SOIL SURVEY OF

Charles County, Maryland

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

Issued July 1974

Major fieldwork for this soil survey was done in the period 1941–69. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1970. This survey was made cooperatively by the Soil Conservation Service and the Maryland Agricultural Experiment Station as part of the technical assistance furnished to the Charles 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, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, 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 Charles County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland subclass 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 the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

Foresters and others can refer to the section "Use of the Soils as 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 can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Use of the Soils for Town and Country Planning."

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

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

Newcomers in Charles County will be interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County."

Cover: Characteristic undulating landscape of the Beltsville-Evesboro-Sassafras association.

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

CHARLES COUNTY is to the west of Chesapeake Bay in Southern Maryland (fig. 1). The Potomac River bends around it and forms the 75 miles of boundary on the south and west sides. It is bounded on the north by

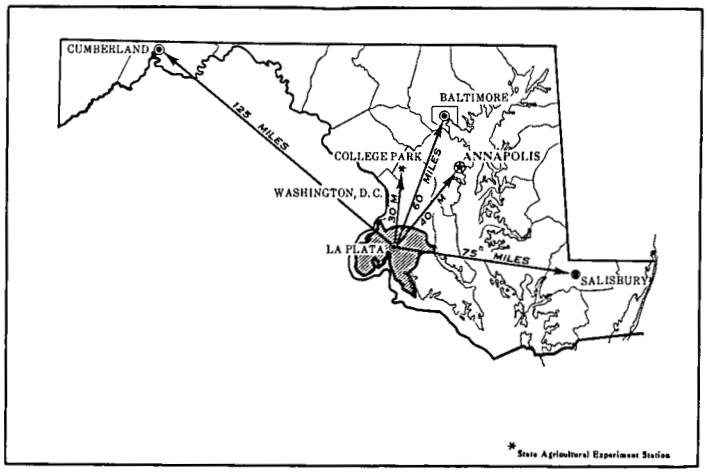

Figure 1.—Location of Charles County in Maryland.

Prince Georges County and on the east by Prince Georges County and St. Marys County. Charles County is about 32 miles from east to west and about 28 miles from north to south. It is 293,120 acres, or 458 square miles, in area. La Plata, the county seat, is near the center of the county. Other important towns and communities are Waldorf, St. Charles, Indian Head, Hughesville, Benedict, and Cob Island.

Most of the soils of the county are suitable for many farm and nonfarm uses. The main exceptions are marshy tidal areas and swamps that are too wet for most uses. About 80 percent of the land is suitable for cultivation.

Of the land suitable for cultivation, about 60 percent has a moderate to severe hazard of further erosion, 32 percent needs artificial drainage, and about 7 percent is severely limited by sandiness and droughtiness. The remaining 1 percent has few, if any, limitations for farming and needs no special management.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Charles 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.

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. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Mattapex silt loam, 0 to 2 percent slopes, is one of several phases within the Mattapex 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. Soil complexes are shown on the soil map of Charles County.

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. Exum-Beltsville silt loams, 2 to 5 percent slopes, moderately eroded, 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. Gravelly land, steep, is a land type in Charles County.

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 yields 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 and rangeland, and engineers.

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 publication shows, in color, the soil associations of Charles 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 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 a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, drainage, and other characteristics that affect their management.

The 10 soil associations in Charles County are each described in the following pages. The terms for texture used in the titles of the associations apply to the surface layer unless otherwise stated.

1. Beltsville-Gravelly Land-Bourne Association

Level to moderately sloping, moderately well drained, loamy soils that are only moderately deep to a dense, root-inhibiting fragipan, and steep, gravelly soil material

This association is in most parts of the county except in the northeast and extreme southwest. The area is well dissected except on small upland flats, and it has many V-shaped ravines. Almost half of the soils are either severely eroded or are subject to the severe hazard of erosion.

This association occupies about 28 percent of the county. It is about 40 percent Beltsville soils, 25 percent Gravelly land, and 8 percent Bourne soils. The remaining 27 percent is minor soils.

Beltsville and Bourne soils are similar, but Beltsville soils are more silty and less sandy than Bourne soils. These soils have a hard, dense fragipan in the lower part of the subsoil. This fragipan prevents the downward movement of water. Late in winter and early in spring, the soil above the fragipan commonly is saturated with water, but little or no free water is in the fragipan and immediately below.

Gravelly land is steep, and it consists of gravelly deposits of soil material. The gravel content is about 20 to 80 percent, and the pebbles generally are less than 2 inches thick.

Many minor soils are in this association. Most extensive are the well-drained Aura, Croom, Sassafras, and Wickham soils, the moderately well drained Exum and Mattapex soils, and the poorly drained Bibb soils on some of the flood plains. This association is also made up of Eroded land on the uplands and of Alluvial land along many small streams.

Beltsville and Bourne soils are suited to most crops grown in the area, including corn, soybeans, and pasture. Tobacco is the most important single crop. Gravelly land generally is not used for farming.

A large part of the association formerly was cultivated but has reverted to woodland consisting mainly of hardwoods and Virginia pine.

A number of residential developments are along the major highways. They generally are on large lots and are individually owned. All of the major soils have a severe limitation for the disposal of effluent from septic tanks; consequently, special means of sewage disposal are necessary. Beltsville and Bourne soils are moderately limited for most other nonfarm uses. Gravelly land is so steep that it is severely limited for practically all uses.

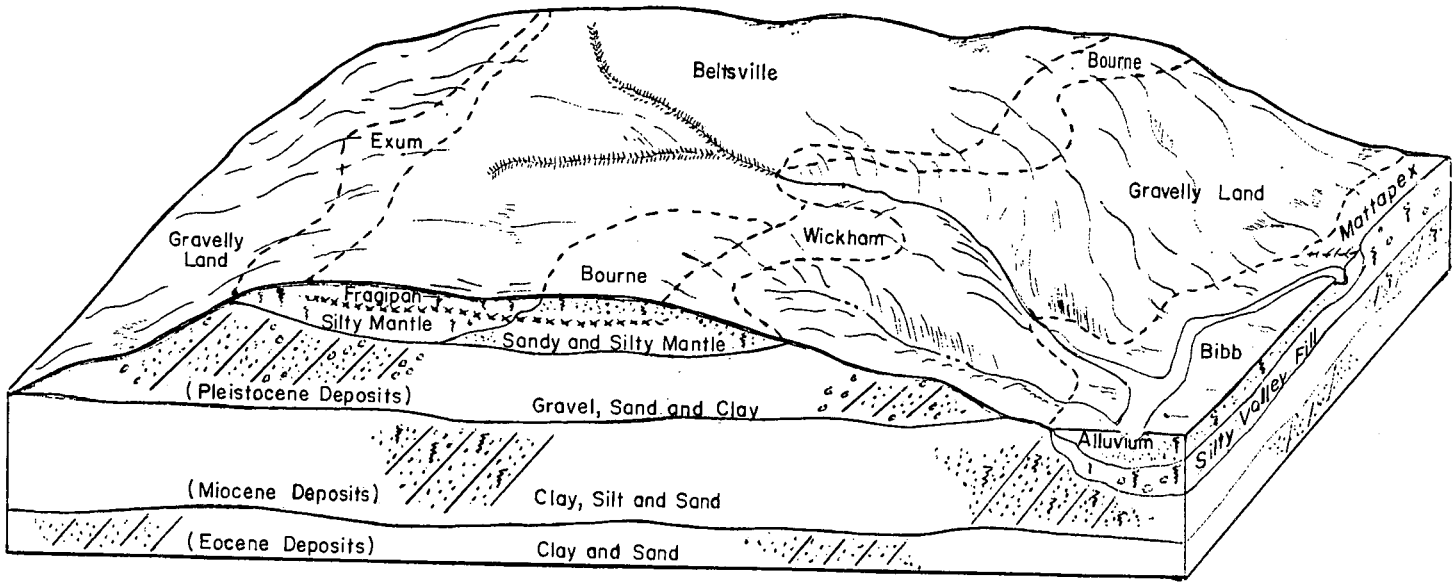

***Figure 2.*—Cross section of association 1 showing topography, important soils, and underlying material.**

Figure 2 is a diagrammatic cross section of a representative area of this association. Figure 3 is an aerial aspect of the same association.

2. Beltsville-Exum-Wickham Association

Level to moderately sloping, moderately well drained and well drained loamy soils, some of which are only moderately deep to a hard, dense, root-inhibiting fragipan

This association is mostly on elevated areas that are moderately dissected by the major streams and rivers of the county. In the western part of the county, parts of the association border the Potomac River and the Nanjemoy Creek. Many moderately sloping areas near drainageways are severely eroded.

This association makes up about 22 percent of the county. It is about 35 percent Beltsville soils, 21 percent Exum soils, and 9 percent Wickham soils (fig. 4). The remaining 35 percent is minor soils.

***Figure 3.*—Landscape bordering the Potomac River south of Popes Creek in the Beltsville-Gravelly land-Bourne soil association.**

The moderately well drained Beltsville soils are very silty and have a hard, dense fragipan in the lower part of the subsoil. This fragipan inhibits the downward growth of roots and the downward movement of water. Late in winter and early in spring, the soil above the fragipan commonly is saturated with water, but little or no free water is in the fragipan and immediately below.

Exum soils are moderately well drained and have a silty surface layer. The subsoil is very thick and is mainly clay loam. The water table is seasonally within 1½ to 2½ feet of the soil surface, but it is not perched above a fragipan as in Beltsville soils. The deep, well-drained Wickham soils typically have a surface layer of fine sandy loam and a subsoil of clay loam to sandy clay loam.

Many minor soils are in this association. Most extensive are the well drained Sassafras and Magnolia soils, the moderately well drained Bourne and Keyport soils, and the poorly drained Elkton, Leonardtown, and Bibb soils. Also in this association are small areas of Alluvial land, Eroded land, and Gravelly land.

About one-third of the association is cleared. These areas are mostly near U.S. Route 301 in the central part of the county. They are used mainly for crops, especially where slopes are less than 5 percent. Comparatively little tobacco is grown. A large part of the association formerly was cultivated, but it has reverted to woodlands consisting chiefly of oaks, beech, gums, and Virginia pine.

Many residential developments are along Route 301, in the area south of Marbury, and along other major roads. Several of these areas are large and are individually owned.

Beltsville soils are severely limited for the disposal of effluent from septic tanks. Exum soils are moderately to severely limited for this use. These soils commonly require special means of sewage disposal. They have moderate limitations for most other nonfarm uses. Wickham soils have few limitations for nonfarm uses except those imposed by steepness of slope.

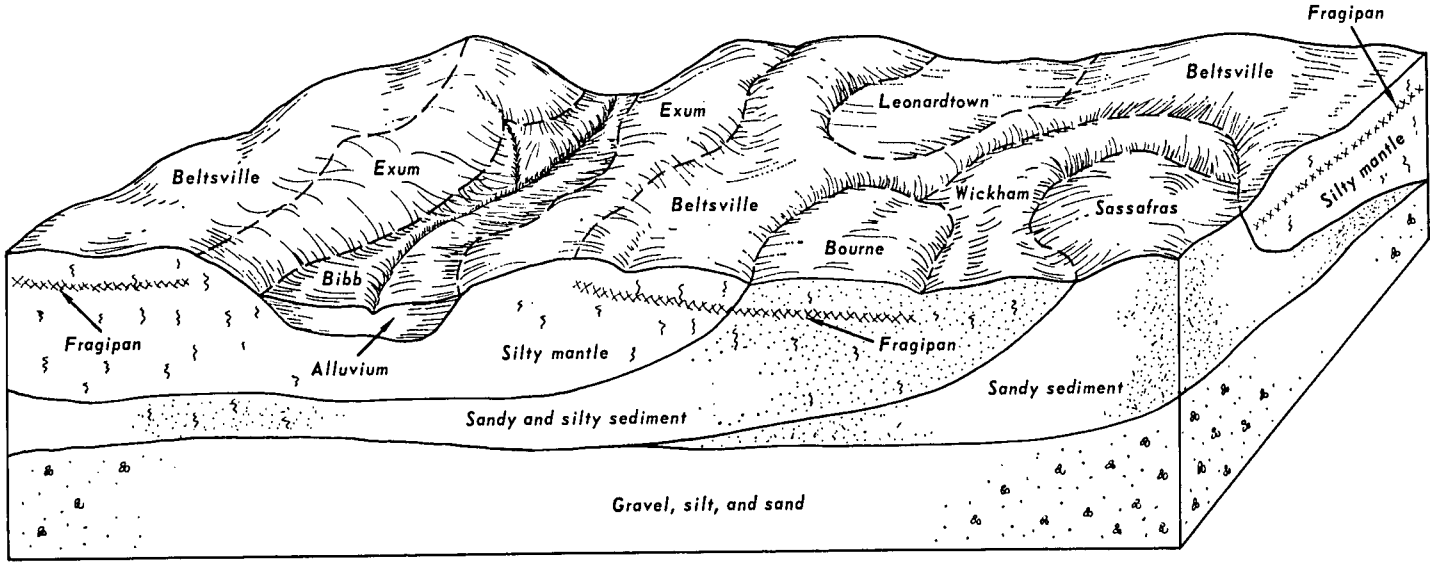

Figure 4.—**Cross section of association 2 showing relief, important soils, and underlying material.**

3. Westphalia-Eroded Land-Gravelly Land Association

Gently sloping to strongly sloping, well-drained, dominantly loamy soils; steep, severely eroded soil material; and gravelly soil material

This association is in one area in the eastern part of the county. It extends from near Benedict westward to near Hughesville and then northward where it adjoins the Prince Georges County line. In most of the association, slopes are greater than 5 percent. Many small streams and drainageways dissect the areas, and there are also many valleys. Erosion is extensive and severe, and in many places the subsoil is exposed. Gullies are common in this association. Some of them are deep and caving.

This association makes up about 4 percent of the county. It is about 35 percent Westphalia soils, 25 percent Eroded land, and 10 percent Gravelly land. The remaining 30 percent is minor soils.

The well-drained Westphalia soils have a surface layer and a subsoil of fine sandy loam. The subsoil is friable to very friable and is relatively thin. Underlying this material is loose loamy sand. Eroded land consists of areas where the surface layer and most of the original subsoil are eroded. Many of these areas are severely gullied. Gravelly land consists mainly of gravelly deposits of soil material. The gravel content is about 20 to 80 percent, and the pebbles generally are less than 2 inches thick. Eroded land and Gravelly land have slopes of about 15 to 50 percent.

Many minor soils are in this association. Most extensive are the excessively drained Evesboro soils, the somewhat excessively drained Rumford soils, the well-drained Croom and Sassafras soils, the moderately well-drained Beltsville soils, and the poorly drained Bibb soils on flood plains of streams.

The gently sloping and moderately sloping soils on uplands are suitable for farming, and most of the tobacco harvested in the county is grown on these soils. The tobacco generally is of very good to excellent quality. Corn and soybeans are also major crops. Supplementary irrigation is particularly beneficial for cultivated crops.

A large part of the association formerly was farmed but has reverted to hardwoods or Virginia pine. In places areas of Eroded land are idle, are in weeds or shrubs, or are almost barren of plants. Valleys are mostly in native hardwoods.

Slopes limit the use of these soils for residential developments and septic tank absorption fields. A few residential developments, however, are along Route 231. These soils commonly have no wetness limitations for foundations for buildings with basements.

4. Beltsville-Evesboro-Sassafras Association

Level to moderately sloping, moderately well drained to excessively drained, loamy and sandy soils, some of which are only moderately deep to a hard, dense, root-inhibiting fragipan

This association occupies one large area in the northern part of the county. It extends from north of Bennsville westward along the county line to near Malcolm, and then southward beyond Beantown to Hughesville and the St. Marys County line. The soils are dominantly undulating, but in places slopes are as much as about 15 percent. They are moderately dissected by drainageways that carry water mainly to Mattawoman Creek, Zekiah Swamp Run, and Gilbert Swamp Run. The association contains much of the highest land in the county.

This association occupies about 16 percent of the county. About 30 percent is Beltsville soils, and about 30 percent is Evesboro and Sassafras soils in equal parts. The remaining 40 percent is minor soils.

