200		
Westphalia fine sandy loam, 20 to 50 percent slopes, severely eroded												
Woodstown sandy loam, 0 to 2 percent slopes	65	130	20	40	20	40	1. 6	3. 0	80	230	1, 100–1, 800	Medium.
Woodstown sandy loam, 2 to 5 percent slopes	65	130	20	40	20	40	1. 6	3. 0	80	230	1, 100–1, 800	Medium.
Woodstown loam, 0 to 2 percent slopes	65	130	20	45	20	45	1. 6	3. 0	80	230	1, 100–1, 800	Low.
Woodstown loam, 2 to 5 percent slopes	65	130	20	45	20	45	1. 6	3. 0	80	230	1, 100–1, 800	Low.

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. For example, an acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

2. Improved varieties of plants are used and optimum plant populations are attained.
3. Cropping systems are of adequate length and generally consist of a tilled crop to help control weeds, a deep-rooted crop to improve the soil permeability and structure, a legume for 1 year or more to help maintain or improve fertility, and a close-growing crop or a green-manure crop to help improve soil structure and tilth, to supply organic matter, and to help control erosion.
4. Manure and crop residue are turned under to supply nitrogen, other nutrients, and organic matter so that the physical condition of the soil is improved and erosion is reduced.
5. Fertilizer and lime are applied according to soil tests and the needs of the crop to be grown. Consult the extension agent at the county office of the Maryland Cooperative Extension Service for information.
6. The soils are cultivated as little as possible, but suitable methods of plowing, preparing the seedbed, and cultivating are used.
7. Planting, cultivating, and harvesting are done at the proper time and in a proper way.
8. Weeds, diseases, and insects are controlled.

The yields shown in columns B are not presumed to be the highest yields obtainable, but they set a goal that is practical for most farmers to reach if they use good management. Yields on the same soil can be expected to vary because of differences in the kind of management, in the weather, in the crop varieties used, and in the numbers and kinds of insects and diseases. However, the yields under improved management should not vary more than 10 percent from those given in columns B of table 8.

When selecting a soil on which tobacco is to be grown, both the quantity and the quality of the tobacco should be considered. The soils that have a surface layer of loam or silt loam or that are only moderately well drained may produce large amounts of tobacco, but the quality tends to be low. The very light sandy soils, which are droughty and low in fertility, may produce only low yields, but the quality of the tobacco tends to be much better than that grown on the more fertile, finer textured soils. The cropping history and the management of the soils also affect the quality and the yield of tobacco.

More information about management practices needed to obtain good yields can be found in the subsection "Capability Groups of Soils."

Woodland

According to the U.S. Census of Agriculture, woodland occupied about 43 percent of Anne Arundel County in 1964. The county has only a few areas where man has not severely altered the original woodland by harvesting the trees, and practically no virgin forests remain. Hardwoods have always been dominant in the stands. Among the hardwoods, oaks are the dominant species on the better drained soils and also make up a large proportion of the hardwoods on the wet soils. Other hardwoods common in the county are yellow-poplar, sweetgum, dogwood, and beech. Many areas now wooded were at one time cleared for farming, and most areas that have remained wooded have been cut over several times.

Virginia pine has invaded the severely cutover woodland and abandoned farmland, particularly on the sandier, better drained soils. There are minor stands of pitch pine and shortleaf pine, but they are neither extensive nor pure in many places.

Loblolly pine is more valuable for timber and pulpwood than Virginia pine. It is used for reestablishing cover in many places because it grows well on many kinds of soils and it can be established in pure stands by planting seedlings. On the sandier soils in the northern part of the county, Virginia pine reseeds more readily than loblolly pine and also can be readily established by planting. If white pine is planted and is not overtopped, it grows better than Virginia pine.

Woodland suitability groups

The soils of Anne Arundel County have been evaluated and grouped for the production of woodland products according to a nationwide system put into use by woodland conservationists of the Soil Conservation Service. In this system, soils are placed in woodland classes according to their productivity for woodland species. Then they are placed in subclasses according to the kinds of limitations, if any, that are inherent in the soil for woodland management. Finally, according to the degree of limitation, they are placed in woodland suitability groups within subclasses. Thus, each woodland suitability group is made up of soils that have about the same productivity potential for the same kinds of trees. Each woodland suitability group also is made up of soils that have about the same kinds and degrees of limitations for good woodland management.

The productivity potential of a soil for trees is expressed as a site index. The site index for a soil is the height, in feet, that a specified kind of tree growing on that soil will reach in 50 years. Soils of the highest site index are placed in class 1 and produce the greatest amount of woodland products. Because more information is available for loblolly pine than for other species, the placement of soils into classes, subclasses, and woodland suitability groups is based primarily on the site index and other factors affecting productivity and management practices for growing loblolly pine in Anne Arundel County. On the drier, sandier soils in the north-central part of the county, Virginia pine establishes itself more readily by seeding than does loblolly pine. However, loblolly pine is more valuable for timber and pulpwood than Virginia pine. Where conditions are favorable, loblolly pine is easily established in pure stands by planting seedlings.

The site indexes for many kinds of soils have been determined for loblolly pine because it is the most important tree in southern Maryland. Some determinations have been made for other kinds of trees on other soils. To obtain the site indexes used in this survey, the results of studies in Maryland and Delaware were correlated with the results of similar studies in New Jersey, Pennsylvania, Virginia, and West Virginia. In stands where a site index was not determined by actual measurement, it was assumed to be approximately the same as the site index of similar soils.

The soils of the county have been placed in woodland classes as follows: Class 1, of very high productivity; the site index for loblolly pine is greater than 95. Class 2, of high productivity; site index for loblolly pine ranges between 85 and 95. Class 3, of medium productivity; site index for loblolly pine ranges from 75 to 85.

Woodland classes are subdivided into woodland subclasses (major kinds of limitations, if any) as follows: Subclass *o*, with no important limitations on management; subclass *w*, with limitations on management because of seasonal wetness, high water table, or hazard of flooding; subclass *s*, with limitations due to excessive sandiness of the soil; subclass *c*, with a highly clayey subsoil that cannot support heavy equipment when wet; subclass *r*, with limitations due to relief or steepness of the landscape; and subclass *f*, with limitations due to the high percent of gravelly material in the soil.

Subclasses are subdivided into woodland groups, where needed, to separate soils according to *degree* of limitation, a soil characteristic or property, or the suitability of a soil for different species of trees.

All the soils in each woodland suitability group have approximately the same site index and are suitable for about the same kind of trees. Also, limitations and hazards that affect management are about the same for each group. These are limitations to the use of equipment, seedling mortality, competition from other plants, erosion, and windthrow. The limitations and hazards are rated *slight*, *moderate*, or *severe* in the descriptions of the woodland suitability groups.

The ratings for equipment limitations are based on the degree that soils and topography restrict or prohibit the use of equipment commonly used in harvesting trees. Seedling mortality refers to the expected degree of mortality of naturally occurring or planted trees as influenced by the kind of soil. Plant competition refers to competition from undesirable species that invade when openings are made in the forest canopy and compete specifically with loblolly pine and hardwoods in general. The ratings for hazard of erosion are determined on the basis of the erodibility of the soil where it is not fully protected by a woodland cover, as in the seedling stage of forest growth or after clear harvesting.

The names of the soil series represented in a woodland suitability group are named in the description of the suitability group, but this does not mean that all the soils of a given series appear in that group. To find a specific soil in any group, refer to the "Guide to Mapping Units" at the back of this survey. Areas that are mapped as complexes containing Urban land are not assigned to a woodland group, because the rate of community development indicates that these areas will never be used as woodland. The miscellaneous land types, other than Loamy and clayey land, were not assigned woodland groups because, without intensive reclamation, they are not suitable as woodland.

Assistance in the management of woodland and reforestation can be obtained from the office of the assistant district forester, Maryland Department of Forests and Parks, in Anne Arundel County. This office can be reached directly, or through the office of the Maryland Cooperative Extension Service, Anne Arundel County, or through the Anne Arundel Soil Conservation District.

WOODLAND SUITABILITY GROUP 1o2

The only soil in this woodland group is Comus silt loam. This soil is well drained and medium textured. It formed in sediments of weathered crystalline rock material that washed from the Piedmont onto the Coastal Plain.

In order of their priority for timber, trees suitable for planting are white pine, yellow-poplar, and black walnut. Douglas-fir, Scotch pine, and white pine are suitable for Christmas trees. Where existing stands are managed, hardwoods should be given preference.

The site index is 80 to 90 for yellow-poplar, 75 to 84 for oaks, 75 to 95 for sweetgum, and 85 to 94 for white pine.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and hardwoods. The use of equipment is only slightly limited by flooding.

WOODLAND SUITABILITY GROUP 2o1

This woodland group consists of moderately well drained soils in the Butlertown, Matawan, and Woodstown series. These soils are loamy to sandy and have moderate to moderately slow permeability.

In order of their priority for timber, loblolly pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine, Norway spruce, Austrian pine, and white pine are suitable for Christmas trees. Existing stands of yellow-poplar, sweetgum, and oaks should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted.

The site index is 85 or more for loblolly pine, 80 to 90 for yellow-poplar, and 75 to 95 for sweetgum. The yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood. The yield of hardwood should be fairly good.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. Seasonal wetness only slightly limits the use of heavy logging and other equipment.

WOODLAND SUITABILITY GROUP 2o2

This woodland group consists of deep, well-drained soils in the Collington and Monmouth series that have slopes of not more than 15 percent. These soils have a surface layer that ranges from thick loamy sand to silt loam and a loamy to clayey subsoil that contains glauconite.

Yellow-poplar, white pine, and loblolly pine are trees well suited to planting. Scotch pine, Norway spruce, and white pine are suitable for Christmas trees. Existing stands of oaks and yellow-poplar should be managed until they are ready for harvesting.

The site index is 85 to 95 for loblolly pine. The yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood. The yield of hardwoods should be fairly good.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. The use of heavy machinery is only slightly limited.

WOODLAND SUITABILITY GROUP 3o1

This woodland group consists of well-drained soils in the Chillum and Matapeake series that have slopes of not more than 15 percent. These soils have a fine sandy loam or silt loam surface layer and a medium-textured to moderately fine textured subsoil. The Chillum soils have a compacted substratum.

Loblolly pine, sweetgum, white pine, and yellow-poplar are well suited to planting. Scotch pine, Austrian pine, and white pine are suitable for Christmas trees. Existing good stands of Virginia pine, black gum, or valuable oaks should be managed until they are ready for harvesting.

The site index is between about 75 and 85 for loblolly pine, a little greater for yellow-poplar, and somewhat less for oaks and Virginia pine. At 50 years of age and an average height of 80 feet, the yield per acre from well-stocked, unmanaged stands of 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 is about 400 board feet of timber or about one-half cord of pulpwood. Other tree crops also do well on these soils.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is moderate for conifers and slight for hardwoods. This group has practically no hazards or limitations that affect woodland management. Equipment limitations are slight.

WOODLAND SUITABILITY GROUP 3o2

This woodland group consists of moderately well drained soils in the Mattapex series. These soils are not sufficiently wet to affect woodland management seriously. They have a surface layer of fine sandy loam or silt loam and a silt loam to silty clay loam subsoil. They have slopes that range from 0 to 10 percent.

In order of their priority for timber, loblolly pine, white pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine and white pine are most suitable for Christmas trees. Existing stands of valuable oaks should be managed until they are harvested. Virginia pine is not generally well adapted.

The site index ranges between 75 and 85 for loblolly pine, a little greater for yellow-poplar, and somewhat less for oaks and Virginia pine.

Seedling mortality is slight. Plant competition ranges from moderate to severe for conifers, and from slight to moderate for hardwoods. There is little or no hazard of windthrow or erosion, and equipment limitations are slight.

WOODLAND SUITABILITY GROUP 3o3

This woodland group consists of deep, well-drained soils in the Marr, Rumford, Sassafras, and Westphalia series that have slopes not greater than 15 percent. These soils have a subsoil that ranges from friable sandy loam to firm sandy clay loam. The nearly level soils in this group are only slightly eroded, but all the other soils are moderately or severely eroded.

In order of their priority for timber, loblolly pine, white pine, Virginia pine, and yellow-poplar are suitable for planting. Scotch pine, Norway spruce, and white pine are suitable for Christmas trees. Existing stands of yellow-poplar and oaks should be well managed until they are ready for harvesting. After harvesting, loblolly pine can be planted. Virginia pine grows well, especially on the sandier soils. The soils in this woodland group are probably easier to manage for woodland production than are any other soils in the county.

The site index is 75 to 84 for loblolly pine and 80 to 100 for yellow-poplar. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood. Well-managed stands of loblolly pine should produce slightly more. Yellow-poplar produces more merchantable timber than loblolly pine on nearly all the soils in this woodland group.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is moderate for conifers and slight for hardwoods. The use of equipment is only slightly limited.

WOODLAND SUITABILITY GROUP 1w1

The only soil in this woodland group is Codorus silt loam. This soil is moderately well drained and has a silt loam to light silty clay loam subsoil. It formed in sediments that washed from areas of weathered crystalline rock on the Piedmont Plateau.

In order of their priority for timber, white pine and yellow-poplar are suitable for planting. Douglas-fir, Scotch pine, and white pine are suitable for Christmas trees. Where existing stands are managed, hardwoods should be given preference.

The site index is 80 to 90 for yellow-poplar, 75 to 84 for oaks, 75 to 95 for sweetgum, and 85 to 94 for white pine.

Seedling mortality and the hazard of windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. During floods, which may occur once or twice a year, these soils are somewhat scoured or additional material is deposited. Wetness and flooding moderately limit the use of equipment.

WOODLAND SUITABILITY GROUP 2w1

This woodland group consists of deep, poorly drained soils in the Fallsington, Osier, and Shrewsbury series. These soils have a surface layer of coarse-textured to medium-textured material and a subsoil having a wide range in texture. The Osier soils are of loose, sandy materials throughout.

In order of their priority for timber, loblolly pine, sweetgum, white pine, and yellow-poplar are suitable for planting. Scotch pine, white pine, and Norway spruce are suitable for Christmas trees. Existing stands of sweetgum and other commercial hardwoods should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted.

The site index is 85 or more for loblolly pine and 75 to 90 for white pine.

Seedling mortality is severe. Plant competition is severe for both conifers and hardwoods. Equipment limitation is also severe because these soils have a seasonally high water table. The hazards of erosion and windthrow on these nearly level soils are only slight.

WOODLAND SUITABILITY GROUP 2w2

This woodland group consists of poorly drained Bibb soils and Mixed alluvial land. These soils occur on flood plains. They formed in recent deposits of sediments that were washed from uplands of the Coastal Plain. They have a sandy loam or silt loam surface layer in most places. Flooding may occur one or more times a year, but floodwater seldom stands for long periods and does not stagnate. These soils are also subject to scouring and deposition.

In order of their priority for timber, loblolly pine, sweetgum, and yellow-poplar are suitable for planting. Scotch pine and white pine are suitable for Christmas trees. Sweetgum and oaks should be encouraged in natural stands, and so should yellow-poplar on hummocks, on natural levees along streams, and in other well-drained areas.

The site index is 85 or more for loblolly pine, 75 to 100 for yellow-poplar, and 75 to 95 for sweetgum. On soils that have a site index of 85, the expected yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is moderate because of flooding. The hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. The use of equipment is severely limited by wetness and flooding.

WOODLAND SUITABILITY GROUP 2w3

This woodland group consists of moderately well drained soils in the Adelphia and Donlonton series. These soils have a sandy loam, fine sandy loam, or silt loam surface layer and a subsoil that contains glauconite, or greensand.

Loblolly pine, yellow-poplar, and sweetgum trees are well suited to planting. Scotch pine, Norway spruce, and white pine are suitable for Christmas trees. Existing natural stands of sweetgum, yellow-poplar, or oaks should be managed until they are ready for harvesting.

The site index is 85 or more for loblolly pine, 75 to 100 for yellow-poplar, and 75 to 95 for sweetgum. The yields per acre are about the same as those for woodland group 2w2.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and only moderate for hardwoods. Equipment limitation is moderate because of a seasonal high water table.

WOODLAND SUITABILITY GROUP 2w4

This woodland group consists of poorly drained soils in the Colemantown series. These soils have a sandy loam or silty loam surface layer and a thick clayey subsoil of glauconitic material.

White pine, loblolly pine, and sweetgum trees are suitable for planting. Scotch pine and white pine are suitable for Christmas trees. Existing natural stands of oaks, sweetgum, and red maple should be managed until they are ready for harvesting.

The site index is 85 or more for loblolly pine and 75 to 90 for white pine. On soils that have a site index of 85, the expected yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is severe. The hazards of erosion and windthrow are only slight. Plant competition is severe for both conifers and hardwoods. Equipment limitation during spring and winter is severe because of the seasonal high water table.

WOODLAND SUITABILITY GROUP 3w1

This woodland group consists of nearly level and gently sloping, moderately well drained Keyport soils. These soils have a sandy loam or silt loam surface layer and a slowly permeable silty clay to clay subsoil. They are seasonally wet.

In order of their priority for timber, loblolly pine, white pine, and sweetgum are generally suitable for planting. Scotch pine, Austrian pine, and white pine are suitable for Christmas trees. Existing natural stands of hardwoods, such as upland oaks and sweetgum, should be managed until they are ready for harvesting.

The site index is between about 75 and 85 for loblolly pine, a little greater for yellow-poplar, and somewhat less for oaks and Virginia pine. At 50 years of age and at an average height of 80 feet, the yield per acre from well-stocked, unmanaged stands of 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 is about 400 board feet of timber or about one-half cord of pulpwood. Other tree crops also do well on these soils.

Seedling mortality is slight. Plant competition is moderate for conifers and slight for hardwoods. The use of heavy equipment is moderately limited because the water table is moderately high for long periods, and the subsoil, when saturated, does not provide sufficient support unless mats are used. Practically no hazards of windthrow or erosion exist on these soils.

WOODLAND SUITABILITY GROUP 3w2

The only soil in this group is Beltsville silt loam, 2 to 5 percent slopes, moderately eroded. This soil is moderately well drained and has a slowly permeable subsoil, which is extremely hard and firm in the lower part.

In order of their priority for timber, loblolly pine, Virginia pine, and white pine are suitable for planting. Hardwoods generally do not grow well.

The site index is 65 to 74 for loblolly pine. 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 years or more, the expected yearly increase is about 300

board feet of timber or about two-fifths cord of pulpwood. The rate of increase generally declines after trees reach 60 to 65 years of age.

Seedling mortality is slight. The hazard of erosion is moderate because runoff can be excessive. The hazard of windthrow is moderate because the root zone is shallow. Plant competition is moderate for conifers and slight for hardwoods. Wetness moderately limits the use of equipment.

WOODLAND SUITABILITY GROUP 3w3

This woodland group consists of poorly drained soils in the Elkton and Othello series. These soils have a surface layer of silt loam or sandy loam and a subsoil that ranges from friable to firm silty clay loam to plastic clay.

In order of their priority for timber, loblolly pine, white pine, and sweetgum are suitable for planting. Scotch pine, white pine, and Austrian pine are suitable for Christmas trees. Existing stands of sweetgum and other commercial hardwoods should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted. Yellow-poplar should be encouraged in areas where surface drainage is adequate.

The site index is 85 or more for loblolly pine and 75 to 90 for white pine. On soils that have a site index of 85, the expected yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. Wetness severely limits the use of equipment.

WOODLAND SUITABILITY GROUP 3w7

The only soil in this group is Hatboro silt loam. This soil is on flood plains and is poorly drained. It consists of material that washed from areas of weathered crystalline rock on the Piedmont Plateau.

In order of their suitability for timber, white pine, Norway spruce, oaks, and sweetgum are suitable for planting. White pine, Scotch pine, and Norway spruce are suitable for Christmas trees.

The site index is 75 to 100 for yellow-poplar, 95 or more for oaks, 75 to 95 for sweetgum, and 75 to 84 for white pine. Water-tolerant hardwoods grow well, and yellow-poplar grows especially well in areas that are adequately drained. An estimate of the expected yield for oaks was not made.

Seedling mortality is moderate because of flooding. The hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. Wetness and flooding severely limit the use of equipment. During floods, which usually occur once or twice a year, these soils are scoured or additional material is deposited.

WOODLAND SUITABILITY GROUP 3s1

This woodland group consists of deep, nearly level to sloping, well-drained to excessively drained soils in the Evesboro, Galestown, and Muirkirk series. These soils have a very sandy surface layer and subsoil. The Evesboro and Galestown soils are coarse textured throughout and are rapidly to very rapidly permeable. Some of the Evesboro soils have a clayey substratum. The Muirkirk soils have a loamy sand surface layer and a clayey, moderately to slowly permeable lower subsoil.

In order of their priority for timber, loblolly pine and Virginia pine are suitable for planting. Scotch pine, white pine, and Virginia pine are suitable for Christmas trees. Existing stands of shortleaf pine or of Virginia pine should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted.

The site index is 75 to 84 for loblolly pine. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is moderate because the soils in this group are droughty. The hazards of erosion and windthrow are slight. Plant competition is moderate for conifers and slight for hardwoods. The use of equipment is moderately limited because these sandy soils are loose.

WOODLAND SUITABILITY GROUP 3s2

This woodland group consists of deep, excessively drained to moderately well drained, very sandy soils in the Evesboro, Galestown, Klej, and Muirkirk series. With the exception of the nearly level Klej soil, these soils have slopes that range from 12 to 40 percent. The Klej soil is only moderately well drained and has a seasonally high water table. Muirkirk soils have a lower subsoil of moderately to slowly permeable clay.