The moderately well drained Beltsville soils are very silty and have a hard, dense fragipan in the lower part of the subsoil. This fragipan inhibits the downward growth of roots and the downward movement of water. Late in winter and early in spring, the soil above the fragipan commonly is saturated with water, but little or no free water is in the fragipan and immediately below.

The excessively drained Evesboro soils are droughty. They are very sandy and extend to a depth of 5 feet or more. In some areas these soils are gravelly, and as much as 30 percent consists of fine, smooth, subangular quartz pebbles. The well-drained Sassafras soils have a sandy loam surface layer and a well-developed subsoil of sandy clay loam.

Many minor soils are in this association. Most extensive are the somewhat excessively drained Rumford soils, the well drained Aura and Croom soils, the moderately well drained Bourne and Exum soils, and the poorly drained Fallsington and Bibb soils. Also in this association are large areas of Gravelly land.

The major soils of this association are suited to most crops grown in the area, but farming is not extensive. Most farms are small and are used mainly for tobacco. A large part of the association formerly was farmed, but it has reverted to oaks and Virginia pine or is used for grazing.

Much of this association is in the path of community expansion from the Washington, D.C. area. A number of residential developments are in the county, particularly along State Route 5. Beltsville soils are severely limited for the disposal of effluent from septic tanks, but they have moderate limitations for most other nonfarm uses. Evesboro and Sassafras soils have fewer limitations, but slopes limit use for nonfarm purposes. Evesboro and Sassafras soils commonly have no wetness limitations for foundations and basements and few limitations for sewage disposal. Effluent moves rapidly and for considerable distances through Evesboro soils, and the hazard of polluting streams, shallow wells, and other water sources is serious.

5. Leonardtown-Beltsville Association

Level to gently sloping, poorly drained and moderately well drained, loamy soils that are only moderately deep to a dense, root-inhibiting fragipan

This association is in two areas in the northern part of the county. The larger area extends from north of Middletown eastward through Waldorf, and the smaller one is near Pomonkey. The soils in this association are level to gently sloping, and are somewhat dissected.

This association makes up about 2 percent of the county. It is about 60 percent Leonardtown soils and about 30 percent Beltsville soils. The remaining 10 percent is minor soils.

Leonardtown soils are poorly drained, and Beltsville soils are moderately well drained. Both soils have a hard, dense fragipan in the lower part of the subsoil. This fragipan inhibits the downward growth of roots and the downward movement of water. In some seasons the soil above the fragipan commonly is saturated with water for long periods, but little or no free water is in the fragipan and immediately below. This free water is nearer the surface in Leonardtown soils than it is in Beltsville soils.

Minor soils are mainly the poorly drained Elkton and Fallsington soils and the moderately well drained Woodstown soils.

Leonardtown soils are seldom cultivated. If these soils are artificially drained, they are suited to corn, soybeans, and some kinds of hay and pasture. Beltsville soils are suited to crops and pasture. Both soils are poorly suited to deep-rooted perennial crops such as alfalfa.

The Leonardtown soils are severely limited for most nonfarm uses, including homesites and septic tank absorption fields. Beltsville soils are also severely limited for the disposal of effluent from septic tanks, but they are only moderately limited for most other nonfarm uses.

6. Magnolia Association

Level to moderately sloping, well-drained, loamy soils

This association is in five small areas, mainly in the western part of the county. The largest and most important areas are about 2 miles northwest of Doncaster and about the same distance southeast of Nanjemoy. These soils are mostly level to gently sloping and are somewhat dissected. Slopes are as much as 12 percent, and in places these soils are severely eroded.

This association makes up about 1 percent of the county. It is about 80 percent Magnolia soils and 20 percent minor soils.

Magnolia soils are deep and well drained. The surface layer is silt loam that grades to distinctly red clay loam in places where the original surface layer has been lost through erosion. Minor soils are the well drained Aura soils and the moderately well drained Beltsville and Exum soils.

Much of this association is farmed. Other parts are idle or have reverted to trees. These soils are well suited to the major crops of the area, and under good management yields are among the highest in the county.

Magnolia soils are suitable for dwellings with basements and for other structures with similar foundations.

7. Elkton-Othello-Keyport Association

Nearly level to moderately sloping, poorly drained and moderately well drained, loamy soils, some of which have a clayey subsoil

This association is mainly in nearly level areas, commonly less than 40 feet above sea level. It borders the rivers and some of the larger creeks of the county. The largest areas border the Potomac River, the Nanjemoy Creek, the Port Tobacco River, and the Wicomico River.

This association makes up about 14 percent of the county. It is about 25 percent Elkton soils, 25 percent Othello soils, and 15 percent Keyport soils (fig. 5). The remaining 35 percent is minor soils.

The Elkton and Othello soils are poorly drained. Elkton soils have a subsoil of clay or silty clay. Othello soils have a subsoil of silt loam or silty clay loam. Keyport soils are moderately well drained, and they have a subsoil mostly of clay or silty clay. Elkton and Othello soils are difficult to drain and need artificial drainage if they are intensively farmed. Keyport soils also need artificial drainage, particularly the more nearly level areas.

Many minor soils are in this association. Most extensive are the well-drained Matapeake and Sassafras soils, and the moderately well drained Mattapex and Woodstown soils. Also included in this association are areas of Tidal marsh.

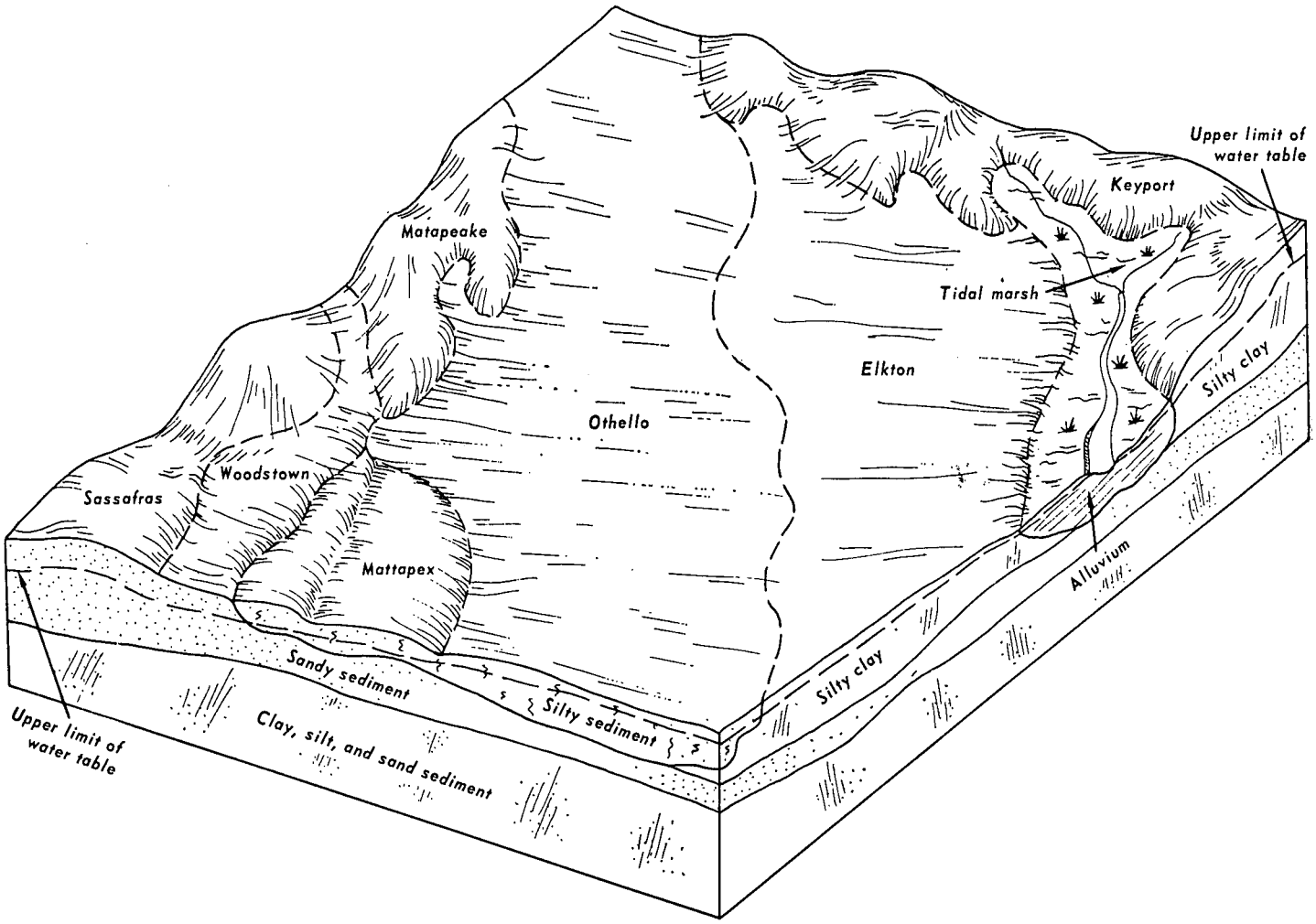

Figure 5.—**Cross section of association 7 showing relief, important soils, and underlying material.**

If the major soils are adequately drained, they are suited to general crops, hay, and pasture. Little tobacco or alfalfa is grown. Large areas, mainly of undrained Elkton and Othello soils, are wooded, and the stands consist of hardwoods and loblolly pine.

No extensive residential developments are in this association. Elkton and Othello soils are severely limited for the disposal of effluent from septic tanks. They are also severely limited for most other nonfarm uses. Keyport soils have only moderate limitations for other nonfarm uses.

8. Sassafras-Mattapex-Othello Association

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

This association is in four small areas in Charles County. It borders Zekiah Swamp Run, Newport Run, Mattawoman Creek, Swanson Creek, and the Patuxent River. Elevations are less than 40 feet above sea level. Most soils in the association are gently sloping, but there are some poorly drained soils on the flats.

This association makes up about 2 percent of the county. It is about 55 percent Sassafras soils, 20 percent Mattapex soils, and 10 percent Othello soils. The remaining 15 percent is minor soils.

The dominant Sassafras soils are well drained and have a sandy loam surface layer. The well-developed subsoil is sandy clay loam. Mattapex soils are moderately well drained, and Othello soils are poorly drained. Mattapex and Othello soils have a subsoil of silt loam or silty clay loam.

The minor soils in this association are mainly the well drained Matapeake soils and the moderately well drained Keyport and Woodstown soils. Also included are small areas of Eroded land and Tidal marsh.

Except for the well-drained Sassafras soils on which some tobacco is grown, the other soils of the association need additional drainage for the cultivation of crops.

Sassafras soils generally are only slightly limited for nonfarm uses. Mattapex soils are severely limited for the disposal of effluent from septic tanks. They are slightly to moderately limited for most other nonfarm uses. Othello soils are severely limited for nearly all nonfarm uses.

9. Evesboro-Keyport-Elkton Association

Level to moderately sloping, excessively drained, sandy soils and moderately well drained and poorly drained, level to gently sloping, loamy soils that have a clayey subsoil.

This association is in five distinct areas along the upper parts of the Potomac River. Elevations commonly are less than 40 feet above sea level. The largest area is in the extreme north of the county near Fenwick and Marshall Hall. Most soils in the association are gently sloping, others are nearly level, and still others have slopes as much as 15 percent.

This association makes up about 4 percent of the county. It is about 30 percent Evesboro soils and about 40 percent Keyport and Elkton soils in equal parts. The remaining 30 percent is minor soils.

The excessively drained Evesboro soils are droughty. They are very sandy to a depth of 5 feet or more. A few areas are gravelly, and contain as much as 30 percent fine, smooth, subangular quartz pebbles. The Keyport soils are moderately well drained and have a subsoil mainly of clay or silty clay. Elkton soils are poorly drained and nearly level and have a subsoil of clay or silty clay.

Many minor soils are in this association. Most extensive are the somewhat excessively drained Galestown and Rumford soils, the well-drained Croom and Sassafras soils, the moderately well drained Matawan and Mattapex soils, and the poorly drained Bibb soils that are on flood plains. Also included in this association are small areas of Tidal marsh.

In this association, farming comparatively is on a small scale. Some tobacco is grown on Evesboro soils. Keyport and Elkton soils require drainage for the cultivation of crops, including hay and pasture.

Because of its location, this association is mainly used for residential and industrial developments. The well-drained to excessively drained soils are mostly used for these developments. The Elkton soils are severely limited for the disposal of effluent from septic tanks and for building sites. Keyport soils are also severely limited for disposal of effluent from septic tanks, but are only slightly to moderately limited for residential and industrial developments.

10. Bibb-Tidal Marsh-Swamp Association

Level or nearly level, poorly drained soils on flood plains and miscellaneous unclassified wetland

This association is in areas along major flood plains and on nearby marshes and swamps. The most important of these areas are along Mattawoman Creek and Zekiah Swamp Run. Others are on the flood plains and estuaries of Chicamuxen Creek, Thorne Gut Marsh, Nanjemoy Creek, Wards Run, Mill Run, Port Tobacco Creek, and Gilbert Swamp Run.

This association makes up about 7 percent of the county. It is about 60 percent Bibb silt loam, 25 percent Tidal marsh, and 10 percent Swamp. The remaining 5 percent is minor soils.

Bibb soils are poorly drained and are subject to flooding. Tidal marsh consists of wet, unstable soil material that is subject to flooding by saline to brackish water. Swamp consists of wet, unclassified soil material that has fresh water above the surface for long periods.

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Where flooding is not too frequent on Bibb soils, or where they are protected from flooding, these soils are suited to corn, soybeans, and pasture. Large areas of the soils in this association were once cultivated, but they have now reverted to hardwoods. Swamp generally is in wetland hardwoods. Tidal marsh and Swamp are not used for farming.

Most extensive minor soils are the moderately well drained Iuka soils and the poorly drained Othello soils.

This association is severely limited for most nonfarm uses. The soils are used mainly as habitat for some kinds of wildlife.

Descriptions of the Soils

This section describes the soil series and mapping units in Charles County. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

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

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

The acreage and proportionate extent of each mapping unit are shown in table 1. Some of the terms used in describing soils are defined in the section "How This Survey Was Made," and many can be found in the Glossary at the end of this survey. More detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*10*).[1]

Alluvial Land

Alluvial land (Ad) is nearly level and consists of soils formed in material recently washed from uplands and deposited on flood plains and in some draws and depressions. Most of the areas on flood plains are fairly narrow. The dominant soils of this land type are silty, but in places the soils are fairly sandy. These soils generally are somewhat poorly drained to very poorly drained, but some of the sandier soils are well drained. Alluvial land generally is flooded once or more each year, but where the watershed is mostly in woods and pasture, flooding may not occur every year.

[1] Italic numbers in parentheses refer to Literature Cited, p. 92.

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

Soil	Acres	Percent
Alluvial land	1,740	0.6
Aura gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	1,150	.4
Aura gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	4,390	1.5
Aura gravelly sandy loam, 5 to 15 percent slopes, severely eroded	8,560	2.9
Beltsville silt loam, 0 to 2 percent slopes	4,500	1.5
Beltsville silt loam, 2 to 5 percent slopes, moderately eroded	54,370	18.5
Beltsville silt loam, 5 to 10 percent slopes, moderately eroded	5,650	1.9
Beltsville silt loam, 5 to 10 percent slopes, severely eroded	7,660	2.6
Bibb silt loam	22,040	7.5
Bourne sandy loam, 2 to 5 percent slopes, moderately eroded	6,200	2.1
Bourne sandy loam, 5 to 10 percent slopes, moderately eroded	1,250	.4
Bourne sandy clay loam, 5 to 10 percent slopes, severely eroded	2,180	.7
Chillum silt loam, 2 to 6 percent slopes, moderately eroded	450	.2
Chillum silt loam, 6 to 12 percent slopes, moderately eroded	210	.1
Coastal beaches	60	(1)
Croom gravelly loam, 3 to 8 percent slopes, moderately eroded	1,490	.5
Croom gravelly loam, 8 to 15 percent slopes, moderately eroded	1,910	.7
Croom gravelly loam, 8 to 15 percent slopes, severely eroded	960	.3
Cut and fill land	270	.1
Elkton silt loam	12,810	4.4
Eroded land, steep	5,460	1.8
Evesboro loamy sand, 0 to 8 percent slopes	7,700	2.6
Evesboro loamy sand, 8 to 15 percent slopes	460	.2
Evesboro gravelly loamy sand, 0 to 8 percent slopes	1,960	.6
Evesboro gravelly loamy sand, 8 to 15 percent slopes	2,710	.9
Exum silt loam, 5 to 10 percent slopes, moderately eroded	4,540	1.5
Exum silt loam, 10 to 15 percent slopes, moderately eroded	1,050	.3
Exum clay loam, 5 to 10 percent slopes, severely eroded	7,080	2.4
Exum clay loam, 10 to 15 percent slopes, severely eroded	1,380	.5
Exum-Beltsville silt loams, 2 to 5 percent slopes, moderately eroded	2,250	.8
Fallsington sandy loam	2,200	.8
Galestown loamy sand, 0 to 8 percent slopes	2,130	.7
Gravel and borrow pits	320	.1
Gravelly land, steep	23,340	8.0
Iuka fine sandy loam	850	.3
Iuka sandy loam, local alluvium	850	.3
Iuka silt loam, local alluvium	1,800	.6
Keyport fine sandy loam, 0 to 2 percent slopes	420	.1
Keyport fine sandy loam, 2 to 5 percent slopes, moderately eroded	590	.2
Keyport silt loam, 0 to 2 percent slopes	5,470	1.8
Keyport silt loam, 2 to 5 percent slopes, moderately eroded	1,500	.5
Keyport silt loam, 5 to 12 percent slopes, moderately eroded	610	.2
Keyport silty clay loam, 5 to 12 percent slopes, severely eroded	300	0.1
Leonardtown silt loam	5,350	1.8
Magnolia silt loam, 0 to 2 percent slopes	670	.2
Magnolia silt loam, 2 to 5 percent slopes, moderately eroded	1,350	.5
Magnolia silt loam, 5 to 12 percent slopes, moderately eroded	410	.1
Magnolia clay loam, 5 to 12 percent slopes, severely eroded	420	.1
Marr fine sandy loam, 2 to 5 percent slopes, moderately eroded	130	(1)
Matapeake fine sandy loam, 0 to 2 percent slopes	350	.1
Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	490	.2
Matapeake silt loam, 0 to 2 percent slopes	510	.2
Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	1,500	.5
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	300	.1
Matapeake silt loam, 5 to 10 percent slopes, severely eroded	230	.1
Matawan loamy sand	430	.1
Mattapex fine sandy loam, 0 to 2 percent slopes	2,640	.9
Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	2,070	.7
Mattapex silt loam, 0 to 2 percent slopes	1,160	.4
Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	700	.2
Mattapex soils, 5 to 12 percent slopes	840	.3
Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes	1,190	.4
Osier loamy sand	370	.1
Othello fine sandy loam	3,790	1.6
Othello silt loam	7,660	2.6
Rumford loamy sand, 0 to 5 percent slopes, moderately eroded	1,830	.6
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	740	.3
Rumford gravelly sandy loam, 0 to 5 percent slopes, moderately eroded	1,370	.5
Rumford gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	470	.1
Sandy land, steep	2,610	.9
Sassafras sandy loam, 0 to 2 percent slopes	2,400	.8
Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	6,610	2.3
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	2,480	.9
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	920	.3
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	780	.3
Sassafras sandy loam, 10 to 15 percent slopes, severely eroded	800	.3
Swamp	3,810	1.3
Tidal marsh	6,380	2.2
Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	750	.3
Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	1,630	.6
Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	180	.1
Westphalia fine sandy loam, 12 to 20 percent slopes, moderately eroded	690	.2

See footnote at end of table.

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

Soil	Acres	Percent	Soil	Acres	Percent
Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded	960	0. 3	Wickham fine sandy loam, 10 to 15 percent slopes, moderately eroded	580	0. 2
Westphalia-Evesboro complex, 2 to 6 percent slopes, moderately eroded	260	. 1	Wickham sandy clay loam, 5 to 10 percent slopes, severely eroded	2, 960	1. 0
Westphalia-Evesboro complex, 6 to 12 percent slopes, moderately eroded	600	. 2	Wickham sandy clay loam, 10 to 15 percent slopes, severely eroded	890	. 3
Westphalia-Evesboro complex, 6 to 12 percent slopes, severely eroded	190	. 1	Woodstown sandy loam, 0 to 2 percent slopes	2, 280	. 8
Wickham fine sandy loam, 2 to 5 percent slopes, moderately eroded	1, 100	. 4	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	1, 640	. 6
Wickham fine sandy loam, 5 to 10 percent slopes, moderately eroded	1, 590	. 5	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	240	. 1
			Total	293, 120	100. 0

[1] Less than 0.05 percent.

This land type is not cultivated. Most areas are idle or are wooded. They are suitable habitat for various kinds of wildlife. Capability unit VIw–1; woodland subclass 2w.

Aura Series

The Aura series consists of moderately sloping, deep, well-drained gravelly soils on uplands. These soils are deep, but a very hard, compact gravelly subsoil that limits root penetration by many plants is at a moderate depth. These soils formed in very old fluvial deposits of gravel, sand, and clay. The native vegetation is mixed upland hardwoods, mainly oak, and Virginia pine.

In a representative profile the surface layer, about 7 inches thick, is light olive-brown gravelly sandy loam. The upper part of the subsoil, about 17 inches thick, is light-brown to light yellowish-brown gravelly loam that is more compact as depth increases. The lower part is yellowish-red, gravelly sandy clay loam. It is very hard and compact and limits root penetration. The underlying material, below a depth of 54 inches, is yellowish-red gravelly sandy loam that is mixed with white.

The soils in this series are fairly easy to work, but the gravel is quite abrasive to farm implements. These soils are very strongly acid and have moderately slow permeability. They have a moderate available moisture capacity and dry out quickly in the rooting zone. For these reasons, they are not extensively farmed. Many areas have been exploited for gravel and road fill. Aura soils are suitable for use as foundations for buildings, but they have moderate to severe limitations for most other nonfarm uses.

Representative profile of Aura gravelly sandy loam, 5 to 10 percent slopes, moderately eroded, in a rewooded area about 2 miles east of Bel Alton:

Ap—0 to 7 inches, light olive-brown (2.5Y 5/4) gravelly sandy loam; very weak, medium, granular structure; very friable; many roots; very strongly acid; abrupt, smooth boundary.

B1—7 to 13 inches, light yellowish-brown (10YR 6/4) gravelly loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; clear, smooth boundary.

B21t—13 to 24 inches, light-brown (7.5YR 6/4) gravelly heavy loam, variegated with yellowish red (5YR 5/6); weak, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; a few roots; distinct reddish-brown (5YR 4/4) clay films; very strongly acid; clear, wavy boundary.

B22t—24 to 37 inches, yellowish-red (5YR 4/8) gravelly sandy clay loam, variegated with reddish yellow (7.5YR 6/6); weak, coarse, blocky, and massive structure; very hard, very firm, slightly sticky and slightly plastic; a few roots; yellowish-red (5YR 4/6) clay films, mostly on pebbles; inclusions of white, decomposed rock material; very strongly acid; clear, wavy boundary.

B23t—37 to 54 inches, yellowish-red (5YR 4/8) gravelly sandy clay loam, variegated with reddish yellow (7.5YR 6/6) and white; massive; very hard, firm, slightly sticky and slightly plastic; pebbles coated and sand grains bridged with yellowish-red (5YR 4/6) clay; very strongly acid; clear, wavy boundary.

C—54 to 66 inches, yellowish-red (5YR 5/6) gravelly sandy loam, variegated with white; massive; firm; friable when removed, slightly sticky; clay films on some pebbles; very strongly acid.

The solum ranges from about 4 to 8 feet in thickness. The subsoil is massive and very hard and extends to a depth of about 12 to 30 inches. The gravel content ranges from 15 to 35 percent in the solum, and is about 35 percent in the C horizon. The gravel is smooth and rounded and generally is ½ inch to 2 inches thick.

The A and B1 horizons are 10YR or 2.5Y in hue, 4 to 6 in value, and 3 to 6 in chroma. Undisturbed A1 horizons less than 6 inches thick are lowest in value and chroma.

The B2 horizon is 7.5YR to 2.5YR in hue, 4 to 6 in value, and 4 to 8 in chroma. The Bt horizon generally is gravelly sandy clay loam but ranges to gravelly loam and gravelly heavy sandy loam. The clay content is about 18 to 27 percent, and the silt content generally is less than 30 percent.

The color range in the C horizon is similar to that in the B horizon, but in some profiles the C horizon is variegated. The C horizon contains less clay and commonly more gravel than the B horizon, and it is less firm and crumbles readily when removed.

Aura soils resemble Croom soils, but they do not contain as much gravel and are redder in color. Commonly they are in association with Rumford and Sassafras soils. The subsoil in soils of the Aura series contains more clay and gravel and less sand than that of soils in the Rumford series. Aura soils contain more gravel than Sassafras soils, and the subsoil commonly is redder than that in Rumford and Sassafras soils. Aura soils are similar to Magnolia soils in color, but Magnolia soils have more clay in the subsoil, and they contain little, if any, gravel.

Aura gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (AuC2).—This profile of this soil is the one described as representative of the series. This soil is mostly on upper slopes between ridgetops and ravines. Generally, at least half of the original surface soil has been washed away. Shallow gullies are fairly common.

This soil is suited to nearly all uses, but if it is cultivated, yields generally are only moderate, and the hazard of further erosion is severe. Capability unit IIIe–9; woodland subclass 3d.

Aura gravelly sandy loam, 10 to 15 percent slopes, moderately eroded (AuD2).—Most of this soil was formerly cultivated but now a large part is in woodland. In most places a part of the original surface soil has been lost through erosion. Shallow gullies are fairly common. Included with this soil in mapping are places where the surface layer has more silt or clay and less sand than that of this soil. The soil is suited to most farm uses, but if it is cultivated, the hazard of further erosion is severe. Capability unit IVe–7; woodland subclass 3d.

Aura gravelly sandy loam, 5 to 15 percent slopes, severely eroded (AuD3).—This soil is mostly on the sides of ravines. Most areas are idle or are in sparse woodland. The subsoil is exposed or is partly eroded in most places. Gullies are common to abundant, and many are filled with gravel that was left behind by erosion. The hazard of further erosion is extremely severe on this soil, unless a permanent protective cover of plants is kept on the areas. This soil is well suited to the production of trees for commercial purposes, watershed protection, wildlife habitat, and some kinds of recreation. Capability unit VIIe–2; woodland subclass 3d.

Beltsville Series

The Beltsville series consists of nearly level to moderately sloping, moderately deep, moderately well drained soils. These soils are strongly acid and slowly permeable, and they have a fragipan that generally is at a depth of less than 30 inches. Beltsville soils formed in silty and moderately sandy material containing moderate amounts of clay. They are in most upland areas and are the most extensive soils in the county. Many farms and communities are almost completely dominated by them. The native vegetation generally is hardwoods, mainly scrub-type oaks, and some Virginia pine and loblolly pine.

In a representative profile the surface layer, about 10 inches thick, is silt loam that generally is pale brown, brown, or yellowish brown. In wooded areas it is grayish brown in the thinner, upper part and pale yellow below. The upper part of the subsoil, about 18 inches thick, is yellowish-brown to brownish-yellow silt loam that is mixed with pale yellow. The lower part of the subsoil is fragipan through which water moves very slowly and roots do not penetrate readily. It is 26 inches thick and is brownish-yellow or yellowish-brown, mottled silt loam that is firm to very firm, dense, and brittle when moist. When dry it is very hard. Below the fragipan is mixed yellowish-brown and red loam.

Beltsville soils are fairly easy to work when the moisture content is favorable, but the moisture content is extremely variable during the year. Near the surface these soils are often saturated, but they are almost dry in and below the slowly permeable fragipan. During other seasons Beltsville soils are almost completely dry as far down as the fragipan, which prevents the upward movement of soil moisture. At such times the soil is droughty and irrigation is beneficial for some crops (fig. 6).

Large areas of Beltsville soils are farmed, others are idle or in woodland, and some areas have intensive nonfarm uses (fig. 7). These soils have moderate to severe limitations for many nonfarm purposes.

Figure 6.—**Corn showing effects of lack of moisture, on Beltsville silt loam near Nanjemoy.**

Representative profile of a Beltsville silt loam, in a gently sloping wooded area just off Popes Creek Road, about 1 mile southwest of Faulkner:

A1—0 to 2 inches, grayish-brown (2.5Y 5/2) silt loam; weak, fine and medium, granular structure; very friable, slightly sticky and slightly plastic; many roots; very strongly acid; abrupt, smooth boundary.

A2—2 to 10 inches, pale-yellow (2.5Y 7/4) silt loam; very weak, fine subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; very strongly acid; clear, smooth boundary.

B1—10 to 16 inches, light yellowish-brown (10YR 6/4) heavy silt loam, variegated with pale yellow (2.5Y 7/4); weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; clear, smooth boundary.

B2t—16 to 28 inches, brownish-yellow (10YR 6/6) heavy silt loam, variegated with pale yellow (5Y 7/4); weak to moderate, medium, subangular blocky structure; friable to firm, slightly sticky and slightly plastic; a few roots; almost continuous pale brown (10YR 6/3) clay films; very strongly acid; clear, smooth boundary.

Bx1—28 to 45 inches, brownish-yellow (10YR 6/6) heavy silt loam; many, medium, faint mottles of very pale brown (10YR 7/3), and common, medium, distinct mottles of light gray (N 7/0) and strong brown (7.5YR 5/6); strong, coarse, prismatic and weak, thick, platy structure; dense; very hard, very firm, slightly sticky and slightly plastic; a few fine roots in upper part; continuous brown (10YR 5/3) clay films on upper surfaces of plates; very strongly acid; gradual, smooth boundary.

Bx2—45 to 54 inches, yellowish-brown (10YR 5/6) silt loam; many, medium, distinct mottles of light gray (2.5Y 7/2) and common, medium, faint mottles of strong brown (7.5YR 5/6); weak, medium, platy and fine, subangular blocky structure; firm, slightly sticky and slightly plastic; faint, discontinuous clay films; very strongly acid; clear, smooth boundary.

IIC—54 to 72 inches, yellowish-brown (10YR 5/6) loam, variegated with red (2.5YR 4/6), strong brown (7.5YR 5/6), and light gray (2.5Y 7/2); massive; firm, slightly sticky; very strongly acid.

The solum ranges from about 40 to 64 inches in thickness. Depth to the Bx horizon ranges from about 20 to 32 inches. The A horizon is 2.5Y or 10YR in hue, 2 to 7 in value, and 1 to 6 in chroma. Very thin A1 horizons are 3 in value and 1 and 2 in chroma. The A2 horizon can be 6 or 7 in value and 1 and 2 in chroma. The B1 and Bt horizons is 10YR in hue, 5 or 6 in value, and 4 or 6 in chroma. They may be variegated. These horizons are silt loam or silty clay loam in texture. The sand content is greater than 15 percent but less than 30 percent. The clay content of the Bt horizon is 18 to 30 percent. The Bx horizon is 2.5Y, 10YR, or 7.5YR in hue, 4 to 6 in value, and 3 to 6 in chroma. It is variegated or has mottles that are low or high in chroma, or both. This horizon is loam, silt loam, or silty clay loam, and characteristically is very dense, tough, and brittle. The IIC horizon has about the same range in color as the Bx horizon, but it is distinctly coarser in texture. Fine to medium smooth pebbles are common to many in the IIC horizon.

Beltsville soils are similar to Bourne soils in color and in natural drainage, but they are much more silty and less sandy throughout. They are better drained than Leonardtown soils, which are dominantly gray throughout. Beltsville soils are not so well drained as the Aura and Croom soils, which have hard, gravelly Bt horizons, and the Chillum soils, which have hard, dense C horizons.