In order of their priority for timber, loblolly pine and Virginia pine are suitable for planting. White pine and sweetgum are also suitable for planting on the Klej soil. Scotch pine, white pine, and Virginia pine are suitable for Christmas trees. Existing stands of shortleaf pine, Virginia pine, or any hardwoods should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted.

The site index is 75 to 84 for loblolly pine. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight on the Klej soil, but it is moderate on all other soils in this group because they are droughty. The hazards of erosion and windthrow are slight. Plant competition is moderate for conifers and slight for hardwoods. The use of equipment is moderately limited because these sandy soils are loose.

WOODLAND SUITABILITY GROUP 2c1

This woodland group consists of deep, well-drained soils in the Howell and Monmouth series. These soils have a surface layer that ranges from fine sandy loam to clay loam and a finer textured, clayey subsoil.

In order of their priority for timber, loblolly pine, white pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine, Norway spruce, white pine, and Virginia pine are suitable for Christmas trees. Locally, there are good stands of upland oaks that should be managed until they are ready for harvesting.

The estimated site index is 75 to 85 for oaks and Virginia pine and is 85 to 95 for yellow-poplar and sweetgum. Planted loblolly pine can be expected to do as well as yellow-poplar or sweetgum. On soils that have a site index of 85, the expected yield per acre from well-stocked, unmanaged stands 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 is about 500 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is slight. The hazard of erosion ranges from slight to moderate on slopes between 6 and 15 percent, and the hazard of windthrow is slight. Plant competition is severe for conifers and moderate for hardwoods. The use of heavy machinery is moderately limited because the clayey subsoil, which is fairly near the surface, does not bear heavy loads well when it is wet.

WOODLAND SUITABILITY GROUP 2c2

This woodland group consists of moderately steep to steep soils in the Howell and Monmouth series. The Howell soils have slopes of 12 to 20 percent and are moderately fine textured to fine textured throughout. The Monmouth soils have slopes of 15 to 40 percent and have a fine sandy loam surface layer and a finer textured subsoil.

In order of their priority for timber, loblolly pine, white pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine, Norway spruce, white pine, and Virginia pine are suitable for Christmas trees. Locally, there are good stands of upland oaks that should be managed until they are ready for harvesting.

The estimated site index is 75 to 85 for oaks and Virginia pine and is 85 to 95 for yellow-poplar and sweetgum. Planted loblolly pine can be expected to do as well as yellow-poplar or sweetgum.

Seedling mortality is slight. The hazard of erosion is severe because these soils are steeper than the soils of woodland group 2c1. Plant competition is severe for conifers and moderate for hardwoods. The hazard of windthrow is only slight. Equipment limitation is severe because the subsoil is clayey and slopes are steep.

WOODLAND SUITABILITY GROUP 2c3

The only soil in this group is Howell clay loam, 20 to 40 percent slopes, severely eroded. This soil is well drained and is moderately fine textured to fine textured throughout.

In order of their priority for timber, loblolly pine, white pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine, Norway spruce, white pine, and Virginia pine are suitable for Christmas trees. Locally, there are good stands of upland oaks that should be managed until they are ready for harvesting.

The estimated site index is 75 to 85 for oaks and Virginia pine and is 85 to 95 for yellow-poplar and sweetgum. Planted loblolly pine can be expected to do as well as yellow-poplar or sweetgum.

Seedling mortality is slight. The hazard of erosion is severe, and the hazard of windthrow is slight. Plant competition is severe for conifers and moderate for hardwoods. Equipment limitation is severe because the subsoil is clayey, slopes are steep, and the soil is severely eroded.

WOODLAND SUITABILITY GROUP 3c1

This woodland group consists of deep soils of the Christiana series. These soils have a silt loam or clay surface layer, a clayey subsoil, and slopes of not more than 10 percent. Also in the group is Loamy and clayey land that has slopes up to 10 percent. Loblolly pine, white pine, and Virginia pine are suitable for planting. Scotch pine, Norway spruce, Austrian pine, white pine, and Virginia pine are suitable for Christmas trees. Existing stands of oaks, Virginia pine, or sweetgum should be managed until they are ready for harvesting. After harvesting, white pine or loblolly pine can be planted.

The site index is 75 to 84 for loblolly pine. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality and the hazards of windthrow and erosion are slight. Plant competition is moderate for conifers and slight for hardwoods. The use of heavy machinery is moderately limited because the unstable clayey subsoil does not bear heavy loads well when it is wet.

WOODLAND SUITABILITY GROUP 3c2

The only mapping unit in this woodland group is Loamy and clayey land, 10 to 40 percent slopes. This land is well drained and has a surface layer of variable texture that overlies deposits of clay.

Loblolly pine, white pine, and Virginia pine are suitable for planting. Scotch pine, Norway spruce, Austrian pine, white pine, and Virginia pine are suitable for Christmas trees. Existing stands of oaks, Virginia pine, or sweetgum should be managed until they are ready for harvesting. After harvesting, white pine or loblolly pine can be planted.

The site index is 75 to 84 for loblolly pine.

Seedling mortality is slight. The hazard of erosion is moderate to severe because this land is strongly sloping to steep. Windthrow hazard is slight. Plant competition is moderate for conifers and slight for hardwoods. Equipment limitation is severe because the subsoil is clayey and slopes are strong to steep.

WOODLAND SUITABILITY GROUP 2r1

The only soil in this group is Butlertown silt loam, 10 to 15 percent slopes, severely eroded. This soil is moderately well drained and has a firm silty clay loam subsoil that is moderately slow in permeability.

In order of priority for timber, loblolly pine, yellow-poplar, and sweetgum are suitable for planting. Scotch pine, white pine, and Austrian pine are suitable for Christmas trees. Existing stands of yellow-poplar, oaks, and sweetgum should be managed until they are ready for harvesting. After harvesting, loblolly pine can be planted.

The site index is 85 or more for loblolly pine, 80 to 90 for yellow-poplar, and 75 to 95 for sweetgum.

Seedling mortality is slight. The hazard of erosion is severe, and the hazard of windthrow is slight. Equipment limitation is moderate because of slope. Plant competition is severe for conifers and moderate for hardwoods.

WOODLAND SUITABILITY GROUP 2r2

The only soil in this group is Collington fine sandy loam, 15 to 40 percent slopes. This soil is well drained and has a fine sandy clay loam subsoil that consists of glauconitic materials. Yellow-poplar, white pine, and loblolly pine are trees that should have priority in planting. Scotch pine, Norway spruce, white pine, and blue spruce are suitable for Christmas trees. Existing good stands of oaks or yellow-poplar should be managed until they are ready for harvesting.

The site index is greater than 85 for yellow-poplar and probably 85 for loblolly pine.

Seedling mortality and the hazards of erosion and windthrow are slight. Plant competition is severe for conifers and moderate for hardwoods. Equipment limitation is moderate on this sloping soil.

WOODLAND SUITABILITY GROUP 3r1

This woodland group consists of well-drained, moderately steep to steep soils in the Marr, Sassafras, and Westphalia series. In most areas these soils are severely eroded.

In order of their priority for timber, loblolly pine, white pine, Virginia pine, and yellow-poplar are suitable for planting. Scotch pine, Norway spruce, and Austrian pine are suitable for Christmas trees.

The site index is 75 to 84 for loblolly pine and 80 to 100 for yellow-poplar.

Seedling mortality is slight. The hazard of erosion is severe, and the hazard of windthrow is moderate. Plant competition is moderate for conifers and slight for hardwoods. Equipment limitation is moderate on slopes that range from 12 to 20 percent and is severe on slopes of more than 20 percent.

WOODLAND SUITABILITY GROUP 3f1

This woodland group consists of well-drained, sloping to moderately steep, moderately eroded Croom soils. These soils have a gravelly sandy loam surface layer and an extremely hard, moderately to moderately slowly permeable very gravelly sandy clay loam subsoil.

In order of their priority for timber, Virginia pine and loblolly pine are suitable for planting. Scotch pine, Austrian pine, and white pine are suitable for Christmas trees. Existing stands of hardwoods should be managed until they are ready for harvesting. After harvesting, Virginia pine or loblolly pine can be planted.

The site index is about 75 to 84 for loblolly pine and 65 to 75 for Virginia pine. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is moderate. The hazards of erosion and windthrow are slight. Plant competition is moderate for conifers and slight for hardwoods. Equipment limitation is slight.

WOODLAND SUITABILITY GROUP 3f2

The only soil in this group is well-drained Croom gravelly sandy loam, 15 to 40 percent slopes. This soil contains gravel throughout. It has an extremely hard, moderately to moderately slowly permeable subsoil of tightly compacted, clayey gravel.

In order of their priority for timber, Virginia pine and loblolly pine are suitable for planting. Scotch pine, Austrian pine, and white pine are suitable for Christmas trees. Existing stands of hardwoods should be managed until they are ready for harvesting. After harvesting, Virginia pine or loblolly pine can be planted.

The site index is about 75 to 84 for loblolly pine. On soils that have a site index of 80, the expected yield per acre from well-stocked, unmanaged stands 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 is about 400 board feet of timber or about one-half cord of pulpwood.

Seedling mortality is moderate because of the gravelly sandy loam surface layer. The hazard of erosion is moderate, and the hazard of windthrow is slight. Plant competition is moderate for conifers and slight for hardwoods. Equipment limitation is moderate because of the steep slopes.

Wildlife

This subsection contains information on how the characteristics of the soils of Anne Arundel County relate to some elements of habitat for native wildlife. Since properties of soils affect the establishment and maintenance of wildlife habitat, these properties will be of interest to biologists, land use planners, and others concerned with soil, water, plant, and wildlife resources. The method of rating soils is described. Uses of the information as well as limitations in its use are discussed. Table 9 shows the soil-wildlife habitat relationships and broad soil suitability ratings for openland, woodland, and wetland wildlife.

The kinds and abundance of most wildlife species depend largely on the availability and adequate distribution of food, shelter, and water. Different kinds of habitat elements are needed to meet these requirements throughout the year. The absence of any one of the necessary elements can result in a scarcity or nonexistence of a particular kind of wildlife.

The habitat needs of wildlife are provided by different kinds of vegetation and by suitable water areas. The characteristics of soils influence the adaptability, growth habits, and productivity of plants. They also affect the quality and distribution of water needed by wildlife. Both vegetation and water can be better managed for use by wildlife if the relationship of soil, plants, water, and wildlife is understood. Plant management for wildlife is achieved by planting desirable plants or improving natural establishments. Water management involves creating or improving water supplies.