Beltsville silt loam, 0 to 2 percent slopes (BlA).—This soil becomes saturated quickly when it rains or when snow melts. Generally, it is wet for a fairly long period because runoff and permeability are slow, and late planting is sometimes necessary. Artificial drainage is beneficial for some crops and for some nonfarm uses. The hazard of further erosion generally is slight, although a small amount of surface soil has been lost in some areas that have been cultivated for many years. Capability unit IIw–8; woodland subclass 3w.

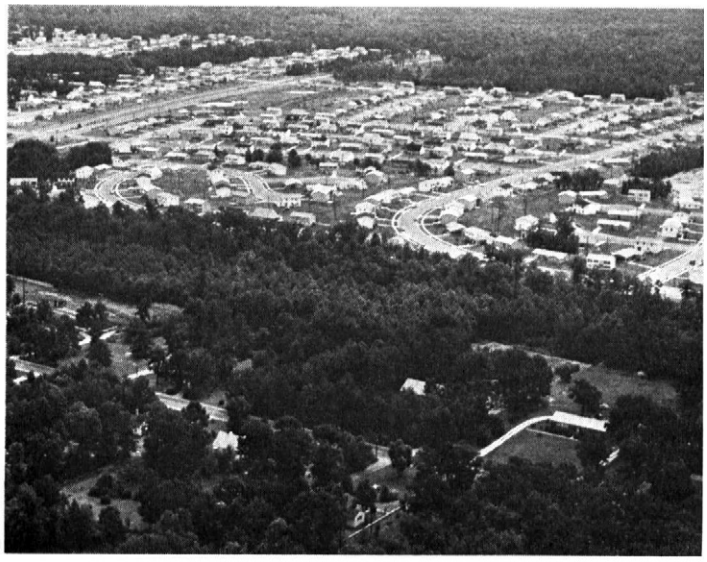

Figure 7.—St. Charles, a new residential development in the northern part of the county. The dominant soils in this area are those of the Beltsville series.

Beltsville silt loam, 2 to 5 percent slopes, moderately eroded (BlB2).—This soil has a profile similar to that described as representative for the series, except that in most places the surface layer is thinner. In practically all cleared areas, surface soil has been lost through erosion, and a few shallow gullies have formed. The hazard of further erosion is moderate, as water runs off readily, especially when the soil is wet. This hazard is a more serious limitation to use on these soils than is impeded drainage. The improvement of drainage is beneficial for some uses. Included with this soil in mapping are some areas where gray mottling is in the part of the subsoil above the fragipan. This Beltsville soil is the most extensive and widespread soil in the county, and its uses and limitations are extremely important. Capability unit IIe–13; woodland subclass 3w.

Beltsville silt loam, 5 to 10 percent slopes, moderately eroded (BlC2).—This soil has a profile similar to that described as representative of the series except that its surface layer and its subsoil generally are thinner. Further erosion is a hazard, and in places plowing usually exposes the subsoil, giving newly plowed areas a spotty appearance. Shallow gullies are present. Included with this soil in mapping are a few small areas that are mottled with gray in the subsoil above the fragipan. The hazard of further erosion is severe. This soil is suited to pasture or trees. Under good management that includes practices to control erosion, this soil is suited to cultivated crops. Capability unit IIIe–13; woodland subclass 3w.

Beltsville silt loam, 5 to 10 percent slopes, severely eroded (BlC3).—This soil has a profile similar to that described as representative of the series, except that it has lost most or all of its original surface layer and a part of its subsoil through erosion. Gullies are common to many, and some of them extend into the fragipan or through it. Included with this soil in mapping are small areas that are mottled with gray in the subsoil above the fragipan. Where gullies occur, this soil is marginal for cultivated crops. It is better suited to hay, pasture, or woodland. Capability unit IVe–9; woodland subclass 3w.

Bibb Series

The Bibb series consists of level or nearly level, poorly drained soils on flood plains. These soils are subject to flooding at irregular intervals (fig. 8). They formed in recently deposited alluvium that was washed mainly from soils on the uplands in the county. The native vegetation is wetland hardwoods, mainly red maple (commonly called swamp maple), blackgum, birch, willow, and oaks, but pond pine and loblolly pine grow in some places. Most of the acreage is woodland.

In a representative profile the surface layer is grayish-brown silt loam that is mottled with reddish brown and is about 14 inches thick. The underlying material, to a depth of about 60 inches, is gray or light gray and is mottled with various colors. It is silt loam mottled with light brownish gray in the upper part, loam mottled with reddish brown in the middle, and gravelly sandy loam mottled with yellowish red in the lower part.

Bibb soils are easy to work when the moisture content is favorable, but the water table is at or near the surface in winter and generally remains there until late in spring.

Figure 8.—A flooded pasture on Bibb silt loam, on the flood plain of Port Tobacco Creek.

The high water table delays planting where Bibb soils are farmed. These soils are moderately permeable. They are severely limited for most nonfarm uses because natural drainage is poor, the water table is seasonally high, and flooding is a hazard.

A representative profile of a level Bibb silt loam, in a wooded area on the flood plain of Port Tobacco Creek, about 2½ miles northwest of La Plata:

A1—0 to 14 inches, grayish-brown (10YR 5/2) silt loam; many, medium, prominent mottles of reddish brown (5YR 4/4); moderate, fine and medium, granular structure; friable, slightly sticky and slightly plastic; common roots; very strongly acid; clear, smooth boundary.

C1g—14 to 21 inches, gray and light-gray (5Y 6/1) silt loam; many, coarse, faint mottles of light brownish gray (2.5Y 6/2) and common, fine, prominent mottles of reddish brown (2.5YR 4/4); weak, fine, granular structure; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; clear, smooth boundary.

C2g—21 to 28 inches, gray and light-gray (5Y 6/1) loam; common, medium, prominent mottles of reddish brown 5YR 4/4); stratified; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; abrupt, wavy boundary.

C3g—28 to 60 inches, gray and light-gray (5Y 6/1) gravelly sandy loam; common, medium, prominent mottles of yellowish red (5YR 5/6) and a few, coarse, prominent mottles of dark red (2.5YR 3/6); stratified; very friable, slightly sticky; very strongly acid.

The A horizon is silt loam in texture. The matrix is 4 to 7 in value and 1 or 2 in chroma. Mottles occur in some places. The matrix of the C horizon is 10YR to 5Y in hue, 4 to 7 in value, and 0 to 2 in chroma. The C horizon is neutral in some places. It is mottled with red, brown, yellow, or gray, the C1g and C2g horizons are silt loam or loam. Depth to the C3g horizon ranges from about 20 to more than 40 inches. The C3g horizon is commonly coarser textured than the horizons above it, but in some places it is abruptly finer textured. Between depths of 10 and 40 inches the soil profile generally is less than 18 percent clay and more than 15 percent sand. The C horizon generally is stratified. Fine smooth pebbles occur at any place in the profile, but they are most common in the C horizon.

Bibb soils resemble Elkton, Fallsington, Othello, and Osier soils in color and in natural drainage, but none of those soils are on flood plains. Bibb soils lack the distinct to prominent Bt horizons that are in Elkton, Fallsington, and Othello soils. They are not so sandy as Osier soils. Associated with Bibb soils are Alluvial land and the moderately well drained soils of the Iuka series.

Bibb silt loam (Bo).—This is the only Bibb soil mapped in the county. It is nearly level and in only a few places are slopes more than 1 percent. Artificial drainage is needed for cultivated crops. Where flooding is not too frequent or too severe, the soil is suited to annual crops that are planted late and to seasonal pasture. Where flooding is very frequent or very severe, the soil is used mostly as woodland. The frequency and severity of flooding cannot be predicted from the soil map, but only from a knowledge of the flooding history of any particular tract or area. Capability unit IIIw–7; woodland subclass 2w.

Bourne Series

The Bourne series consists of gently sloping to moderately sloping, moderately well drained soils that have a dense, brittle fragipan in the lower part of the subsoil. These soils are on broad ridgetops at the higher elevations. They formed in thick sandy sediment containing moderate amounts of clay and some silt. The native vegetation is upland oaks and Virginia pine.

In a representative profile, the surface layer is sandy loam about 13 inches thick. It is dark grayish brown in the upper 2 inches and pale brown below. The upper part of the subsoil, about 10 inches thick, is yellowish-brown loam. The lower part of the subsoil is a fragipan about 28 inches thick. It consists of brownish-yellow to pale-brown fine sandy loam that is mottled with various colors. It is dense and is very firm and brittle when moist and very hard when dry. Water moves very slowly through this layer, and roots ordinarily do not penetrate it. Below the subsoil is stratified, massive fine sandy loam.

Bourne soils are easy to work, except where they are severely eroded. The available water capacity is low to moderate. Above the fragipan these soils are wet for short periods, but they tend to dry out thoroughly in summer and in fall. The fragipan is seldom wet, for it acts as a barrier for soil moisture. Bourne soils are slowly permeable. They have moderate to severe limitations for many nonfarm uses.

Representative profile of Bourne sandy loam, in a gently sloping wooded area on east side of State Route 232, about 3 miles east of Newport:

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

A2—2 to 13 inches, pale-brown (10YR 6/3) sandy loam; weak, fine and medium, granular structure; friable, slightly sticky; common roots; extremely acid; clear, smooth boundary.

B2t—13 to 23 inches, yellowish-brown (10YR 5/6) heavy loam; very weak, medium, subangular blocky structure; friable, sticky and slightly plastic; a few roots; thin, discontinuous clay films; very strongly acid; abrupt, smooth boundary.

Bx1—23 to 42 inches, brownish-yellow (10YR 6/6) fine sandy loam, faintly variegated or mottled with yellowish brown (10YR 5/8), strong brown (7.5YR 5/8), and light gray (5Y 7/2); weak, thick, platy structure; very hard, firm, slightly sticky and slightly plastic; patchy clay films; very strongly acid; clear, smooth boundary.

Bx2—42 to 51 inches, pale-brown (10YR 6/3) fine sandy loam, variegated with yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6); weak, thick, platy structure

and weak, medium, blocky structure; very hard, firm, slightly sticky and slightly plastic; strong-brown (7.5YR 5/6) patchy clay films; very strongly acid; clear, smooth boundary.

Cx—51 to 60 inches, variegated yellowish-brown (10YR 5/8), brownish-yellow (10YR 6/6), and yellowish-red (5YR 4/8) fine sandy loam; stratified, massive; firm, slightly sticky and slightly plastic; a few vertical cracks; very strongly acid.

The A horizon is 4 to 6 in value and 2 to 4 in chroma. In the Bt horizon hue is 10YR or 7.5YR, value is 5 or 6, and chroma is 4 to 8. This horizon is commonly sandy clay loam, but its range includes loam and clay loam. The clay content of the Bt horizon generally is between about 18 and 30 percent. The Bt horizon is 10 inches thick or more. The Bx horizon is at a depth of 18 to about 28 inches, and it ranges from about 16 to 30 inches in thickness. In the Bx horizon, the matrix is 10YR or 7.5YR in hue, 5 or 6 in value, and 3 to 8 in chroma. Mottles range from 5Y to 5YR in hue, and the range in value and chroma is wide. In some profiles, the Bx horizon is highly variegated and there is no dominant matrix color. The Bx horizon is loam or fine sandy loam. The solum ranges from about 40 to 70 inches in thickness. The Cx horizon generally is variegated. It is massive and stratified. Texture is sandy loam or fine sandy loam. Fine, smooth quartz pebbles may occur in any horizon.

Bourne soils resemble Beltsville soils but are less silty and more sandy in the A and B horizons, including the Bx horizon.

Bourne sandy loam, 2 to 5 percent slopes, moderately eroded (BrB2).—This soil has a profile similar to that described as representative of the series, except that in most places the surface layer is thinner. Included in mapping are a few small areas where slopes are less than 2 percent. Also included are some wooded areas that are similar to this soil, but they are only slightly affected by erosion. There are also a few areas of severely eroded soils. Water runs off this soil readily, especially when it is wet. The hazard of further erosion is moderate. Impeded drainage is a concern, and improved drainage is needed for some purposes. This soil is suited to cultivated crops, pasture, and trees, but it is seldom used for pasture. Capability unit IIe–36; woodland subclass 3w.

Bourne sandy loam, 5 to 10 percent slopes, moderately eroded (BrC2).—This soil is subject to further erosion when it is cultivated. Included in mapping are some wooded areas that are slightly eroded. Under good management that includes practices for controlling erosion, this soil can be cultivated regularly. The soil is seldom used for pasture. Capability unit IIIe–36; woodland subclass 3w.

Bourne sandy clay loam, 5 to 10 percent slopes, severely eroded (BuC3).—This soil has lost most or all of its original sandy loam surface layer, and the subsoil is exposed in many places. Gullies that extend into the lower part of the subsoil are common. Where plowed, the present surface layer is sticky and crusts when dry, and it generally is difficult to manage. This soil is marginal for cultivated crops. It is better suited to perennials, including trees. Capability unit IVe–7; woodland subclass 3w.

Chillum Series

The Chillum series consists of gently sloping to moderately sloping, well-drained soils on uplands. These soils are on ridgetops and their upper slopes. They formed in silty sediment over deposits of dense, compact gravelly material. The native vegetation is hardwoods, mainly oak, and Virginia pine.

In a representative profile the surface layer, about 6 inches thick, is silt loam that is dark grayish brown in the thinner upper part and brown below. The upper part of the subsoil, about 16 inches thick, is strong-brown heavy silt loam. Below it is about 6 inches of yellowish-brown loam that is also very silty. The underlying material is hard and compact gravelly sandy loam variegated with many colors.

Chillum soils are easy to work and have high available moisture capacity. They are moderately permeable. Slope and the hazard of further erosion limit the use of these soils for some purposes. Other uses are limited by the hard, compact underlying material that is sometimes exploited for gravel.

Representative profile of Chillum silt loam, in a gently sloping wooded area, on Forest Road within Cedarville State Forest, about 5 miles east of Waldorf:

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

A2—2 to 6 inches, brown (10YR 5/3) light silt loam; weak, medium and coarse, granular structure; very friable, slightly sticky and slightly plastic; many roots; very strongly acid; clear, smooth boundary.

B2t—6 to 22 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, fine and medium, subangular blocky structure; friable, sticky and slightly plastic; a few roots; thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

B3—22 to 28 inches, yellowish-brown (10YR 5/6) loan; weak, fine and medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; traces of clay films; very strongly acid; abrupt, smooth boundary.

IIC1—28 to 45 inches, yellowish-brown (10YR 5/6) gravelly sandy loam, variegated with strong brown (7.5YR 5/8), light yellowish brown (10YR 6/4), and light gray (2.5Y 7/2); massive; very hard, very firm and brittle; some pebbles coated with clay or silt; strongly acid; gradual, smooth boundary.

IIC2—45 to 60 inches, light yellowish-brown (10YR 6/4) gravelly light sandy loam, variegated with strong brown (7.5YR 5/8) and very pale brown (10YR 8/3); massive; firm in place; some pebbles coated; strongly acid.

The solum ranges from about 24 to 30 inches in thickness. It is 10YR or 7.5YR in hue. A few pebbles are present, but they are commonly only in the IIC horizon. The A horizon is 3 to 5 in value and 2 to 4 in chroma. Undisturbed A1 horizons less than 6 inches thick are 3 in value. The B horizon is 4 or 5 in value and 4 or 6 in chroma. The Bt horizon is silt loam or silty clay loam. Where present, the B3 horizon is loam or silt loam. The IIC horizon is variable in color, and commonly variegated. It is hard, firm, and generally quite gravelly.

Chillum soils resemble Marr, Matapeake, and Sassafras soils in color and natural drainage. The solum of Chillum soils is similar to that of Matapeake soils, but Matapeake soils have a friable loamy C horizon in contrast to the very hard gravelly C horizon of the Chillum soils. Chillum soils have more silt and less sand than Marr and Sassafras soils. They formed in the same kind of silty material as the Matapeake soils, the moderately well drained Beltsville and Mattapex soils, and the poorly drained Leonardtown and Othello soils.