TABLE 9.—*Soil suitability for elements*

[Cut and fill land, Gravel and borrow pits, Made land, and

Soil series or land type and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Adelphia:				
AdA, AsA	Fair	Good	Good	Good
AdB, AsB	Fair	Good	Good	Good
Beltsville: BeB2, BlB	Fair	Good	Good	Good
Bibb: Bm	Poor	Fair	Fair	Good
Butlertown:				
BuA	Good	Good	Good	Good
BuB2	Fair	Good	Good	Good
BuC2	Fair	Good	Good	Good
BuC3	Poor	Fair	Good	Good
BuD3	Unsuited	Poor	Good	Good
Chillum:				
CaB2, CbB	Fair	Good	Good	Good
CaC2	Fair	Good	Good	Good
Christiana:				
CcB2	Fair	Good	Good	Good
CcC2	Fair	Good	Good	Good
CdC3	Poor	Fair	Fair	Fair
Coastal beaches: Ce	Unsuited	Poor	Poor	Unsuited
Codorus: Ch	Fair	Good	Good	Good
Colemantown: Ck, Cm	Poor	Fair	Fair	Good
Collington:				
CnB2	Fair	Fair	Fair	Fair
CnC2	Fair	Fair	Fair	Fair
CoA, CpA	Good	Good	Good	Good
CoB2, CpB2, CpuB	Fair	Good	Good	Good
CoC2	Fair	Good	Good	Good
CoC3	Poor	Fair	Good	Good
CoD2	Poor	Fair	Good	Good
CoD3, CpuD	Unsuited	Poor	Good	Good
CoE	Unsuited	Poor	Good	Good
Comus: Cr	Good	Good	Good	Good
Croom:				
CsC2	Fair	Good	Good	Fair
CsD2, CtD	Poor	Fair	Good	Fair
CsE	Unsuited	Fair	Good	Fair
Donlonton:				
DnA	Fair	Good	Good	Good
DnB2, DuB	Fair	Good	Good	Good
Elkton: Ek, En	Poor	Fair	Fair	Good
Evesboro:				
EoB, ErB	Poor	Poor	Poor	Poor
ErC, EsC, EuC	Poor	Poor	Poor	Poor
EsE	Unsuited	Unsuited	Poor	Poor

of wildlife habitat and kinds of wildlife

Urban land are so variable that ratings were not made for them]

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Fair	Fair	Fair	Fair	Fair	Good	Fair.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Good	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Fair	Good	Good	Good	Fair	Good	Good.
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Good	Unsuited	Unsuited	Unsuited	Unsuited	Poor	Unsuited.

TABLE 9.—*Soil suitability for elements*

Soil series or land type and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Fallsington: Fa	Poor	Fair	Fair	Good
Galestown: GaB	Poor	Poor	Poor	Poor
Hatboro: Ha	Fair	Good	Good	Good
Howell:				
HfB2, HgB2, HsB2, HtB2	Fair	Good	Good	Good
HyC3, HzC3	Poor	Fair	Good	Good
HyD3	Unsuited	Fair	Good	Good
HyE3	Unsuited	Poor	Good	Good
Keyport:				
KeA, KpA	Fair	Good	Good	Good
KeB, KpB2, KrB	Fair	Good	Good	Good
Klej: Ks	Poor	Fair	Fair	Fair
Loamy and clayey land:				
LoB	Fair	Fair	Good	Good
LoC	Poor	Fair	Good	Good
LoD	Unsuited	Poor	Good	Good
Marr:				
MfB2	Fair	Good	Good	Good
MfC2	Fair	Good	Good	Good
MfC3	Poor	Fair	Good	Good
MfD2	Poor	Fair	Good	Good
MfD3	Unsuited	Poor	Good	Good
MfE3	Unsuited	Unsuited	Good	Good
Matapeake:				
MkA, MmA	Good	Good	Good	Good
MkB2, MmB2	Fair	Good	Good	Good
MmC2	Fair	Good	Good	Good
MmC3	Poor	Fair	Good	Good
MmD3	Unsuited	Poor	Good	Good
Matawan:				
MnA	Fair	Good	Good	Good
MnB	Fair	Good	Good	Good
Mattapex:				
MpA, MrA	Fair	Good	Good	Good
MpB2, MrB2	Fair	Good	Good	Good
MrC2	Fair	Good	Good	Good
Mixed alluvial land: Mt	Poor	Fair	Fair	Good
Monmouth:				
MuA	Fair	Fair	Fair	Fair
MuB2	Fair	Fair	Fair	Fair
MuC2	Fair	Fair	Fair	Fair
MuC3	Poor	Poor	Fair	Fair
MuD2	Poor	Poor	Fair	Fair
MuD3	Unsuited	Poor	Fair	Fair
MvA	Good	Good	Good	Good
MvB2, MxB	Fair	Good	Good	Good
MvC2	Fair	Good	Good	Good
MwC3	Poor	Fair	Good	Good
MvD2	Poor	Fair	Good	Good
MwD3, MxD	Unsuited	Poor	Good	Good
MvE	Unsuited	Poor	Good	Good

of wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Fair	Good	Good	Good	Fair	Good	Good.
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Poor	Fair	Fair	Fair	Good	Fair	Fair.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Poor	Poor	Good	Fair	Poor	Fair.
Poor	Unsuited	Unsuited	Unsuited	Good	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Unsuited	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Fair	Fair	Poor	Fair	Fair	Good	Fair.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Uusuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.

TABLE 9.—*Soil suitability for elements*

Soil series or land type and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Muirkirk:				
MyB, MzB	Poor	Poor	Poor	Poor
MyC	Poor	Poor	Poor	Poor
MyD, MzD	Poor	Poor	Poor	Poor
MyE	Unsuited	Poor	Poor	Poor
Osier: Os	Unsuited	Poor	Poor	Good
Othello: Ot	Poor	Fair	Fair	Good
Rumford:				
RuA	Fair	Fair	Fair	Fair
RuB2, RyB	Fair	Fair	Fair	Fair
RuC2	Fair	Fair	Fair	Fair
RuC3	Poor	Poor	Fair	Fair
RuD2, RyD	Poor	Poor	Fair	Fair
Sassafras:				
SaA, SfA	Good	Good	Good	Good
SaB2, SfB2, SnB	Fair	Good	Good	Good
SaC2	Fair	Good	Good	Good
SaC3	Poor	Fair	Good	Good
SaD2	Poor	Fair	Good	Good
SaD3, SnD	Unsuited	Poor	Good	Good
SaE	Unsuited	Poor	Good	Good
Shrewsbury: Sr, Ss	Poor	Fair	Fair	Good
Swamp: Sw	Unsuited	Poor	Unsuited	Fair
Tidal marsh: Tm	Unsuited	Unsuited	Unsuited	Unsuited
Westphalia:				
WaB2	Fair	Good	Good	Good
WaC2	Fair	Good	Good	Good
WaC3	Poor	Fair	Good	Good
WaD3	Unsuited	Poor	Good	Good
WaE3	Unsuited	Unsuited	Good	Good
Woodstown:				
WdA, WoA	Fair	Good	Good	Good
WdB, WoB	Fair	Good	Good	Good

of wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Good	Unsuited	Unsuited	Unsuited	Poor	Poor	Unsuited.
Good	Unsuited	Unsuited	Unsuited	Unsuited	Poor	Unsuited.
Good	Good	Good	Good	Poor	Good	Good.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Fair	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Fair	Good	Good	Good	Fair	Good	Good.
Unsuited	Good	Good	Fair	Unsuited	Poor	Good.
Unsuited	Good	Fair	Unsuited	Unsuited	Unsuited	Fair.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Fair	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Poor	Fair	Unsuited.
Poor	Unsuited	Unsuited	Unsuited	Unsuited	Fair	Unsuited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Unsuited	Unsuited	Unsuited	Good	Good	Unsuited.

The soil-wildlife interpretations that follow are based upon soil maps. They are only guides and, for detailed planning and application, must be supplemented by on-site investigation. No attempt is made to relate individual kinds of wildlife to the soils; nor are present land use, existing vegetation, the relationships of one soil to another, and the mobile nature of wildlife considered. Data on construction characteristics of soils can be found in the section "Engineering Uses of Soils."

A knowledge of individual wildlife species and their habitat is important when interpreting the use of soils for wildlife needs. This subsection may be used to aid (1) planning on a broad scale for the use of wildlife areas in parks, refuges, nature study trails, and recreational developments; (2) selecting the soils for creating, improving, or maintaining various kinds of wildlife habitat; (3) determining the relative degree of management intensity required to attain satisfactory results in establishment of wildlife habitat; (4) elimination of sites on which it is not feasible to attempt habitat management; and (5) determination of areas desirable for habitat preservation, or suitability for acquisition for wildlife land use.

The soils of the county are rated for use for the creation, improvement, or maintenance of eight elements of habitat and for their potentialities for three classes or kinds of wildlife. The ratings, based on soil limitations, are *good*, *fair*, *poor*, and *unsuited*. Soils not rated good have one or more limitations in soil characteristics and vary in the severity of those limitations.

The eight elements of habitat listed in table 9 are described in the following paragraphs.

Grain and seed crops.—Corn, sorghum, millet, soybeans, buckwheat, cowpeas, wheat, oats, rye, barley, and other crops grown for grain or grainlike seeds are valuable for wildlife. The soils rated as good for these plants are deep, level to gently sloping, medium textured, and mostly well drained. They have a high available moisture capacity and are not subject to frequent flooding.

Grasses and legumes.—Lespedeza, alfalfa, alsike clover, Ladino clover, red clover, tall fescue, bromegrass, bluegrass, and timothy are planted grasses and legumes valued as wildlife food and cover. The soils are deep to moderately deep, have a good available moisture capacity, and are not more than moderately eroded.

Wild herbaceous upland plants.—Among these plants that wildlife use for food and cover are panicgrass and other native grasses, partridge-pea, beggartick, various native lespedezas, and other native herbs. The soils favored by these plants are, for the most part, deep soils of the uplands that do not have a thick, sandy surface layer.

Hardwood woody plants.—Some hardwood trees and shrubs are valuable for wildlife because they grow vigorously and produce a good crop when they are planted or when they seed naturally. Among these are sumac, dogwood, persimmon, sassafras, hazelnut, shrub lespedeza, multiflora rose, autumn-olive, wild cherry, various oaks and hickories, bayberry, blueberry, huckleberry, highbush cranberry, blackhaw, sweetgum, and various hollies. The soils favored by these plants are deep and do not have a thick, sandy surface layer.

Coniferous woody plants.—Virginia pine, loblolly pine, shortleaf pine, red pine, Scotch pine, pond pine, Norway spruce, redcedar, and Atlantic white-cedar are valuable for wildlife food and cover. These plants generally are naturally established on bare soil or where plant cover is thin. Soil characteristics such as shallowness, droughtiness, and other qualities that cause plants to grow slowly provide the better conditions for this habitat element. On soils rated fair, widely spaced plants may quickly but temporarily produce desirable growth characteristics. Management may be difficult because these soils are rated good for competing hardwoods, which invade and overtop the conifers. Topping and thinning of fast-growing conifers also are necessary for habitat management.