Chillum silt loam, 2 to 6 percent slopes, moderately eroded (ChB2).—This soil has a profile similar to that described as representative of the series, except that in most places the surface layer is thinner. Included in mapping are a few small, nearly level areas. The soil is suited to cultivated crops, pasture, and trees. The gravelly substratum, at a moderate depth, restricts deep root development, and it is the principal limitation to use. The hazard

of further erosion is moderate. Capability unit IIs–7; woodland subclass 3o.

Chillum silt loam, 6 to 12 percent slopes, moderately eroded (ChC2).—The profile of this soil is similar to that described as representative of the series except the surface layer is thinner. Also included in mapping are small areas in which most of the silty surface layer has been washed away. In places plowing exposes a part of the strong-brown subsoil. The hazard of further erosion is a greater concern of management than the gravelly substratum, which limits the development of roots. Capability unit IIIe–7; woodland subclass 3o.

Coastal Beaches

Coastal beaches (Co) consist of strips of land along some shores of the tidal part of the Potomac River and a few of its major tributaries. Typically, they consist mainly of loose sand that has been worked and reworked by tides and wave action. Some areas are shelly, and others are clayey or muddy sand. The beaches are mostly smooth and nearly level. Others are hummocky and have short slopes. The sand shows no soil development, and little or no vegetation exists. This land is well suited to recreation, and is used as habitat for selected wildlife. Capability unit VIIIs–2; woodland subclass not assigned.

Croom Series

The Croom series consists of gently sloping to moderately sloping, shallow, well-drained gravelly soils on uplands. These soils formed in very old fluvial deposits of gravel containing sand and clay. The native vegetation is upland hardwood, mainly oak, and some Virginia pine.

In a representative profile the surface layer is gravelly loam about 11 inches thick. It is light brownish gray in the thinner upper part and yellowish brown below. The upper part of the subsoil, about 24 inches thick, is strong-brown, very gravelly sandy clay loam. It is extremely hard and compact and limits root penetration. The lower part is brown, very gravelly sandy loam about 14 inches thick. It is somewhat less hard and compact than the upper part of the subsoil. The underlying material to a depth of about 72 inches is strong-brown, stratified, very gravelly loamy coarse sand.

Croom soils are not difficult to work in places suitable for plowing. The gravel, however, is quite abrasive to farm implements. These soils seldom are used for farming. They have a low available moisture capacity, and the rooting zone dries quickly. Permeability in these soils is moderately slow. Many areas have been exploited for gravel and road fill. Although these soils provide stable foundations for buildings, they have moderate to severe limitations for most other nonfarm uses.

Representative profile of Croom gravelly loam, in a gently sloping wooded area, south of Durham Church Road, about 1 mile northeast of old Durham Church:

A1—0 to 2 inches, light brownish gray (2.5Y 6/2) gravelly loam; very weak, fine and medium, granular structure; friable, slightly sticky; many roots; extremely acid; abrupt, smooth boundary.

A2—2 to 11 inches, yellowish-brown (10YR 5/4) gravelly loam; very weak, fine and medium, granular structure; friable, slightly sticky; many roots; extremely acid; clear, smooth boundary.

B2t—11 to 35 inches, strong-brown (7.5YR 5/6) very gravelly sandy clay loam; massive; extremely hard, very firm, slightly sticky and slightly plastic; a few roots; distinct reddish-brown (5YR 4/4) clay films on pebbles; extremely acid; gradual, smooth boundary.

B3—35 to 49 inches, brown (7.5YR 5/4) very gravelly sandy loam; massive; very hard, very firm, slightly sticky; no roots; some thin clay films on pebbles in upper part; very strongly acid; clear, wavy boundary.

C—49 to 72 inches, strong-brown (7.5YR 5/6) very gravelly loamy coarse sand; stratified; friable to firm; very strongly acid.

The solum ranges from about 40 to more than 100 inches in thickness. This wide range is influenced by the thickness of the B3 horizon, which is as much as 8 feet. The depth to the extremely hard B2t horizon is no more than 15 inches in uneroded areas. Structure is weak or it is lacking throughout the soil. The A horizon is 10YR or 2.5Y in hue, 5 to 7 in value, and 2 to 4 in chroma. The B horizon is 10YR or 7.5YR in hue, 5 or 6 in value, and 4 to 8 in chroma. The B2t horizon contains 50 to 75 percent rounded or subangular gravel, mostly less than 2 inches thick. The fine material in this horizon generally is sandy clay loam, but may be heavy loam or clay loam that is low in silt. The clay content of this fine material generally is more than 18 percent but less than 30 percent. The C horizon resembles the B horizon in color and in gravel content, but the fine material in the C horizon is less than 18 percent clay. It is stratified and generally is less hard and less compact than the B horizon.

Croom soils resemble Aura soils, but have more gravel in the B and C horizons than those soils, and they are not so reddish. Commonly, Croom soils are in association with Aura Chillum, and Beltsville soils. They have a very gravelly solum, but the Chillum and Beltsville soils have little or no gravel in the solum. Chillum soils are friable in the solum but have hard C horizons, whereas Beltsville soils have a dense fragipan in the lower part of the subsoil and are only moderately well drained.

Croom gravelly loam, 3 to 8 percent slopes, moderately eroded (CrB2).—This soil has a profile similar to that described as representative of the series, except that in most places the surface layer is thinner. Most of the surface layer of this soil has been washed away and in a few areas the subsoil is exposed or almost exposed. This soil has rills and shallow and deep gullies in which gravel has accumulated. Included in mapping are small areas where the surface layer is a little sandier and the subsoil is less hard than that described. Low available moisture capacity and the hazard of erosion mostly limit farming. The soil is suited to corn and tobacco. These crops will benefit from irrigation. The soil is seldom used for hay or pasture. Some areas are in woodland. Capability unit IIs–7; woodland subclass 4d.

Croom gravelly loam, 8 to 15 percent slopes, moderately eroded (CrC2).—A profile of this soil is similar to that described as representative of the series except that the surface layer is only 5 to 8 inches thick. Plowing is difficult in the upper subsoil. A few shallow gullies are present. Included in mapping are small areas where the surface layer is somewhat sandier than that described and others where it has comparatively little gravel. The hazard of further erosion is severe in places where the soil is tilled. Under good management, the soil is suited to crops such as corn and tobacco. Uncultivated areas are mostly in woodland. Capability unit IIIe–7; woodland subclass 4d.

Croom gravelly loam, 8 to 15 percent slopes, severely eroded (CrC3).—This soil is so severely eroded that it is seldom used for cultivated crops or pasture. Most of it is idle or in second-growth woodland. Most of the surface layer has eroded, exposing most of the subsoil. Many gullies

are present. Included in mapping are areas where the exposed subsoil is not so dense and hard as described in the representative profile. Even under very good management, crops are seldom grown. Woodland improvement is economical, and will provide important watershed protection. Capability unit IVe–7; woodland subclass 4d.

Cut and Fill Land

Cut and fill land (Cu) consists, in part, of land areas where the soil has been cut away by grading and similar operations. Most of the remaining areas generally are filled with soil and other materials to a depth of many feet, but others are filled only to a depth of 1 or 2 feet. Included in mapping are small areas where the fill is garbage or other solid wastes. Also included are a few shopping plazas and other paved areas.

Cut and fill land is never farmed. Where used, it is chiefly for commercial or residential purposes. It is so variable in nature that the suitability of any area for a specific use must be determined by onsite investigation. Capability unit and woodland subclass not assigned.

Elkton Series

The Elkton series consists of nearly level, poorly drained soils in areas bordering major rivers and on higher upland flats. These soils have a fine subsoil that is slowly permeable to very slowly permeable. They formed in old deposits of very clayey marine and alluvial sediment. The native vegetation is wetland hardwoods, mainly red or swamp maple, willow oak, and birch. In other areas are stands of loblolly and other pines.

In a representative profile the surface layer, about 6 inches thick, is gray silt loam. The upper part of the subsoil, about 6 inches thick, is light-gray, friable heavy silt loam mottled with pale brown and yellowish brown. The lower part of the subsoil, about 28 inches, is gray or light-gray silty clay that is firm, sticky and plastic and mottled with brighter colors. The underlying material, to a depth of about 70 inches, is light-gray, mottled fine sandy loam.

If cultivated, Elkton soils must be worked when the moisture content is favorable. When dry, these soils are rough and hard and when wet, they do not support heavy machinery. These soils have high available moisture capacity. They have a high water table and are wet for long periods. Permeability in these soils generally is slow, but it is slow to very slow in the lower part of the subsoil. Artificial drainage is necessary if these soils are farmed. Poor drainage and the high water table are severe limitations for most nonfarm uses.

Representative profile of Elkton silt loam, in a level rewooded area about 1½ miles west of Riverside:

Ap—0 to 6 inches, gray (5Y 5/1) silt loam; very weak, fine, granular structure; friable, slightly sticky; many roots; extremely acid; abrupt, smooth boundary.

B1g—6 to 12 inches, light-gray (5Y 7/1) heavy silt loam; common, medium, distinct mottles of pale brown (10YR 6/3) and a few fine, prominent mottles of yellowish brown (10YR 5/8); weak, fine, granular structure; friable, sticky and slightly plastic; a few roots; extremely acid; clear, wavy boundary.

B21tg—12 to 21 inches, gray or light-gray (5Y 6/1) silty clay; common, medium, prominent mottles of brownish yellow (10YR 6/6); moderate, coarse, blocky structure; very firm, plastic and sticky; a few roots; distinct, almost continuous, gray (5Y 5/1) clay films; very strongly acid; gradual, smooth boundary.

B22tg—21 to 40 inches, light-gray (5Y 7/2) silty clay; many, medium, prominent mottles of brownish yellow (10YR 6/6) and a few, medium, prominent mottles of strong brown (7.5YR 5/8); moderate, medium and coarse, blocky structure; firm, plastic and sticky; a few roots; faint, almost continuous, gray or light gray (5Y 6/1) clay films; very strongly acid; clear, smooth boundary.

IICg—40 to 70 inches, light-gray (5Y 7/1) fine sandy loam; many, medium, faint mottles of light olive gray (5Y 6/2) and common, medium, prominent mottles of reddish yellow (7.5YR 6/8); massive; friable; medium to strongly acid.

The solum ranges from about 30 to 40 inches in thickness. Fine, smooth gravel is likely to occur anywhere in the profile, but is common only in the IICg horizon. Hue throughout the profile is 10YR to 5Y, or the colors are neutral. The A horizon is 3 to 5 in hue and 1 or 2 in chroma. Very thin A1 horizons are 3 in value. In the B horizon the matrix is 5 to 7 in value, and 0 to 2 in chroma. Mottles are 7.5YR in hue or yellower, 4 in value and 2 to 8 in chroma. The Bt horizon is clay, silty clay, or silty clay loam in places. Generally, the clay content is 35 to 50 percent. The color range of the C horizon is the same as that of the B horizon. In texture the C horizon ranges from loamy sand to clay.

Elkton soils are similar to Bibb, Fallsington, Leonardtown, Othello, and Osier soils in drainage and in color. They are more clayey than Fallsington and Osier soils. They have a Bt horizon that is not present in Bibb, Osier, and Elkton soils. This horizon has more clay and less silt than similar horizons in Leonardtown and Othello soils. Although they formed in similar clayey sediment, Elkton soils are more poorly drained than Keyport soils.

Elkton silt loam (Ek).—This is the only Elkton soil mapped in the county. Included in mapping are small areas where the surface layer has a little more sand or clay and is more sticky than that of this soil. Also included are scattered small areas where the surface layer, to a depth of about 4 inches, is very dark gray or black. If this soil is artificially drained, it is well suited to corn and soybeans. It is not suitable for tobacco. Most undrained areas are wooded. Capability unit IIIw–9; woodland subclass 3w.

Eroded Land

This land type is represented by one mapping unit, Eroded land, steep (ErE). It consists of steep areas that have been so severely eroded that the soil profile largely has been destroyed. Slopes range from about 15 to more than 40 percent. Adjacent soils commonly are of the Sassafras and Westphalia series, but included with this unit in mapping are areas of Woodstown, Beltsville, Bourne, Exum, Wickham, Marr, Keyport, Matapeake, Mattapex, and Chillum soils. In most places the surface layer and the subsoil have been lost, have been severely gullied, or both. In some places, soil has been left between the gullies. These gullies, however, are either very close together or very deep, or both.

This unit is not suitable for crops or grazing. Many areas are in woodland that has been regenerated on what was once open cropland or pasture. Erosion caused by runoff on this land results in damage to surrounding areas. The soil lost from this land can clog ditches and drainageways and cause silting-in of ponds or other bodies of water. Keeping the areas of this land under a cover of protective vegetation helps to control erosion. The vegetation

can also be used for woodland products, for watershed protection, and as wildlife habitat. Capability unit VIIe–2; woodland subclass 3r.

Evesboro Series

The Evesboro series consists of very deep, excessively drained, level to moderately sloping soils. In places these soils resemble low dunes. They formed in old marine deposits of sand that have been at least partly reworked by wind and water. The native vegetation primarily is hardwoods, mainly oak, and some Virginia pine.

In a representative profile the surface layer is about 11 inches thick. The underlying material is yellowish brown and it extends to a depth of about 60 inches. The upper 34 inches is loamy sand, and the lower 15 inches is gravelly loamy sand that has about 40 percent fine, smooth, quartz pebbles.

Evesboro soils are easy to work, and they warm quickly in spring. These soils and the Galestown soils are the first soils in the county to be ready for farming. The available moisture capacity is low, and the sand is loose. These features chiefly limit soil use. Loose dry surfaces are subject to soil blowing. Erosion by water generally is a minor problem. Permeability is rapid in these soils.

Representative profile of Evesboro loamy sand, 0 to 8 percent slopes, in a cultivated area on Burnt Store Road, about 2 miles southwest of Hughesville:

Ap—0 to 11 inches, brown (10YR 5/3) loamy sand; very weak, fine, granular structure; loose to very friable; common roots; strongly acid; abrupt, smooth boundary.

C1—11 to 36 inches, yellowish-brown (10YR 5/6) loamy sand; single grain; loose to very friable; a few roots; strongly acid; clear, smooth boundary.

C2—36 to 45 inches, yellowish-brown (10YR 5/8) light loamy sand; single grain; loose to very friable; sand grains coated; some fragments of iron-cemented sand; very strongly acid; abrupt, smooth boundary.

IIC3—45 to 60 inches, yellowish-brown (10YR 5/4) gravelly loamy sand; single grain; loose; about 40 percent smooth, subangular, quartz pebbles as much as 1 inch thick; very strongly acid.

The depth to the IIC horizon is 40 inches or more. At a depth of about 36 inches is sand or loamy sand. The entire profile is nearly free of coarse fragments, but all horizons may contain up to 30 percent fine, subangular, quartz pebbles. The A horizon is 3 to 5 in value and 1 to 3 in chroma. A1 horizons less than 6 inches thick are 3 in value and 1 in chroma. The C horizon is 5 to 7 in value and 4 to 8 in chroma. The lower part of the C horizon generally is lowest in chroma, but in places thin strata or bands are high in chroma.

Evesboro soils resemble Galestown soils, but they do not have the strong-brown to reddish-brown, weakly developed Bt horizon of those soils. Osier soils are poorly drained and formed in similar very sandy deposits as Evesboro soils.

In some of these soils, the percent of gravel is higher than the range defined for the series, but this difference does not alter their usefulness or behavior.

Evesboro loamy sand, 0 to 8 percent slopes (EvB).—This soil has the profile described as representative of the series. Included with this soil in mapping are some depressional areas where loose loamy sand has recently accumulated. Also included are a few areas in the eastern part of the county where the soil is reddish and somewhat finer at depths below 40 inches. Low available moisture capacity is the main limitation to farming. This soil is used mainly for tobacco, but corn and soybeans are also grown. Under good management that includes supplemental irrigation, yields are favorable. Capability unit IVs–1; woodland subclass 3s.

Evesboro loamy sand, 8 to 15 percent slopes (EvC).—This soil has an irregular surface. It occurs as dunelike ridges on the sides of sandy hills and depressions. Included with this soil in mapping are small areas of reddish, somewhat finer textured material at depths below 40 inches. The soil is very poorly suited to crops or pasture. It is better suited to woodland and to some nonfarm uses. Capability unit VIIs–1; woodland subclass 3s.

Evesboro gravelly loamy sand, 0 to 8 percent slopes (EwB).—This soil has a profile similar to that of the soil described as representative of the series, except that all horizons contain 15 to 30 percent fine, smooth, subangular quartz pebbles. The soil is seldom used except for tobacco, but it is suited to other crops. Under good management practices that include supplemental irrigation, plant growth is favorable. Some areas of this soil have been exploited for gravel. Capability unit IVs–1; woodland subclass 3s.

Evesboro gravelly loamy sand, 8 to 15 percent slopes (EwC).—This soil has an irregular surface and is chiefly on the sides of sandy and gravelly hills and ridges. It is poorly suited to crops or pasture. The soil is better suited to woodland and to some nonfarm uses. Several areas have been exploited for gravel. Capability unit VIIs–1; woodland subclass 3s.

Exum Series

The Exum series consists of gently sloping to moderately sloping, deep, moderately well drained soils on uplands. These soils formed in old silty deposits containing moderate amounts of clay and small amounts of sand. The native vegetation mostly is mixed hardwoods and Virginia pine.

In a representative profile the surface layer, about 5 inches thick, is dark yellowish-brown silt loam. The upper part of the subsoil, about 38 inches thick, is yellowish-brown clay loam. It is sticky and plastic and mottled with red and light brownish gray. The lower part of the subsoil about 25 inches thick, is yellowish-brown loam. This material is underlain by friable, mixed colored loam that extends to a depth of about 8 feet.

Exum silt loams are moderately easy to work at a favorable moisture content. The severely eroded clay loams are difficult to work when too wet or dry. These soils have a high available moisture capacity, but are low in natural content of plant nutrients. Permeability is moderate to moderately slow. Wetness, slope, and the hazard of erosion chiefly limit use of these soils.

Representative profile of Exum silt loam, 5 to 10 percent slopes, moderately eroded, in an idle area in Woodhaven Park, about 2 miles southeast of La Plata:

Ap—0 to 5 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure; friable, slightly sticky; a few roots; very strongly acid; clear, smooth boundary.

B1—5 to 8 inches, yellowish-brown (10YR 5/6) clay loam, a few variegations of yellowish red (5YR 4/6); moderate, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; strongly acid; abrupt, smooth boundary.

B21t—8 to 16 inches, yellowish-brown (10YR 5/6) heavy clay loam; common, medium, prominent mottles of red (2.5YR 4/8) and a few, medium, faint mottles of light brownish-gray (10YR 6/2); very weak, thick platy

and moderate, fine, subangular blocky structure; friable to firm, sticky and plastic; a few roots; continuous brown or dark-brown (7.5YR 4/4) clay films; strongly acid; clear, smooth boundary.

B22t—16 to 43 inches, yellowish-brown (10YR 5/6) clay loam; common, fine to coarse, prominent mottles of red (2.5YR 4/8), and a few, fine and medium, faint mottles of light brownish-gray (10YR 6/2); weak, very thick platy and moderate to strong, medium, subangular blocky structure; friable to firm, sticky and plastic; a few roots; continuous reddish-brown (5YR 4/4) and brown to dark-brown (7.5YR 4/4) clay films; very strongly acid; gradual, smooth boundary.

B23t—43 to 68 inches, yellowish-brown (10YR 5/6) heavy loam; common, fine and medium, prominent mottles of red (2.5YR 4/8), and common, fine and medium, faint mottles of light brownish-gray (10YR 6/2); weak, thick platy and weak to moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; yellowish-red (5YR 4/6) and brown or dark-brown (7.5YR 4/4) clay films; very strongly acid; gradual, smooth boundary.

C—68 to 96 inches, variegated yellowish-brown (10YR 5/6), red (2.5YR 4/8), and light brownish-gray (10YR 6/2) loam; massive; friable, slightly sticky; very strongly acid.

The solum is more than 60 inches in thickness. Fine, smooth pebbles are in the lower part of the solum and in the C horizon of a few profiles. In the subsoil are red mottles and a few soft nodules of incipient plinthite. The A horizon is 10YR or 2.5Y in hue, 4 or 5 in value, and 2 to 4 in chroma. The A2 or Ap horizon is as much as 4 in chroma. The A horizon generally is silt loam, but in severely eroded areas the surface is clay loam. The B horizon is 10YR in hue, but hue is 2.5Y or 7.5YR in some subhorizons. The matrix of the B horizon is 5 or 6 in color and 4 to 8 in chroma. Mottles range from red to gray, but in the B horizon some are less than 2 in chroma. The Bt horizon is commonly clay loam that is high in silt and low in sand. This horizon is 27 to 35 percent clay, and 30 to 50 percent silt. Most of the sand is very fine. The C horizon is mixed colored loam that is stratified in places.

Exum soils resemble Beltsville, Bourne, Iuka, Keyport, Matawan, Mattapex, and Woodstown soils in natural drainage. They lack the fragipan of Beltsville and Bourne soils. The subsoil of Exum soils is thicker and more clayey than that of Iuka, Matawan, Mattapex, and Woodstown soils. In places Exum and Beltsville soils are in a complex pattern, and they tend to intergrade toward each other.

Exum silt loam, 5 to 10 percent slopes, moderately eroded (ExC2).—The profile of this soil is the one described as representative of the series. The surface layer is fairly thin as most of it has been lost through erosion. Included with this soil in mapping are some areas where the lower subsoil is much redder than normal. Also included are areas where the subsoil is firmer and more brittle than that described. The soil is cut by some shallow gullies. It is suited to crops, pasture, and woodland. The hazard of further erosion is severe in places where the soil is tilled. Capability unit IIIe–16; woodland subclass 3o.

Exum silt loam, 10 to 15 percent slopes, moderately eroded (ExD2).—A large part of this soil is in woodland, most of which is second or third growth. In most places the surface layer is thin, and in many places plowing exposes a part of the subsoil. Shallow gullies are common in some places. The hazard of further erosion is severe, so only occasional cultivated crops can be grown safely. This soil is better suited to hay, pasture, woodland, and as wildlife habitat. Wooded areas are suitable for watershed protection. Capability unit IVe–9; woodland subclass 3o.

Exum clay loam, 5 to 10 percent slopes, severely eroded (EyC3).—This soil has lost the original surface layer and part of the subsoil in many places. The new surface layer is yellowish-brown clay loam. It commonly is sticky and difficult to work properly when too wet or too dry. The soil has shallow and deep gullies. Included with this soil in mapping are many small areas where the lower part of the subsoil is redder than normal. Where the soil is protected against the severe hazard of further erosion, it is suited to hay, pasture, and woodland. Capability unit IVe–9; woodland subclass 4o.

Exum clay loam, 10 to 15 percent slopes, severely eroded (EyD3).—This soil is severely gullied in nearly all areas. Between the gullies, the soil has been washed away, exposing subsoil. Included with this soil in mapping are small areas that have a reddish subsoil. In many places the exposed subsoil is so dense and compact that runoff is rapid. The soil is not suited to crop cultivation. A permanent protective cover of grasses, shrubs, vines, or trees would make it suitable for pasture, woodland, watershed protection, and as a wildlife habitat. Capability unit VIe–2; woodland subclass 4o.

Exum-Beltsville silt loams, 2 to 5 percent slopes, moderately eroded (EzB2).—This mapping unit consists of a complex of Exum and Beltsville soils. Of this, 65 to 75 percent is Exum silt loam. The rest is the Beltsville soil. In mapping, it was impractical to separate these two soils because the Beltsville soil is mostly in small, irregularly shaped areas. Included with this unit in mapping are small areas that are more level, and a number of severely eroded areas (fig. 9). The soils are suited to most uses. They have a moderate limitation in farming chiefly because of a moderate hazard of further erosion. Capability unit IIe–16; woodland subclass 3o.

Fallsington Series

The Fallsington series consists of nearly level, deep, poorly drained soils on upland flats and on terraces above major streams. These soils formed in marine and old alluvial deposits of sandy material containing low to moderate amounts of silt and clay. The native vegetation chiefly is wetland oaks and maples, holly, sweetgum, and blackgum. There are also a few Virginia and loblolly pines.

In a representative profile the surface layer, about 8 inches thick, is sandy loam. It is dark grayish brown in the thinner upper part, and grayish brown mottled with yellowish brown below. The subsoil, about 20 inches thick, is light brownish-gray, heavy sandy loam in the upper part and sandy clay loam mottled with strong brown below. The underlying material to a depth of about 60 inches is light-gray gravelly and very gravelly sandy loam mottled with various shades of brown.

Fallsington soils are easy to work when they are not too wet. In spring farm operations are delayed until the water table has lowered. Because water moves readily through these soils, they are not very difficult to drain in places where outlets are adequate. Poor drainage and the high water table are the chief limitations to use. These soils have a moderate available moisture capacity.

Representative profile of Fallsington sandy loam, in a level wooded area one-fourth mile south of Burnt Store Road, about 2 miles southwest of Hughesville:

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, medium, granular structure; friable; many roots; very strongly acid; abrupt, wavy boundary.

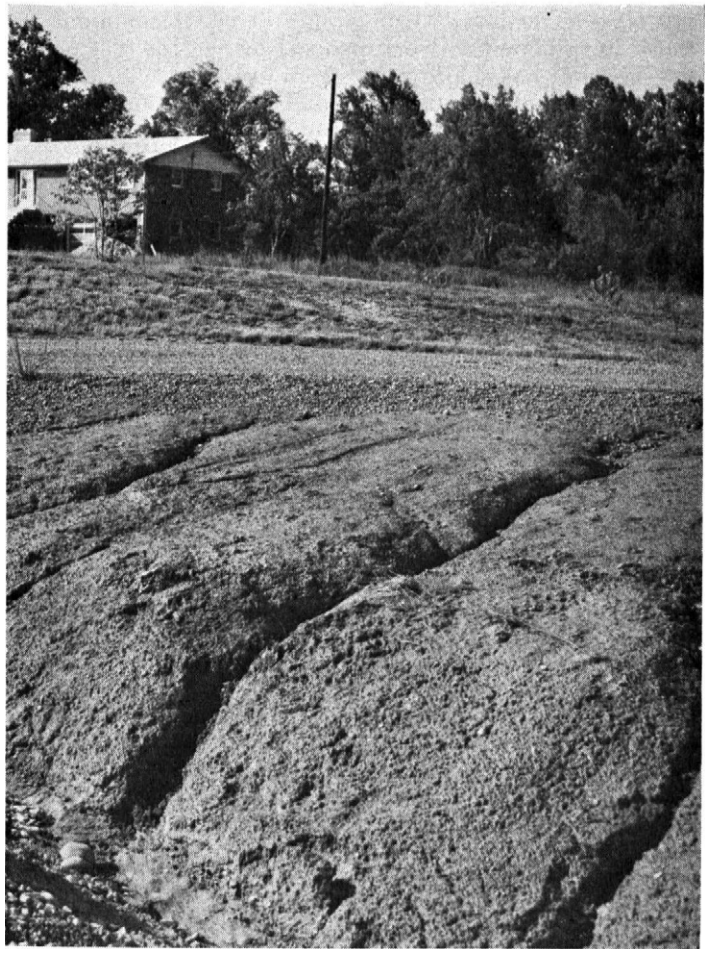

Figure 9.—**Unprotected, severely eroded spot on Exum-Beltsville silt loams, 2 to 5 percent slopes, moderately eroded, in Woodhaven Park.**

A2g—3 to 8 inches, grayish-brown (2.5Y 5/2) sandy loam; common, medium, distinct mottles of yellowish-brown (10YR 5/6); weak, fine and medium, subangular blocky structure; friable, slightly sticky; a few roots; very strongly acid; clear, smooth boundary.

B21tg—8 to 16 inches, light brownish-gray (2.5Y 6/2) heavy sandy loam; many, medium, prominent mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable, slightly sticky; a few roots; faint, discontinuous, yellowish-brown (10YR 5/4) clay films; very strongly acid; clear, smooth boundary.

B22tg—16 to 28 inches, light brownish-gray (2.5Y 6/2) sandy clay loam; many medium, prominent mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; distinct, continuous, pale-brown (10YR 6/3) clay films; very strongly acid; abrupt, wavy boundary.

IIC1g—28 to 35 inches, light-gray (5Y 6/1) gravelly sandy loam; common, medium, prominent mottles of strong brown (7.5YR 5/8) and a few fine, prominent mottles of dark brown (7.5YR 4/4); single grain; very friable, slightly sticky; a few roots; very strongly acid; gradual, smooth boundary.

IIC2g—35 to 60 inches, light-gray (N 7/0) very gravelly sandy loam; a few, coarse, prominent mottles of yellowish brown (10YR 5/6); single grain; very friable; strongly acid.

The solum ranges from about 24 to 38 inches in thickness. In places smooth quartz pebbles, about 1 inch thick, occur in the B horizon, and in places they are common to abundant in the C horizon. The hue throughout the profile is about 2.5Y, but includes 10YR and 5Y. Some subhorizons are neutral in color. The A horizon is 2 to 5 in hue and 0 to 2 in chroma. Where the A1 horizon is thin, value is 2 and 3. In the B horizon, the matrix of 4 to 6 in hue and 0 to 2 in chroma. The B horizon generally is mottled with colors high in chroma. The Bt horizon is sandy clay loam, heavy loam, or heavy sandy loam. Generally, the clay content of this horizon is 18 to 25 percent. The C horizon is coarser in texture than the B horizon, and generally is coarser than the A horizon. In color, the C horizon is similar to the B horizon, but in places the matrix is higher in value. Some profiles have few or no pebbles in the C horizon.

Fallsington soils resemble Bibb, Elkton, Leonardtown, Osier, and Othello soils in color and in natural drainage. They are sandier in the Bt horizon than Elkton, Leonardtown, and Othello soils. They have less sand than Osier soils, which do not have a Bt horizon. The Bt horizon is lacking in Bibb soils. Closely associated with Fallsington soils are the somewhat excessively drained Rumford soils, the well drained Sassafras soils, and the moderately well drained Woodstown soils.

Fallsington sandy loam (Fs).—This is the only Fallsington soil mapped in the county. Included in mapping are a few small areas where slope is slightly greater than 2 percent and a few areas that contain more silt and less sand in the surface layer. Also included with this soil are small areas where the soil is extremely wet, and the surface layer is black. These areas are shown on the detailed map by the conventional symbol for wet spot. Drained areas are used mainly for corn, but they are also suited to soybeans, truck crops, hay, and pasture. Most undrained areas are in woodland. Seasonal wetness and the presence of a high water table severely limit the soil for most nonfarm uses. Capability unit IIIw–6; woodland subclass 2w.

Galestown Series

The Galestown series consists of very deep, somewhat excessively drained, nearly level to gently sloping soils. These soils are chiefly in areas bordering major rivers of the county. Others are on higher elevations. These soils formed in old marine and alluvial deposits of sandy material, and some of them have been reworked by water. The native vegetation is hardwoods, mainly oak, but Virginia and loblolly pine grow in some places.

In a representative profile the surface layer, about 11 inches thick, is dark grayish-brown loamy sand. The upper part of the subsoil, about 9 inches thick, is yellowish-brown loamy sand. The lower part of the subsoil, about 21 inches thick, is strong-brown loamy fine sand. It contains a little more clay than the layers above and below it. The underlying material is light yellowish-brown, loose fine sand, extending to a depth of at least 5 feet.

Galestown soils are very easy to work. They warm very quickly in spring and are among the earliest soils in the county to be ready for planting. The available moisture capacity is low, and the sand is loose. These factors chiefly limit most soil uses. Loose dry surfaces are subject to wind blowing. Erosion by water is a minor problem. Permeability is rapid on these soils.

Representative profile of Galestown loamy sand, 0 to 8 percent slopes, in a cultivated area about 2 miles southwest of Newport:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) loamy sand; very weak, medium, granular structure; very friable; many roots; strongly acid; abrupt, smooth boundary.