Wetland food and cover plants.—Examples of plants that provide food and cover for waterfowl and fur-bearing animals are smartweed, wildrice, barnyard grass, bulrush, pondweed, duckweed, arrow-arum, pickerelweed, water willow, cattail, and various sedges. The soils favored by these plants are those that have a high water table most of the year.

Shallow water developments.—The suitability of a soil for shallow impoundments depends on the ease in controlling the water in or on the soil. The soils used for shallow water developments have a high water table much of the time and are in a low topographical position where the water level can be readily controlled to within 2 feet above the soil surface.

Excavated ponds.—The suitability of a soil for constructing excavated ponds depends on how well the pond is supplied by the ground water. These ponds must not depend upon runoff from surrounding areas, though that water may help to keep the pond at the desired level.

The soils are rated according to their suitability for three major kinds of wildlife. These are openland, woodland, and wetland wildlife. The ratings are based on the suitability of the soils for the habitat elements of the particular kind of wildlife as given in table 9. For example, the rating of the soils for openland wildlife is based on their suitability for grain and seed crops, grasses and legumes, and wild herbaceous upland plants. The rating of the soils for woodland wildlife is based on their suitability for hardwood woody plants, conifers, wild herbaceous upland plants, and grasses and legumes. The rating of the soils for wetland wildlife is based on their suitability for wetland plants and their use for constructing shallow water developments or excavated ponds.

The three major kinds of wildlife are defined in the following paragraphs.

Openland wildlife.—This kind consists of birds and animals that normally are found in such open situations as crop fields, meadows, pastures, and nonforested overgrown land. Examples are bobwhite quail, mourning dove, woodcock, cottontail rabbit, meadow lark, killdeer, and field sparrow.

Woodland wildlife.—This kind consists of birds and animals that normally are found in wooded areas. Among these are wild turkey, deer, squirrel, raccoon, wood thrush, and warbler.

Wetland wildlife.—This kind consists of birds and animals that normally are found in wet areas such as ponds, marshes, and swamps. Examples of these are ducks, geese, heron, snipe, rail, coot, and muskrat.

Formation and Classification of the Soils

This section consists of four main parts. In the first part the factors of soil formation are discussed as they relate to the formation of soils in Anne Arundel County. The second part explains the interrelationships of soil series in the county, and the third part discusses the genesis and morphology of soils. In the fourth part, each soil series represented in the county is classified by higher categories.

Factors of Soil Formation

Soils are the products of soil-forming processes acting upon materials altered or deposited by geologic forces. The factors that contribute to the differences among soils are climate, plant and animal life, parent material, topography, and time. Climate and plant and animal life, particularly vegetation, are the active forces in soil formation. Their effect on parent material is modified by topography 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 dominates in the formation of a soil and determines most of its properties. Normally, however, the interaction of all factors determines the kind of soil that develops in any given place.

Climate

Climate is important in the formation of soils because it influences the weathering of minerals. Weathering is more rapid under a warm, humid climate than it is under a cold or a dry climate. The type and abundance of vegetation are influenced by the amount of precipitation and the length of the growing season. Precipitation also affects the translocation and leaching of some products of weathering. Hard rains and frequent showers can cause excessive erosion.

Anne Arundel County has the humid, temperate climate that is typical of the eastern United States. Facts about the temperature and precipitation are given in tables 1 and 2 in the section "General Nature of the County."

The climate is nearly the same throughout the county, and precipitation is rather uniformly distributed during the year. In winter the precipitation is generally in the form of light snows and showers, and in other seasons it comes as light, prolonged rains or as quick, hard showers. Winter is moderately cold and sometimes wet; summer is usually hot and humid.

This humid, temperate climate has caused all the soils of the county to be strongly weathered, leached, acid, and comparatively low in supply of plant nutrients.

Plant and animal life

Before the county was settled, the native vegetation consisted mainly of hardwoods, but there also were some coniferous trees. These plants had a major influence on the development of the soils. In addition, the activities of micro-organisms, earthworms, larvae, rodents, and other forms of animal life were important in the cycle of decay and regeneration of plants.

Hardwood trees and other plants take up minerals from the soil and store them in their roots, stems, and leaves. When these plants or parts of them decay, the minerals re-enter the soil and are again used by the plants. Unless disturbed, this cycle continues through the years.

Soil development also is affected by plant roots, which penetrate soil material to various depths, generally increase its porosity, and may break or split coarse fragments and particles. Root distribution is limited in shallow, extremely acid, or steep soils and in some poorly drained soils. Organic acids produced by plants and plant decay react on basic minerals contained in the parent material. Minerals taken into solution or suspension may be leached from a soil or translocated within it.

As farming developed in Anne Arundel County, the activity of man influenced soil formation. Forests were cleared, and new kinds of plants were introduced. Cultivation and artificial drainage changed some characteristics of soils in the county.

Man's activity has caused an accelerated loss of soil through erosion. Because of this loss, the soil in many areas is now thin and has been changed in other ways. Some of the material washed from sloping soils has been deposited in depressions and on flood plains. Young or immature soils are formed in such material.

Parent material

Most of the soils in the county formed in sediments transported by water, wind, or the force of gravity, or by a combination of these, into the area known as the Atlantic Coastal Plain.

The Coastal Plain in the county consists of sedimentary formations of clay, sand, greensand, marl, silt, and diatomaceous earth that range in geologic age from Cretaceous to Recent (*3*). Most of the soils formed in material weathered from these formations and are easily associated with them because of inherited characteristics. Thus, the red clays of the Patapsco Formation are evident in the Christiana soils, the olive-green to brown, glauconitic sands of the Aquia Formation are apparent in the Collington soils, and the fine, smooth, yellow sands of the Miocene epoch are evident in the Westphalia soils. Many other soils have characteristics inherited from their associated geologic formations.

The oldest of these sedimentary formations are those of the Cretaceous System. They consist of gray and yellow sand; red, brown, and gray clay with nodules of ironstone; and variegated red and yellow sand, clay, and fine gravel interbedded with layers of clay. In places these materials are capped by remnants of Pleistocene sand, gravel, clay, or sandy clay. Where the Lower Cretaceous materials have been exposed to weathering, they form the parent material for the Christiana soils and the subsoil of the Muirkirk soils.

Of special interest in Anne Arundel County is the parent material of the Adelphia, Colemantown, Collington, Donlonton, Monmouth, and Shrewsbury soils. These are commonly called "greensand soils." They occur in a belt between Washington, D.C., and Annapolis, Maryland, the western edge of which is roughly parallel to the boundary between the Piedmont and Coastal Plain. The parent material is composed predominantly of sand-size quartz and glauconite pellets rich in iron, which

give the parent material an overall greenish appearance. Most of those who have studied glauconite have concluded that it formed under marine conditions and formed in the formations in which it is found (*5*). These are the Aquia and Monmouth Formations.

The Pleistocene deposits of sand, silt, clay, and gravel are exposed to a varying depth over the county and form the parent material of the Elkton, Fallsington, Keyport, Sassafras, and Woodstown soils. The gravelly sand and clay of the Croom soils consist of river outwash deposited in Pliocene or early Pleistocene time. Soils of the Evesboro, Galestown, Klej, and Osier series formed in sandy Pleistocene deposits. These coarse-textured materials are also the source of the surface layer, or A horizon, in the Muirkirk soils and probably in the Matawan soils.

The Beltsville and Chillum soils developed in a thin silty mantle that was deposited over sediments of both the Pleistocene and Lower Cretaceous geologic systems.

The Butlertown soils developed in a thick deposit of silt, and the Matapeake, Mattapex, and Othello soils developed in a silty mantle over loose sand.

The materials most recently deposited are alluvial sediments on flood plains, in depressions, and on low stream terraces. These sediments are the parent material of the Bibb, Codorus, Comus and Hatboro soils.

Topography

Topography, or relief, controls surface drainage and affects percolation of water through the soil and into the underlying material. It affects the depth of soil and some of the soil-forming processes, and it has some effect on the dominant kind of vegetation.

Steep soils formed on side slopes normally have weakly expressed horizons and have a solum that generally is thin because much of it is eroded away almost as rapidly as it forms. Soils in low depressions and on flood plains generally have impeded drainage to some degree.

The topography of Anne Arundel County ranges from nearly level to steep. Most of the soils in the northern and western part are gently sloping to sloping. The soils in the center of the county are the steepest. Here, the streams flowing into the tidal estuaries of the Chesapeake Bay have incised deep ravines through the geologic materials. In places bordering the Chesapeake Bay, there are broad areas of nearly level soils that are only a few feet above tide.

Differences in topography can account for some differences between soils formed in the same or similar material. This is illustrated by the Marr and Westphalia soils, both of which formed in smooth fine sand and finer material of the Miocene geologic epoch. The gently sloping to moderately sloping Marr soils have a thick solum and a strongly expressed subsoil. In contrast, the strongly sloping to steep Westphalia soils have a much thinner solum and a definite but not strongly expressed subsoil. These differences are caused mainly by topography and its effect on the rate of geologic and accelerated erosion.

Time

Time is important in the formation of soils. If the factors of soil formation have operated long enough to form a soil that has well-defined, genetically related horizons and that is in equilibrium with its environment, the soil is considered mature. However, if the soil shows little or no horizonation, the soil is considered immature. Many soils range in maturity between these extremes.

Soils that formed in the same kind of parent material but in areas of different topography do not necessarily mature in the same length of time. For example, no definite horizons have had time to develop on steep slopes because the soil has been removed by erosion almost as rapidly as it has formed. But there is time for some soil development in less strongly sloping areas.

Soils formed in material that is resistant to weathering require more time to reach maturity than soils formed in easily weathered material. On flood plains the development of genetically related horizons in the soil may be slowed or prevented if alluvium is still being deposited frequently.

Among the soils in Anne Arundel County, the Butlertown soils are mature soils in which the horizons are well defined and genetically related, the rate of weathering has far exceeded that of geologic erosion, and the soils generally are in equilibrium with their environment. The Westphalia soils are only partly mature because they are sloping and occur in areas where the rate of erosion is nearly that of weathering. The Comus soils are immature because the material in which they formed is recently deposited and is constantly being renewed.

Interrelationships of Soil Series

In table 10 the soil series of Anne Arundel County are grouped to show the relationships in position, parent material, and drainage. Most of the soils are on uplands or terraces, but some are on flood plains.

Soils of the uplands and terraces.—The soils on uplands and on terraces developed in the same kind of parent material. The topographic position does not, in itself, affect the classification of soils. For example, soils of the Sassafras, Galestown, and some other series developed on alluvial terraces and also in older sediments on uplands.

The soils on uplands have developed in Pleistocene or older sediments than those of the terraces. The soils on terraces have developed mainly in Pleistocene sediments, though in some places the sediments may have been deposited during the Pliocene epoch on what are now terraces.