B1—11 to 20 inches, yellowish-brown (10YR 5/6) loamy sand; single grain; loose to very friable; many roots; strongly acid; clear, smooth boundary.
B2t—20 to 41 inches, strong-brown (7.5YR 5/8) loamy fine sand; very weak, medium, blocky structure; very friable; roots are common in upper portion; sand grains are strongly coated; distinct clay bridging; very strongly acid; abrupt, wavy boundary.
C—41 to 60 inches, light yellowish-brown (10YR 6/4) fine sand, with a few thick bands of strong brown (7.5YR 5/6); single grain; loose; very few roots; very strongly acid.

The solum is about 27 to 45 inches in thickness. The profile generally is free of gravel. In the A horizon, the matrix is 10YR or 7.5YR in hue, 2 to 5 in value, and 1 to 4 in chroma. The A1 horizons less than 6 inches thick are 2 and 3 in value and 1 in chroma. In the B horizon, the matrix most commonly is 7.5YR in hue. The B1 horizon is about 10YR in hue, and the Bt horizon is 5YR. These horizons are 4 to 6 in value, and the chroma is 4 to 8. The B horizon generally is loamy sand, but in places it is sand or fine sand. In some profiles, a B3 horizon is between the B2t and C horizons. The C horizon is commonly yellower in hue, and is higher in value and lower in chroma than the B horizon. In the C horizon of some profiles, are very thin bands that resemble material in the B horizon.

Galestown soils resemble Evesboro soils, but Evesboro soils generally are yellower in color and do not have Bt horizons. Also, Galestown soils are not so excessively drained and droughty as Evesboro soils.

Galestown loamy sand, 0 to 8 percent slopes (GaB).—This is the only Galestown soil mapped in the county. The low available moisture capacity is the chief concern of management. This soil is used mostly for tobacco, corn, and soybeans. Without good management that includes supplemental irrigation during dry seasons, crop yields are low. Capability unit IVs–1; woodland subclass 3s.

Gravel and Borrow Pits

Gravel and borrow pits (Gp) consist of excavations from which gravel and other materials have been or are being removed. These materials are used mainly for road fill or for other kinds of construction. Most pits are exploited for gravel, others for sand, and still others for both gravel and sand. In some pits soil material is removed. The total area of these pits is increasing. Possible uses of these pits must be determined after onsite investigation. Capability unit VIIIs–4; woodland subclass not assigned.

Gravelly Land

Gravelly land, steep, (GvE) consists of gravelly deposits of soil material. Some of these represent areas that may have once been profiles of the Aura and Croom soils, but if so the profiles have been so severely eroded that they cannot be identified. Other areas are mostly relatively unaltered deposits of gravelly materials that have some similarity to the underlying material of various soils in the county.

The gravel content of this mapping unit ranges from about 20 to 80 percent, by volume. Most of the gravel is quartz pebbles that are smooth, rounded to subangular, and mostly less than 2 inches in diameter. Slopes range from about 15 to 50 percent.

Gravelly land is not suitable for crops or for grazing. Many areas are idle or in woodland. It is best suited to woodland, watershed protection, wildlife habitat, and a source of gravel. Capability unit VIIe–2; woodland subclass 4f.

Iuka Series

The Iuka series consists of nearly level to gently sloping, deep, moderately well drained soils on flood plains and in upland depressions. These soils formed in recently deposited alluvium that was washed mainly from soils on the uplands in the county. Where these soils occur on flood plains, they are subject to flooding from streams. Where they occur in upland depressions, they are saturated with water for short periods. The native vegetation consists of mixed wetland hardwoods.

In a representative profile, the surface layer is about 18 inches thick. It is dark yellowish-brown fine sandy loam in the upper part and is yellowish-brown fine sandy loam in the lower part. The upper part of the underlying material, about 10 inches thick, is pale-brown loam that is mottled with light gray and dark brown. Below is grayish-brown silt loam, about 8 inches thick, that is mottled with brown or dark brown. Below this layer, to a depth of 60 inches, is gray or light-gray fine sandy loam that is mottled with yellowish-brown in places.

Iuka soils are easy to work at a favorable moisture content. They have a high water table late in spring and are fairly slow to warm. Seasonal wetness, impeded drainage, and the hazard of flooding are moderate to severe limitations on these soils for nearly all purposes. They have high available moisture capacity. Permeability on these soils is moderate to moderately slow.

Representative profile of Iuka fine sandy loam, in a level cultivated area on the flood plain of Port Tobacco Creek, about 2½ miles northwest of La Plata:

Ap—0 to 9 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, granular structure; friable; many roots; medium acid (limed); abrupt, smooth boundary.
A1—9 to 18 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine, granular structure; friable, slightly sticky; many roots; medium acid; clear, smooth boundary.
C1—18 to 28 inches, pale-brown (10YR 6/3) loam; many fine, distinct mottles of light gray (10YR 7/2) and dark brown (10YR 3/3); massive; friable, slightly sticky; a few roots; strongly acid; clear, smooth boundary.
C2g—28 to 36 inches, grayish-brown (2.5Y 5/2) light silt loam; common, fine, distinct mottles of brown or dark brown (7.5YR 4/4); massive; friable, slightly sticky and slightly plastic; a few roots; strongly acid; clear, smooth boundary.
C3g—36 to 42 inches, gray (5Y 5/1), variegated with light-gray (5Y 6/1) fine sandy loam; massive, very friable, slightly sticky; a few roots; very strongly acid; abrupt, smooth boundary.
C4g—42 to 60 inches, light-gray (2.5Y 7/2) fine sandy loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; very friable; extremely acid.

Iuka soils do not have a B horizon. The C horizon has mottles and variegations less than 2 in chroma. In the A horizon the matrix is 10YR or 7.5YR in hue, 3 to 6 in value, and 2 to 4 in chroma. The surface subhorizons, less than 6 inches thick, are 3 in value. The A horizon is sandy loam, fine sandy loam, or silt loam. In the C1 horizon, the matrix color is 7.5YR to 2.5Y in hue, 4 to 6 in value, and 3 to 6 in chroma. Mottles are similar in hue and are 4 to 7 in value. Mottles are 2 or less than 2 in chroma. Within 20 inches of the soil surface, mottles higher in chroma may or may not be present. The matrix of the C2 and C3 horizons differ from the C1 in having chromas as low as 1 or 2. The C4 horizon is highly variable in color. The

C horizon is stratified and ranges from sandy loam to silt loam or silty clay loam.

Iuka soils resemble Beltsville, Bourne, Exum, Keyport, Mattapex, and Woodstown soils in color and in natural drainage, but those soils are not in flood plains, and all of them have a Bt horizon. Beltsville and Bourne soils have a fragipan. Associated with Iuka soils on flood plains are poorly drained Bibb soils and Alluvial land. Associated with Iuka soils in upland depressions are the well-drained Ochlockonee soils.

Iuka fine sandy loam (Ik).—This soil has the profile described as representative of the series. It is dominantly level (fig. 10), but in a few places slopes are more than 2 percent. The soil is on flood plains where traces of old stream channels frequently are evident. Included with this soil in mapping are small, better drained areas, and spots where the surface layer is more silty and less sandy than that of this soil.

Where flooding is not too frequent or too severe, this soil is suited to some cultivated crops, but for other crops improved drainage is needed. Areas that are subject to severe or frequent flooding are suitable for seasonal grazing or for woodland. Frequency and severity of flooding can only be predicted from a knowledge of the flooding history of a particular tract. Capability unit IIw–7; woodland subclass 1o.

Iuka sandy loam, local alluvium (Im).—The profile of this soil is similar to the one described as representative of the series, except that the surface layer is sandy loam. Also, this soil is in upland depressions and at the base of some upland slopes. This soil is level to gently sloping, but in places slopes are as much as 4 percent. It is not subject to flooding, but it is seasonally wet, and seepage spots are common (fig. 11). The soil is suited to cultivated crops, pasture, and woodland. Capability unit IIw–7; woodland subclass 1o.

Iuka silt loam, local alluvium (In).—The surface layer of this soil is silt loam but the profile otherwise is similar to the one described as representative of the series. This soil is dominantly nearly level, but in a few places slopes are as great as 5 percent. The soil is seasonally wet, and seepage spots are common. It does not dry as quickly and is not so easy to work as Iuka sandy loam, local alluvium. On this soil, planting generally is delayed. The soil is suited to cultivated crops, pasture, and woodland. Capability unit IIw–7; woodland subclass 1o.

Keyport Series

The Keyport series consists of moderately well drained, nearly level to moderately sloping soils. These soils are chiefly at low elevations near major rivers (fig. 12), but some are at higher elevations on uplands. They formed in old marine and alluvial deposits dominated by clay. The

Figure 10.—Iuka fine sandy loam, on the flood plain of Port Tobacco Creek.

Figure 11.—**Damage to tobacco by temporary wetness in Iuka sandy loam, local alluvium, after an unusually heavy rain.**

native vegetation consists of mixed and wetland hardwoods but Virginia pine grows in some places.

In a representative profile the surface layer is silt loam about 11 inches thick. It is dark grayish brown in the thinner upper part and light yellowish brown below. The upper part of the subsoil, about 5 inches thick, is yellowish-brown heavy silt loam. The middle part, about 23 inches thick, is yellowish-brown silty clay or heavy silty clay loam mottled with light gray. The lower part of the subsoil, about 17 inches thick, is light-gray fine sandy loam mottled with yellowish brown. The underlying material, to a depth of 66 inches, is gravelly sandy loam of various colors.

Keyport soils are easy to work when the moisture content is favorable and where erosion is not severe. They have high available moisture capacity, and permeability is slow. These soils are limited by impeded drainage, slow movement of water through the subsoil, and the hazard of further erosion. They are not well suited to deep-rooted crops that require good drainage and soil aeration, or to perennial crops that are likely to be damaged by frost heave in winter. These soils have severe limitations to use for septic tank sewage disposal fields because of slow permeability.

Representative profile of Keyport silt loam, 0 to 2 percent slopes, in a wooded area, about 1½ miles west of Riverside:

A1—0 to 4 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine and medium, granular structure; friable, slightly sticky; many roots; strongly acid; abrupt, smooth boundary.

A2—4 to 11 inches, light yellowish-brown (2.5Y 6/4) silt loam; very weak, very fine, subangular blocky structure; friable, slightly sticky; a few roots; strongly acid; clear, smooth boundary.

B1—11 to 16 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; firm, slightly sticky and slightly plastic; a few roots; strongly acid; clear, smooth boundary.

B21t—16 to 27 inches, yellowish-brown (10YR 5/8) silty clay; moderate, fine and medium, blocky structure; firm, sticky and slightly plastic; a few roots; thin, continuous, yellowish-brown (10YR 5/4) clay films; strongly acid; gradual, smooth boundary.

B22t—27 to 39 inches, yellowish-brown (10YR 5/8) heavy silty clay loam; a few, fine, prominent mottles of light gray (5Y 7/1); moderate, fine, blocky structure; firm, slightly sticky and slightly plastic; very few roots; distinct, yellowish-brown (10YR 5/4) clay films; strongly acid; clear, smooth boundary.

IIB3g—39 to 56 inches, light-gray (5Y 7/1) fine sandy loam; many, medium, prominent mottles of yellowish-brown (10YR 5/6); massive, firm, slightly sticky; a few roots; faint clay films in a few vertical fractures; very strongly acid; abrupt, wavy boundary.

IIIC—56 to 66 inches, yellowish-brown (10YR 5/6) gravelly sandy loam, variegated with very pale brown (10YR 8/3); massive; very friable; very strongly acid.

The solum ranges from about 36 to more than 50 inches in thickness. Fine smooth pebbles are in the profile, but they are common only in the C horizon. In the A horizon, the matrix is 10YR or 2.5Y in hue, 3 to 6 in value, and 1 to 4 in chroma. The lower value and chroma are confined to undisturbed A1 horizons less than 6 inches thick. The A horizon generally is silt loam or fine sandy loam. In severely eroded profiles, the Ap horizon is commonly silty clay loam. In the B horizon, the matrix is 10YR or 2.5Y in hue and 4 to 6 in value. In the lower part it is 5Y in hue or 7 in value. The B1 and B2 horizons are 4 or more in chroma, but in places chroma is as low as 1 in the B3 horizon. Mottles with chroma of 2 or less are in the Bt horizon but not in its upper 10 inches. Mottles that are high in chroma may occur in the lower part of the B horizon. The Bt horizon is clay, silty clay, heavy silty clay loam, or heavy clay loam. Structure is moderate and strong, and is dominantly blocky. The C horizon is highly variable, but in most places it is coarser in texture than the Bt horizon.

Keyport soils resemble Exum, Mattapex, and Woodstown soils in most major features, but they have a finer, more slowly permeable subsoil. They are not so poorly drained as the Elkton soils that formed in a similar clayey sediment.

Keyport fine sandy loam, 0 to 2 percent slopes (KeA).—The profile of this soil is similar to the one described as representative of the series, except that the surface layer is fine sandy loam. The subsoil contains fine sand. This soil is easier to work earlier in spring than the Keyport silt loams. The soil is suited to cultivated crops, pasture, and woodland. Drainage improvement is of benefit to some crops. The hazard of further erosion is slight. Capability unit IIw–9; woodland subclass 3w.

Figure 12.—**Erosion on Keyport silt loam on shore of the Potomac River.**

Keyport fine sandy loam, 2 to 5 percent slopes, moderately eroded (KeB2).—This soil has only 6 to 8 inches or less of the original surface layer. Shallow gullies are present. In places, the subsoil is exposed. The moderate hazard of further erosion is the major concern of management. Impeded drainage and moisture movement also limit use. The soil is suited to crops, pasture, and trees. Capability unit IIe–36; woodland subclass 3w.

Keyport silt loam, 0 to 2 percent slopes (KpA).—This soil has the profile described as representative of the series. Included in mapping are small areas where the surface layer is thinner than that of this soil. Also included are areas where silty material that was washed from other soils has accumulated. The surface layer is not so easy to work or to drain as in Keyport fine sandy loams. The soil is suited to cultivated crops, pasture, and trees. Drainage improvement will benefit some uses. Capability unit IIw–8; woodland subclass 3w.

Keyport silt loam, 2 to 5 percent slopes, moderately eroded (KpB2).—This soil is similar to the one described as representative of the series, except that the remaining silt loam surface layer is thinner. In small areas the subsoil is exposed. A few gullies are present. The soil is suited to cultivated crops, pasture, and trees. The hazard of further erosion is moderate, and it is a major concern of management. Other concerns of management are impeded drainage and moisture movement. Capability unit IIe–13; woodland subclass 3w.

Keyport silt loam, 5 to 12 percent slopes, moderately eroded (KpC2).—In most places this soil has lost much of the original surface layer. Plowing will expose the brighter colored subsoil in these places, giving newly plowed areas a spotty appearance. Included with this soil in mapping are a few areas where the surface layer is less silty and more sandy than that described. Shallow gullies are present. Although the hazard of further erosion is severe, with careful management, the soil is suited to crops, pasture, and trees. Capability unit IIIe–13; woodland subclass 3w.

Keyport silty clay loam, 5 to 12 percent slopes, severely eroded (KrC3).—The original surface layer of this soil has been lost through erosion. The subsoil is exposed so plowing and other soil manipulation is difficult. The surface layer is sticky and will crust over when drying, thus making it very difficult to prevent clodding. The hazard of further erosion is severe. With these limitations, the soil is suited to pasture and trees. It generally is not suited to tilled crops. Capability unit VIe–2; woodland subclass 3w.

Kitchen Midden

On the soil map, a number of places are marked by a special symbol that indicates a *kitchen midden.* As used in this survey, a kitchen midden is an abandoned area formerly used by American Indians. Prolonged use of these middens have drastically altered the original soils.

In Charles County, these kitchen middens are almost entirely on low bluff areas adjacent to the Potomac River, but a few areas are along the shores of the Nanjemoy and Piccowaxen Creeks. Oyster shells on the surface of and in the upper part of the soil help to identify these areas. Arrowheads and other Indian artifacts are in places, but they are difficult to find and to identify among the shells.