Soils of flood plains.—These soils developed in recent alluvium and, in most areas, are periodically covered with fresh material. Soils on flood plains are occasionally or frequently covered by floodwater that deposits fresh material.

In some places the material is of uniform texture and generally consists of fine sand or silt. In other places it is made up of interstratified or otherwise mixed materials, chiefly sand, silt, and even gravel.

Little soil development is evident in most areas of these deposits, though generally there is an A horizon that locally is covered with thin overwash laid down only recently. In soils that are not at least well drained, mottling or fairly distinct gleying occurs within 3 feet of the surface. In none of the soils is there a horizon of clay accumulation, for the soil material has not been in place long enough.

TABLE 10.—*Soil series arranged to show relationships in position, parent material, and drainage*

Parent material	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained [1]	Poorly drained
Soils of Uplands and Terraces					
Sand and loamy sand	Evesboro	Galestown		Klej	Osier
Sand, silt, and clay			Sassafras	Woodstown	Fallsington
Sand and a little clay and silt			Rumford		
Thick deposits of silt				Butlertown	Othello
Thin mantle of silt over sand			Matapeake	Mattapex	Othello
Old gravelly sediments		Croom			
Silt over compact sandy and gravelly sediments			Chillum	Beltsville	
Clay or silty clay			Christiana	Keyport	Elkton
Sand over clay, silty clay, or fine sandy clay		Muirkirk		Matawan	
Miocene clay, silt, and fine sand			Howell	Keyport	Elkton
Miocene fine sand and silt			Marr, Westphalia		
Sand and silt with a moderate glauconite content			Collington	Adelphia	Shrewsbury
Sandy clay with a high glauconite content			Monmouth	Donlonton	Colemantown
Soils of Flood Plains					
Recent alluvium from crystalline rocks			Comus	Codorus	Hatboro
Recent alluvium from Coastal Plain sediments					Bibb

[1] These soils are dominantly moderately well drained, but parts of some series extend into the somewhat poorly drained range.

Genesis and Morphology of Soils

Most soils of the county have strongly differentiated horizons. The exceptions, in which horizonation is weak or lacking, are the young alluvial soils and the soils that consist mainly of quartz sand.

The differentiation of horizons in the soils is the result of several soil-forming processes. The most important of these are the following: (1) accumulation of organic matter, (2) leaching of carbonates and of salts more soluble than calcium carbonate, (3) chemical and physical weathering of the primary minerals of parent material into silicate clay minerals, (4) translocation of these silicate clay minerals, and probably of some silt-sized particles, from one horizon to another, and (5) chemical change and transfer of iron.

In the formation of most soils in the county, several of these processes have interacted to a varying degree. In some soils perhaps only one or two processes have been active and, in some, only to a slight degree. In the soils developed in glauconite sediments an important process is the physical breakdown of glauconite pellets and subsequent eluviation and illuviation of the resulting particles.

Some organic matter has accumulated in all the soils to form an A1 horizon. In many places this horizon has eroded away or has been mixed with material from underlying horizons through cultivation. The content of organic matter varies in the different soils and ranges from very low to high. Sandy soils, such as the Evesboro and Galestown soils, have a weak A1 horizon that contains little organic matter.

Most soils in Anne Arundel County formed in unconsolidated sediments. All of the soils have been completely leached of carbonates and salts and are naturally acid. Many of them are very strongly acid or extremely acid.

The weathering of primary minerals to silicate clay minerals, largely by the process of hydrolysis, results finally in the production of kaolinitic clays. No complete study of clay minerals has been made in Anne Arundel County, but kaolinite is probably the most common, though clay mineralogy is mixed in mature soils of the county. Other clays, such as illite, montmorillonite, and probably halloysite, occur in some of the soils.

The translocation and the development in place of silicate clay minerals have contributed strongly to the formation of horizons in soils of the county. Silicate clays formed in the A1 and A2 horizons have been largely translocated to the lower B horizon by percolation and have been at least partly immobilized. This process contributes to the formation of a textural, or a B2t, horizon. The process may also be active to a limited degree in soils that do not have a distinct B2t horizon. Silicate clays may also develop within a B2t horizon and be partly or completely immobilized as quickly as they are formed. For example, translocation of silicate clays has occurred in the Collington and Sassafras soils, and translocation and inplace development of silicate clays have taken place in the Christiana soils.

Gleying, or the process of chemical reduction and transfer of iron, occurs in soils with impeded drainage. The naturally wet soils of the county have some degree of gleying in one or more of their horizons. Colemantown and Elkton soils are examples of soils that have been affected by gleying because the water table is seasonally high.

Orientation of soil particles in the lower subsoil generally results in the formation of a compact layer commonly called a fragipan, though the process of fragipan formation is obscure and debatable. This fragipan is a part of the B horizon in most of these soils and is designated by the symbol Bx. It may extend into the

underlying C material, where it is recognized as a Cx horizon. A soil may therefore have a fragipan in either the B or the C horizon, or in both.

Because a fragipan generally is slowly permeable, a temporary perched water table can form above it while deeper strata of the soil remain relatively dry. Beltsville soils have a strongly developed fragipan.

Iron that has been reduced in areas where the soil is poorly aerated generally becomes mobile and may be removed from the soil. Part of the mobile iron moves either within the horizon where it originated or to another horizon. Part of this iron may be segregated and reoxidized to form the red, yellowish-red, strong-brown, or yellowish-brown mottles that are common in some horizons of soils having impeded drainage. The reduction, segregation, and reoxidation of iron have occurred in horizons of the Adelphia and Woodstown soils.

When silicate clay forms from primary materials, some iron generally is freed as hydrated oxide. Depending on the degree of hydration, such oxides normally are of various shades of red. In soils formed in parent material that is highly quartzose, or in soils that are coarse textured and lack sufficient silicate clay minerals to form a B2t horizon, only a small amount of hydrated oxide is required to color the soil material. Such soils generally have a highly colored cambic B horizon. The Galestown soils of Anne Arundel County lack a B2t horizon but do not have a distinctly colored cambic B horizon.

In most well-developed and freely aerated soils with a B2t horizon, hydrated iron oxide may color the horizon as strongly as it does a nontextural B horizon. For example, the Monmouth soils, which have a B2t horizon of olive hues and low chromas and values, show little or no visible evidence of free iron oxide. At the other extreme are the Christiana soils, which have red hues, distinctly higher chromas, and generally higher values than the Monmouth soils. The B2t horizon in the Christiana soils is very strongly colored by free iron oxide.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*7*) and revised later (*6*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 (*9*). It is under continual study. Readers interested in the development of the system should refer to the latest literature available (*4*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 11 shows the classification of each soil series of Anne Arundel County by family, subgroup, and order, according to the current system. It also shows one category—the great soil group—of the 1938 system.

In the broadest category of the current system there are 10 orders, but only three of these are recognized in Anne Arundel County. These are Entisols, Inceptisols, and Ultisols.

Entisols are mineral soils that are only slightly modified from the geologic materials in which they have formed. In Anne Arundel County, the principal modification is a weakly developed A1 horizon.

Inceptisols are mineral soils in which horizons have begun to develop. At the present stage of development, these soils are not in equilibrium with their environment.

Most of the soils in Anne Arundel County are in the order Ultisols. They are strongly weathered or strongly developed soils. These soils range from well drained to very poorly drained. Ultisols commonly represent advanced stages in soil development in which the processes have not been halted by lack of weatherable minerals in the geologic materials or by aberrations in the environment.

TABLE 11.—*Soil series classified according to the current system of classification and the revised 1938 system*

Series	Current classification			1938 classification of great soil group
	Family	Subgroup	Order	
Adelphia	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Beltsville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Gray-Brown Podzolic soils.
Bibb	Coarse-loamy, siliceous, acid, thermic.	Typic Haplaquents	Entisols	Low-Humic Gley soils.
Butlertown	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

See footnotes at end of table.

TABLE 11.—*Soil series classified according to the current system of classification and the revised 1938 system*—Continued

Series	Current classification			1938 classification of great soil group
	Family	Subgroup	Order	
Chillum	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Christiana	Clayey, kaolinitic, mesic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Codorus [1]	Fine-loamy, mixed, mesic	Aquic Fluventic Dystrochrepts.	Inceptisols	Alluvial soils.
Colemantown	Clayey, glauconitic, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Collington	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Comus [2]	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Croom	Loamy-skeletal, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Donlonton	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Evesboro	Mesic, coated	Typic Quartzipsamments	Entisols	Regosols.
Fallsington	Fine-loamy, siliceous, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Galestown	Sandy, siliceous, mesic	Psammentic Hapludults	Ultisols	Sol Bruns Acides soils.
Hatboro	Fine-loamy, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Howell	Clayey, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Klej	Mesic, coated	Aquic Quartzipsamments	Entisols	Regosols.
Marr	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Matapeake	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Matawan	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Mattapex	Fine-silty, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Monmouth	Clayey, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Muirkirk	Clayey, kaolinitic, mesic	Arenic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Osier	Siliceous, thermic	Typic Psammaquents	Entisols	Regosols.
Othello	Fine-silty, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Rumford	Coarse-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Sassafras	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Shrewsbury	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Westphalia	Coarse-loamy, siliceous, mesic	Ochreptic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Woodstown	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

[1] The Codorus soils in Anne Arundel County are taxadjuncts to the Codorus series. They are stratified, and they do not have weak subangular blocky structure in the subsoil.

[2] The Comus soils in Anne Arundel County are taxadjuncts to the Comus series. They are stratified, and they do not have weak subangular blocky structure in the subsoil.

In Anne Arundel County the Entisols consist of two suborders, the Aquents and Psamments. The Aquents in this county are made up of two great groups, Psammaquents and Haplaquents, both of which are in Typic subgroups. The Psamments of the county are all in the Quartzipsamments great group; however, the Quartzipsamments are in two subgroups, Typic and Aquic. Quartzipsamments are sandy soils that consist of 95 percent or more quartz or other normally insoluble minerals. They range from moderately wet to extremely dry.

Typic Psammaquents are wet, gray, sandy soils that are saturated with water for part of the year. The A1 horizon is weakly developed and somewhat darker gray than the underlying soil material. The Osier soils are in this subgroup.

Typic Quartzipsamments are primarily of quartz sand. They are not bright colored soils, but neither are they dominantly gray. The A1 horizon is weakly developed and natural drainage is excessive. The Evesboro soils are in this subgroup.

Aquic Quartzipsamments are like the Typic Quartzipsamments but have mottles with gray colors within 40 inches of the surface. These soils are naturally saturated with water for brief periods of the year. They have a seasonally fluctuating water table. Klej soils are in this subgroup.

Typic Haplaquents have a light-colored A horizon and a weakly developed B horizon that shows no evidence of clay accumulation. They are saturated with water for part of the year. The Bibb soils are Typic Haplaquents.

In this county the Inceptisols consist of the suborders Aquepts and Ochrepts. Aquepts are dominantly gray in color and are saturated with water at some season of the year. Ochrepts have brighter colors than Aquepts and are saturated with water for only brief periods of the year or not at all.

Fluventic Haplaquepts have a thin A horizon over a weakly developed B horizon and are dominantly gray within 30 inches of the surface soil. The Hatboro soils are in this subgroup. In Anne Arundel County, the Hatboro soils, as mapped, are not typical, but have a somewhat greater development of their B horizon than that representative of the series.

Dystrochrepts are the great group under the Ochrepts. They have weak horizonation and have a low exchange capacity in the subhorizons that are within 30 inches of the surface. Fluventic Dystrochrepts lack gray mottles in the soil profile. The Comus soils are in this subgroup.

Aquic Fluventic Dystrochrepts are like Fluventic Dystrochrepts, but they have gray mottles within 20 inches of the soil surface. The Codorus soils are in this subgroup.

The Comus and Codorus soils in Anne Arundel County have stratification and lack the weak, subangular blocky structure in their subsoil that is normally found in the series.

In Anne Arundel County the Ultisols are represented by the suborders Aquults and Udults. The Aquults have a horizon of clay accumulation that is dominantly gray, and they are wet and poorly drained. The Udults also have a horizon of clay accumulation, but they are not very wet or poorly drained. In the Udults, at least a part of the Bt horizon (the horizon of clay accumulation) is brighter colored than the Bt horizon of the Aquults, having some higher chroma of yellow, brown, or red.

The suborder Aquults is represented by the great group Ochraquults. Ochraquults have a relatively light colored A horizon. The Colemantown, Elkton, Fallsington, Othello, and Shrewsbury soils are in this group.

The suborder Udults is divided into the great groups Hapludults, Fragiudults, and Paleudults. The Hapludults are the normal soils of the suborder. They have a horizon of clay accumulation that is dominantly bright colored reddish brown, strong brown, or yellowish brown. They also have textures that are loamy fine sand or coarser in some part of the Bt horizon. Fragiudults typically have a fragipan (a dense brittle horizon) just beneath the horizon of clay accumulation, and Paleudults are Udults with an old, very thick argillic horizon that has few weatherable minerals.

Typic Fragiudults have a fragipan under a bright yellow or reddish horizon of clay accumulation. There are no gray mottles (chroma of 2 or less) within the upper 10 inches of the horizon of clay accumulation. These soils also have a light-colored A horizon. The Beltsville and Butlertown soils are in this subgroup.

Typic Hapludults show no evidence of wetness in their horizons. They have a horizon of clay accumulation with somewhat bright colors, having chromas of 6 or more in at least some part of the soil. Chillum, Collington, Croom, Howell, Marr, Matapeake, Monmouth, Rumford, and Sassafras soils are in this subgroup.

Aquic Hapludults are like Typic Hapludults but they have some gray mottling with a chroma of 2 or less between 10 and 20 inches below the upper boundary of their horizon of clay accumulation. They are moderately well drained. The Adelphia, Donlonton, Keyport, Matawan, Mattapex, and Woodstown soils are in this subgroup.

Ochreptic Hapludults have only a thin Bt horizon or thin layer of clay accumulation and no evidence of wetness. The Westphalia soils are in this subgroup.

Psammentic Hapludults are like Typic Hapludults except that they have a texture of loamy fine sand or coarser in some part of the horizon of clay accumulation. They also have a higher chroma than Typic Hapludults. The Galestown soils are in this subgroup.

In Anne Arundel County, the great group Paleudults is divided into the subgroups Typic Paleudults and Arenic Paleudults. Typic Paleudults are the normal soils of the great group. They have no mottles with chromas of 2 or less within 30 inches of their soil surface. Typic Paleudults in this County are represented by Christiana soils.

Arenic Paleudults are like Typic Paleudults except that they have a loamy sand surface layer more than 20 inches thick over the thick argillic horizon. The Muirkirk soils are classified as Arenic Paleudults.

Families of soils within subgroups are differentiated on the basis of texture, coarse fragments, mineralogy, and mean annual soil temperature. Anne Arundel County is near the rather indefinite boundary between the thermic (warm or hot) and the mesic (temperate) soil temperatures. For this reason, some of the soil series of Anne Arundel County have been placed in thermic families and some in mesic families. Table 11 shows the family classification of the soil series.

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Glossary

Acidity, soil. 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.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base. 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_4).

Buffer strips. Strips of grass or other erosion-resisting vegetation between or below cultivated strips or fields.

Chroma. See 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.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slopes or that are parallel to terrace grade.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Diversion, or diversion terrace. A ridge of earth, generally a terrace that is built to divert runoff from its natural course and thus to protect areas downslope from the effects of such runoff.

Drainage. 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.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Glauconite. A mineral that consists of a dull green earthy iron potassium silicate occurring abundantly in greensand.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Green-manure crop. A crop grown for the purpose of being turned under in an early stage of maturity for soil improvement.

Greensand. A sedimentary deposit that consists largely of dark greenish grains of glauconite often mingled with clay or sand.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesqui-

oxides, humus, or some combination of these: (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Hue. See Munsell notation.

Immature soil. A soil lacking clearly defined horizons because the soil-forming forces have acted on the parent material only a relatively short time since it was deposited or exposed.

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 drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching. The removal of soluble material from soils or other material by percolating water.

Marine deposit. Material deposited in the waters of oceans and seas and exposed by the elevation of the land or the lowering of the water level.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in 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.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Natural soil drainage. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizons and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Nutrient, plant. Any element taken in by a plant, essential to its growth and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil and carbon, hydrogen, and oxygen obtained largely from the air and water are plant nutrients.

Parent material. The weathered rock or partly weathered soil material from which soil has formed; the C horizon.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class 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 on earthy 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 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 solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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. See Relief.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geologic). 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 Munsell notation.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflowers) wilt so much that they do not recover when placed in a dark, humid atmosphere.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit or a woodland suitability group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 3, page 10.
Use of soils for community development, table 4, page 50.
Use of soils for recreation, table 5, page 58.
Use of the soils in engineering, tables 6 and 7, pages 70 through 87.
Estimated yields of crops, table 8, page 100.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
AdA	Adelphia sandy loam, 0 to 2 percent slopes	12	IIw-5	93	2w3	108
AdB	Adelphia sandy loam, 2 to 5 percent slopes	12	IIe-36	91	2w3	108
AsA	Adelphia silt loam, 0 to 2 percent slopes	12	IIw-1	92	2w3	108
AsB	Adelphia silt loam, 2 to 5 percent slopes	13	IIe-16	91	2w3	108
BeB2	Beltsville silt loam, 2 to 5 percent slopes, moderately eroded	13	IIe-13	91	3w2	108
BlB	Beltsville-Urban land complex, 0 to 5 percent slopes	13	------	--	---	---
Bm	Bibb silt loam	14	IIIw-7	96	2w2	108
BuA	Butlertown silt loam, 0 to 2 percent slopes	15	IIw-1	92	2o1	106
BuB2	Butlertown silt loam, 2 to 5 percent slopes, moderately eroded	16	IIe-16	91	2o1	106
BuC2	Butlertown silt loam, 5 to 10 percent slopes, moderately eroded	16	IIIe-16	95	2o1	106
BuC3	Butlertown silt loam, 5 to 10 percent slopes, severely eroded	16	IVe-9	97	2o1	106
BuD3	Butlertown silt loam, 10 to 15 percent slopes, severely eroded	16	VIe-2	97	2r1	110
CaB2	Chillum silt loam, 2 to 6 percent slopes, moderately eroded	16	IIs-7	94	3o1	107
CaC2	Chillum silt loam, 6 to 12 percent slopes, moderately eroded	16	IIIe-7	94	3o1	107
CbB	Chillum-Urban land complex, 0 to 6 percent slopes	17	------	--	---	---
CcB2	Christiana silt loam, 2 to 5 percent slopes, moderately eroded	17	IIe-42	92	3c1	110
CcC2	Christiana silt loam, 5 to 10 percent slopes, moderately eroded	17	IIIe-42	95	3c1	110
CdC3	Christiana clay, 5 to 10 percent slopes, severely eroded	17	IVe-3	96	3c1	110
Ce	Coastal beaches	18	VIIIs-2	98	----	---
Ch	Codorus silt loam	18	IIw-7	93	1w1	107
Ck	Colemantown sandy loam	19	IIIw-6	95	2w4	108
Cm	Colemantown silt loam	19	IIIw-7	96	2w4	108
CnB2	Collington loamy sand, 2 to 5 percent slopes, moderately eroded	20	IIs-4	93	2o2	106
CnC2	Collington loamy sand, 5 to 10 percent slopes, moderately eroded	20	IIIe-33	95	2o2	106
CoA	Collington fine sandy loam, 0 to 2 percent slopes	20	I-5	90	2o2	106
CoB2	Collington fine sandy loam, 2 to 5 percent slopes, moderately eroded	20	IIe-5	90	2o2	106
CoC2	Collington fine sandy loam, 5 to 10 percent slopes, moderately eroded	20	IIIe-5	94	2o2	106
CoC3	Collington fine sandy loam, 5 to 10 percent slopes, severely eroded	20	IVe-5	96	2o2	106
CoD2	Collington fine sandy loam, 10 to 15 percent slopes, moderately eroded	20	IVe-5	96	2o2	106
CoD3	Collington fine sandy loam, 10 to 15 percent slopes, severely eroded	20	VIe-2	97	2o2	106
CoE	Collington fine sandy loam, 15 to 40 percent slopes	21	VIe-2	97	2r2	111
CpA	Collington silt loam, 0 to 2 percent	21	I-4	90	2o2	106
CpB2	Collington silt loam, 2 to 5 percent slopes, moderately eroded	21	IIe-4	90	2o2	106
CpuB	Collington-Urban land complex, 0 to 5 percent slopes	21	------	--	---	---
CpuD	Collington-Urban land complex, 5 to 15 percent slopes	21	------	--	---	---
Cr	Comus silt loam	22	I-6	90	1o2	106
CsC2	Croom gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	22	IIIe-9	95	3f1	111
CsD2	Croom gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	22	IVe-7	97	3f1	111

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
CsE	Croom gravelly sandy loam, 15 to 40 percent slopes	23	VIIe-2	98	3f1	111
CtD	Croom-Urban land complex, 5 to 15 percent slopes	23	------	--	---	---
CuB	Cut and fill land, 0 to 5 percent slopes	23	------	--	---	---
CuD	Cut and fill land, 5 to 15 percent slopes	23	------	--	---	---
CuE	Cut and fill land, 15 to 30 percent slopes	23	------	--	---	---
DnA	Donlonton fine sandy loam, 0 to 2 percent slopes	25	IIw-9	93	2w3	108
DnB2	Donlonton fine sandy loam, 2 to 5 percent slopes, moderately eroded	25	IIe-36	91	2w3	108
DuB	Donlonton-Urban land complex, 0 to 5 percent slopes	25	------	--	---	---
Ek	Elkton sandy loam	26	IIIw-11	96	3w3	109
En	Elkton silt loam	26	IIIw-9	96	3w3	109
EoB	Evesboro loamy sand, 0 to 6 percent slopes	26	IVs-1	97	3s1	109
ErB	Evesboro loamy sand, clayey substratum, 0 to 5 percent slopes	26	IIIs-1	96	3s1	109
ErC	Evesboro loamy sand, clayey substratum, 5 to 10 percent slopes	27	IVs-1	97	3s1	109
EsC	Evesboro and Galestown loamy sands, 6 to 12 percent slopes	27	VIIs-1	98	3s1	109
EsE	Evesboro and Galestown loamy sands, 12 to 40 percent slopes	27	VIIs-1	98	3s2	109
EuC	Evesboro-Urban land complex, 0 to 15 percent slopes	27	------	--	---	---
Fa	Fallsington sandy loam	28	IIIw-6	95	2w1	107
GaB	Galestown loamy sand, 0 to 5 percent slopes	28	IVs-1	97	3s1	109
Gp	Gravel and borrow pits	28	VIIIs-4	98	---	---
Ha	Hatboro silt loam	29	IIIw-7	96	3w7	109
HfB2	Howell fine sandy loam, 2 to 6 percent slopes, moderately eroded	30	IIe-28	91	2c1	109
HgB2	Howell fine sandy loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	30	IIe-28	91	2c1	109
HsB2	Howell silt loam, 2 to 6 percent slopes, moderately eroded	30	IIe-29	91	2c1	109
HtB2	Howell silt loam, shaly subsoil, 2 to 6 percent slopes, moderately eroded	30	IIe-29	91	2c1	109
HyC3	Howell clay loam, 6 to 12 percent slopes, severely eroded	30	IVe-3	96	2c1	109
HyD3	Howell clay loam, 12 to 20 percent slopes, severely eroded	30	VIe-2	97	2c2	110
HyE3	Howell clay loam, 20 to 40 percent slopes, severely eroded	31	VIIe-2	98	2c3	110
HzC3	Howell clay loam, shaly subsoil, 6 to 12 percent slopes, severely eroded	31	IVe-3	96	2c1	109
KeA	Keyport sandy loam, 0 to 2 percent slopes	31	IIw-9	93	3w1	108
KeB	Keyport sandy loam, 2 to 5 percent slopes	31	IIe-36	91	3w1	108
KpA	Keyport sandy loam,0 to 2 percent slopes	32	IIw-8	93	3w1	108
KpB2	Keyport silt loam, 2 to 5 percent slopes, moderately eroded	32	IIe-13	91	3w1	108
KrB	Keyport-Urban land complex, 0 to 5 percent slopes	32	------	--	---	---
Ks	Klej loamy sand	32	IIIw-10	96	3s2	109
LoB	Loamy and clayey land, 0 to 5 percent slopes	33	IIIe-42	95	3c1	110
LoC	Loamy and clayey land, 5 to 10 percent slopes	33	IVe-3	96	3c1	110
LoD	Loamy and clayey land, 10 to 40 percent slopes	33	VIe-2	97	3c2	110
Ma	Made land	33	------	--	---	---
MfB2	Marr fine sandy loam, 2 to 6 percent slopes, moderately eroded	34	IIe-5	90	3o3	107
MfC2	Marr fine sandy loam, 6 to 12 percent slopes, moderately eroded	34	IIIe-5	94	3o3	107
MfC3	Marr fine sandy loam, 6 to 12 percent slopes, severely eroded	34	IVe-5	96	3o3	107
MfD2	Marr fine sandy loam, 12 to 20 percent slopes, moderately eroded	34	IVe-5	96	3r1	111
MfD3	Marr fine sandy loam, 12 to 20 percent slopes, severely eroded	34	VIe-2	97	3r1	111
MfE3	Marr fine sandy loam, 20 to 35 percent slopes, severely eroded	34	VIIe-2	98	3r1	111
MkA	Matapeake fine sandy loam, 0 to 2 percent slopes	35	I-5	90	3o1	107
MkB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	35	IIe-5	90	3o1	107
MmA	Matapeake silt loam, 0 to 2 percent slopes	35	I-4	90	3o1	107
MmB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	35	IIe-4	90	3o1	107

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
MmC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	35	IIIe-4	94	3o1	107
MmC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	35	IVe-3	96	3o1	107
MmD3	Matapeake silt loam, 10 to 15 percent slopes, severely eroded	35	VIe-2	97	3o1	107
MnA	Matawan loamy fine sand, 0 to 2 percent slopes	36	IIw-10	93	2o1	106
MnB	Matawan loamy fine sand, 2 to 5 percent slopes	36	IIe-36	91	2o1	106
MpA	Mattapex fine sandy loam, 0 to 2 percent slopes	37	IIw-5	93	3o2	107
MpB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	37	IIe-36	91	3o2	107
MrA	Mattapex silt loam, 0 to 2 percent slopes	37	IIw-1	92	3o2	107
MrB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	37	IIe-16	91	3o2	107
MrC2	Mattapex silt loam, 5 to 10 percent slopes, moderately eroded	37	IIIe-16	95	3o2	107
Mt	Mixed alluvial land	37	VIw-1	98	2w2	108
MuA	Monmouth loamy sand, 0 to 2 percent slopes	38	IIs-5	94	2o2	106
MuB2	Monmouth loamy sand, 2 to 5 percent slopes, moderately eroded	38	IIs-5	94	2o2	106
MuC2	Monmouth loamy sand, 5 to 10 percent slopes, moderately eroded	38	IIIe-5	94	2o2	106
MuC3	Monmouth loamy sand, 5 to 10 percent slopes, severely eroded	38	IVe-5	96	2o2	106
MuD2	Monmouth loamy sand, 10 to 15 percent slopes, moderately eroded	39	IVe-5	96	2o2	106
MuD3	Monmouth loamy sand, 10 to 15 percent slopes, severely eroded	39	VIe-2	97	2o2	106
MvA	Monmouth fine sandy loam, 0 to 2 percent slopes	39	I-28	90	2c1	109
MvB2	Monmouth fine sandy loam, 2 to 5 percent slopes, moderately eroded	39	IIe-28	91	2c1	109
MvC2	Monmouth fine sandy loam, 5 to 10 percent slopes, moderately eroded	39	IIIe-28	95	2c1	109
MvD2	Monmouth fine sandy loam, 10 to 15 percent slopes, moderately eroded	39	IVe-5	96	2c1	109
MvE	Monmouth fine sandy loam, 15 to 40 percent slopes	39	VIe-2	97	2c2	110
MwC3	Monmouth clay loam, 5 to 10 percent slopes, severely eroded	39	IVe-3	96	2c1	109
MwD3	Monmouth clay loam, 10 to 15 percent slopes, severely eroded	39	VIe-2	97	2c1	109
MxB	Monmouth-Urban land complex, 0 to 5 percent slopes	39	------	--	---	---
MxD	Monmouth-Urban land complex, 5 to 15 percent slopes	40	------	--	---	---
MyB	Muirkirk loamy sand, 0 to 5 percent slopes	40	IIs-5	94	3s1	109
MyC	Muirkirk loamy sand, 5 to 10 percent slopes	40	IIIe-5	94	3s1	109
MyD	Muirkirk loamy sand, 10 to 15 percent slopes	40	IVe-5	96	3s1	109
MyE	Muirkirk loamy sand, 15 to 30 percent slopes	41	VIIe-2	98	3s2	109
MzB	Muirkirk-Urban land complex, 0 to 5 percent slopes	41	------	--	---	---
MzD	Muirkirk-Urban land complex, 5 to 15 percent slopes	41	------	--	---	---
Os	Osier loamy sand	41	IVw-6	97	2w1	107
Ot	Othello silt loam	42	IIIw-7	96	3w3	109
RuA	Rumford loamy sand, 0 to 2 percent slopes	43	IIs-4	93	3o3	107
RuB2	Rumford loamy sand, 2 to 5 percent slopes, moderately eroded	43	IIs-4	93	3o3	107
RuC2	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	43	IIIe-33	95	3o3	107
RuC3	Rumford loamy sand, 5 to 10 percent slopes, severely eroded	43	IVe-5	96	3o3	107
RuD2	Rumford loamy sand, 10 to 15 percent slopes, moderately eroded	43	IVe-5	96	3o3	107
RyB	Rumford-Urban land complex, 0 to 5 percent slopes	43	------	--	---	---
RyD	Rumford-Urban land complex, 5 to 15 percent slopes	43	------	--	---	---
SaA	Sassafras fine sandy loam, 0 to 2 percent slopes	44	I-5	90	3o3	107
SaB2	Sassafras fine sandy loam, 2 to 5 percent slopes, moderately eroded	44	IIe-5	90	3o3	107
SaC2	Sassafras fine sandy loam, 5 to 10 percent slopes, moderately eroded	44	IIIe-5	94	3o3	107
SaC3	Sassafras fine sandy loam, 5 to 10 percent slopes, severely eroded	44	IVe-5	96	3o3	107
SaD2	Sassafras fine sandy loam, 10 to 15 percent slopes, moderately eroded	44	IVe-5	96	3o3	107
SaD3	Sassafras fine sandy loam, 10 to 15 percent slopes, severely eroded	44	VIe-2	97	3o3	107

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
SaE	Sassafras fine sandy loam, 15 to 40 percent slopes	45	VIe-2	97	3r1	111
SfA	Sassafras loam, 0 to 2 percent slopes	45	I-4	90	3o3	107
SfB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	45	IIe-4	90	3o3	107
SnB	Sassafras-Urban land complex, 0 to 5 percent slopes	45	------	--	---	---
SnD	Sassafras-Urban land complex, 5 to 15 percent slopes	45	------	--	---	---
Sr	Shrewsbury fine sandy loam	46	IIIw-6	95	2w1	107
Ss	Shrewsbury silt loam	46	IIIw-7	96	2w1	107
Sw	Swamp	46	VIIw-1	98	---	---
Tm	Tidal marsh	46	VIIIw-1	98	---	---
Ur	Urban land	46	------	--	---	---
WaB2	Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	48	IIe-5	90	3o3	107
WaC2	Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	48	IIIe-5	94	3o3	107
WaC3	Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	48	IVe-5	96	3o3	107
WaD3	Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded	48	VIe-2	97	3r1	111
WaE3	Westphalia fine sandy loam, 20 to 50 percent slopes, severely eroded	48	VIIe-2	98	3r1	111
WdA	Woodstown sandy loam, 0 to 2 percent slopes	49	IIw-5	93	2o1	106
WdB	Woodstown sandy loam, 2 to 5 percent slopes	49	IIe-36	91	2o1	106
WoA	Woodstown loam, 0 to 2 percent slopes	49	IIw-1	92	2o1	106
WoB	Woodstown loam, 2 to 5 percent slopes	49	IIe-16	91	2o1	106

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