In many places the shells are in soil material as much as 2 feet thick. The fine soil that is mixed with the shells is black or almost black. Lime from the shell deposits has changed the reaction of the subsoil and the underlying material in most of these areas from strongly acid or very strongly acid to moderately alkaline. The alkalinity of the soil is so intensive that it limits the growth of some plants.

These kitchen middens have affected a number of the soils in the county, mainly those of the Mattapex, Woodstown, Keyport, and Elkton series. Also affected are small areas of the Matapeake (fig. 13), Sassafras, Othello, and Beltsville soils. In the county there are about 800 acres of kitchen middens distributed over several miles near river shorelines. Although these areas have little value for crops, limitations are likely to be few for most nonfarm uses.

Leonardtown Series

The Leonardtown series consists of shallow or moderately deep, poorly drained, nearly level soils that have a fragipan. These soils are on upland flats that commonly lack channeled drainageways. They formed in old silty marine deposits. The native vegetation consists of wetland hardwoods, including oaks, holly, maples, and gums.

In a representative profile the surface layer is silt loam about 8 inches thick. The thinner upper part is grayish brown, and the lower part is light olive gray. The upper part of the subsoil, about 8 inches thick, is light olive gray, firm silt loam mottled with brownish yellow. The lower

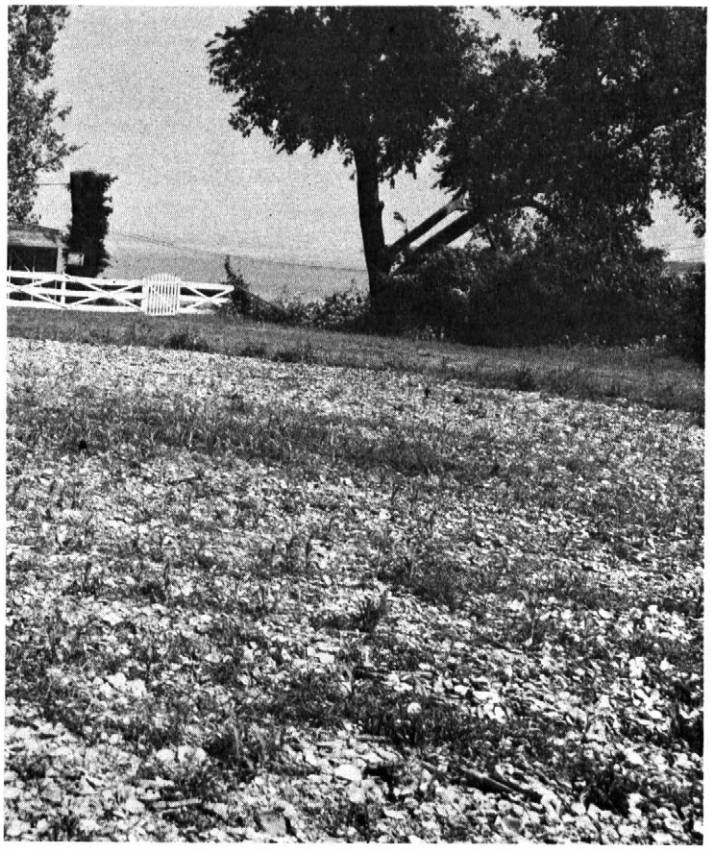

Figure 13.—Kitchen midden deposit of oyster and other shells, on Cedar Point Neck, within an area of Matapeake fine sandy loam, 0 to 2 percent slopes.

part of the subsoil, about 24 inches thick, is olive gray to light gray mottled with yellowish red and yellowish brown. It is a fragipan that is very firm, brittle, and very slowly permeable. The underlying material, to a depth of about 72 inches, is light-gray silty clay loam mottled with strong brown.

Leonardtown soils have moderate available moisture capacity. Generally, they are low in natural fertility. These soils are severely limited for farming because natural drainage is poor, the water table is seasonally high (fig. 14), and the rooting zone is limited. These soils also have severe limitations for most nonfarm uses.

Representative profile of Leonardtown silt loam, in a level wooded area west of Popes Creek Road, about 1 mile southwest of Faulkner:

A1—0 to 1 inch, grayish-brown (2.5Y 5/2) silt loam; weak, fine and medium, granular structure; friable, slightly sticky and slightly plastic; many roots; very strongly acid to extremely acid; abrupt, smooth boundary.

A2g—1 to 8 inches, light olive-gray (5Y 6/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); very weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; abrupt, smooth boundary.

B2tg—8 to 16 inches, light olive-gray (5Y 6/2) heavy silt loam, many, medium, distinct mottles of brownish yellow (10YR 6/6); weak, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; a few roots; thin, pale-olive (5Y 6/3) clay films; very strongly acid to extremely acid; clear, smooth boundary.

Bx1—16 to 24 inches, olive-gray (5Y 5/2) heavy silt loam, common, medium, prominent mottles of yellowish red (5YR 5/6) and dark brown (7.5YR 4/4), common, medium, faint mottles of light gray (5Y 7/1); weak, coarse, prismatic structure and medium, platy structure; hard, very firm, brittle, slightly sticky and slightly plastic; a few roots; continuous, pale olive (5Y 6/3) clay films; extremely acid; abrupt, smooth boundary.

Bx2—24 to 40 inches, gray or light-gray (5Y 6/1) heavy silt loam, common, medium, distinct mottles of yellowish brown (10YR 5/6) and common, medium, faint mottles of light gray (5Y 7/1); weak, thick, platy structure and moderate, fine and medium, blocky structure; hard, very firm, brittle, slightly sticky and slightly plastic; distinct, gray (5Y 5/1) clay films; very strongly acid to extremely acid; gradual, smooth boundary.

Cg—40 to 72 inches, gray or light-gray (5Y 6/1) silty clay loam, common, medium, prominent mottles of strong brown (7.5YR 5/8) and common, medium, faint mottles of gray (5Y 5/1); massive; firm, sticky and plastic; some vertical cracks lined with gray silt; extremely acid.

The solum ranges from about 28 to 40 inches in thickness. The fragipan ranges from about 24 to 30 inches. The matrix commonly is 2.5Y or 5Y in hue, but may be 10YR or neutral in some subhorizons. Any horizon may be mottled. In places smooth pebbles are in the C horizon. In the A horizon, the matrix is 3 to 6 in value and 1 or 2 in chroma. Undisturbed A1 horizons less than 6 inches thick are 3 in value. In the B and C horizons, the matrix color generally is 5 or 6 or sometimes 4 in value and 0 to 2 in chroma. Mottles are variable in hue, in value, and in chroma. The B horizon is silt loam or silty clay loam. The C horizon ranges from sandy loam to silty clay loam.

Leonardtown soils resemble Bibb, Elkton, Fallsington, Othello, and Osier soils in color and in natural drainage. Those soils, however, do not have a fragipan. Leonardtown soils are more poorly drained than the closely associated Beltsville soils. The well-drained Chillum and Matapeake soils, the moderately well drained Beltsville soils, and the poorly drained Othello soils formed in the same kind of silty material as Leonardtown soils.

Figure 14.—**Ponded area of Leonardtown silt loam. Water table almost at the surface of this soil severely limits its use for homesites and other nonfarm purposes.**

Leonardtown silt loam (Le).—This is the only Leonardtown soil mapped in the county. Included in mapping are areas where the upper part of the subsoil is pale yellow to olive. These areas are better drained than Leonardtown soils. In most areas the hazard of further erosion is slight. If this soil is drained, it is suited to some annual crops, mainly corn. Undrained areas are suited to woodland and seasonal pastures. Capability unit IVw–3; woodland subclass 3w.

Magnolia Series

The Magnolia series consists of very deep, well-drained, level to moderately sloping soils. These soils are chiefly on very old alluvial terraces along the Potomac River and other major rivers and streams of the county. They formed mostly on old flood plains in sediment deposited by these rivers and streams. The native vegetation is mixed hardwoods and some Virginia and loblolly pine.

In a representative profile the surface layer is silt loam about 16 inches thick. It is brown in the thinner upper part and strong brown below. The upper part of the subsoil, about 49 inches thick, is red to weak-red, heavy sticky and plastic clay loam. The lower part of the subsoil, about 11 inches thick, is weak-red, sticky, heavy sandy clay loam. The underlying material, to a depth of 90 inches, is weak-red, stratified gravelly sandy loam.

Magnolia soils are easy to work except when wet and are well suited to farming. Slope and the hazard of further erosion are the major limitations on these soils. These soils have high available moisture capacity and are moderately permeable. Almost all areas are cleared.

Representative profile of Magnolia silt loam, 2 to 5 percent slopes, moderately eroded, in an idle area near Grayton Post Office, about 2½ miles southeast of Nanjemoy:

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

A2—6 to 16 inches, strong-brown (7.5YR 5/6) silt loam; weak, medium and coarse, granular structure; friable; many roots; very strongly acid; clear, wavy boundary.

B21t—16 to 43 inches, red (2.5YR 4/6) heavy clay loam, faintly variegated with pale red (2.5YR 6/2); moderate, fine, subangular blocky structure; firm, sticky and plastic; a few roots; distinct, dark reddish-brown (2.5YR 3/4) continuous clay films; very strongly acid; gradual, smooth boundary.

B22t—43 to 65 inches, weak-red (10R 4/4) heavy clay loam, variegated with red (2.5YR 4/6); moderate, fine, and medium, subangular blocky structure; firm, sticky and plastic; a few roots; faint, discontinuous clay films; some fine, strongly weathered, yellowish pebbles; very strongly acid; gradual, smooth boundary.

B23t—65 to 76 inches, weak-red (10R 4/4) heavy sandy clay loam; weak, fine and medium, subangular blocky structure; firm, sticky and slightly plastic; faint, patchy clay films; some fine, strongly weathered, yellowish pebbles; very strongly acid; abrupt, wavy boundary.

IIC—76 to 90 inches, weak-red (10R 4/4) gravelly sandy loam; stratified; friable, slightly sticky and slightly plastic; some whitish, mostly decomposed cobblestones; very strongly acid.

In the A horizon, the matrix is 10YR or 7.5YR in hue, 4 to 6 in value, and 2 to 6 in chroma. The A2 horizon is 4 and 6 in chroma. The B horizon is 2.5YR or 10R in hue, and commonly is 4 in value or 3 in some subhorizons. This horizon is 4 or 6 in chroma. The Bt horizon is clay loam to clay. The subhorizons are clay, sandy clay, or heavy sandy clay loam. The B23t horizon is at least 30 percent clay. The C horizon has about the same color range as the B horizon. Observations indicate that the C horizon is unconforming and gravelly.

Magnolia soils resemble Aura soils somewhat in color, but Aura soils have less than 35 percent clay in the Bt horizon and are gravelly throughout. In Charles County, Magnolia soils are lighter in color and have less clay and more silt in the profile than the defined range for the series. However, these differences do not alter their usefulness and behavior.

Magnolia silt loam, 0 to 2 percent slopes (MgA).—This soil has a profile similar to that described as representative of the series, except that it has a thicker surface layer and generally is dark grayish brown in color. Included in mapping are a few areas where the surface layer is less silty and more sandy than this soil. This soil is well suited to most uses, and it has few or no limitations. It is among the most productive soils in the county. Capability unit I–4; woodland subclass 2o.

Magnolia silt loam, 2 to 5 percent slopes, moderately eroded (MgB2).—This soil has the profile described as representative of the series. A part of the original surface layer has been lost in most places, and in places the subsoil is almost exposed. Also included in mapping are areas where the surface layer has less silt and more sand than that of the soil described as representative of the series. The hazard of further erosion is moderate if this soil is tilled. The soil is well suited to crops, pasture, trees, and most nonfarm uses. Capability unit IIe–4; woodland subclass 2o.

Magnolia silt loam, 5 to 12 percent slopes, moderately eroded (MgC2).—This soil has a profile similar to that described as representative of the series, except that its subsoil is not so thick. Included in mapping are a few areas where the surface layer is more sandy and less silty than this soil. The hazard of further erosion is severe in places where the soil is tilled. Under good management, the soil is suited to crops, pasture, and trees. Capability unit IIIe–4; woodland subclass 2o.

Magnolia clay loam, 5 to 12 percent slopes, severely eroded (MkC3).—Most of the original silty surface layer and parts of the subsoil have been lost through erosion. The new surface layer is sticky and plastic clay loam that is difficult to work. Where this soil is tilled, it is difficult to prevent clodding and to control further erosion. For these reasons, this soil is marginal for crops. It is better suited to pasture and trees. Capability unit IVe–3; woodland subclass 2o.

Marr Series

The Marr series consists of deep, well-drained, gently sloping soils on uplands. These soils formed in old deposits of fine sandy sediment containing moderate amounts of silt and clay. The sand particles in Marr soils are uniform in size. The native vegetation is mixed hardwoods and some Virginia pine.

In a representative profile, the surface layer, about 11 inches thick, is brown fine sandy loam. The subsoil, about 27 inches thick, is brown to strong-brown sandy clay loam or very fine sandy loam. The underlying material, to a depth of at least 60 inches, is fine sandy loam of various colors that indicates stratification.

Marr soils are easy to work, but they are limited by slope and the hazard of further erosion for most uses. Most areas are cultivated, and the soils are especially productive for tobacco. They have high available moisture capacity and are moderately permeable.

Representative profile of Marr fine sandy loam, in a gently sloping wooded area that was formerly cultivated near the end of Swanson Creek Road, about 1½ miles northwest of Benedict:

Ap—0 to 11 inches, brown (7.5YR 5/4) fine sandy loam; weak, medium, granular structure; friable, slightly sticky; many roots; very strongly acid; abrupt, smooth boundary.

B1—11 to 17 inches, brown (7.5YR 5/4) very fine sandy loam, variegated with yellowish-red (5YR 5/6); weak, medium, subangular blocky structure; friable to firm; slightly sticky and slightly plastic; a few roots; very strongly acid; clear, smooth boundary.

B21t—17 to 26 inches, strong-brown (7.5YR 5/8) heavy sandy clay loam; moderate, fine and medium, subangular blocky structure; firm, sticky and slightly plastic; a few roots; distinct, continuous, yellowish-red (5YR 4/8) clay films; very strongly acid; clear, smooth boundary.

B22t—26 to 38 inches, strong-brown (7.5YR 5/8) sandy clay loam; moderate, fine and medium, subangular blocky structure; friable to firm, slightly sticky and slightly plastic; a few roots; discontinuous, yellowish-red (5YR 4/6) clay films; very strongly acid; clear, smooth boundary.

C—38 to 60 inches, variegated reddish-yellow (7.5YR 6/6), strong-brown (7.5YR 5/8), and yellowish-red (5YR 5/8) fine sandy loam, with pockets or inclusions of brown (7.5YR 5/4); massive to weakly stratified; friable to firm, slightly sticky; a few roots; very strongly acid to extremely acid.

The A horizon is 10YR or 7.5YR in hue, 3 to 5 in value, and 2 to 4 in chroma. Value of 3 generally is confined to undisturbed A1 horizons less than 6 inches thick. The B horizon generally is 7.5YR in hue, but hue is 10YR in subhorizons. It is 5 or 6 in value and 6 or 8 in chroma. Where present, B1 and B3 horizons are 4 in chroma. The Bt horizon is sandy clay loam, heavy fine sandy loam, or heavy very fine sandy loam. This horizon is 18 to 30 percent clay. The sand is uniform in size and commonly is near the boundary of fine sand and very fine sand, as it is in any of the profiles. The C horizon is mixed with colors. It is 4 to 8 both in value and in chroma and 10YR to 5YR in hue. The C horizon is loamy fine sand to very fine sandy loam.

Marr soils resemble Westphalia soils but the Bt horizon of Westphalia soils is no more than 10 inches thick and contains less than 18 percent clay. Marr soils do not contain as much medium and coarse sand as Sassafras soils. They are one unit higher in value and in chroma in the Bt horizon. Marr soils may have less weatherable minerals than Sassafras soils.

Marr fine sandy loam, 2 to 5 percent slopes, moderately eroded (MlB2).—This soil has a profile similar to that described as representative of the series, except that in most places the surface layer is thinner. Included with this soil in mapping are a few areas that are nearly level. This soil is suitable for all crops of the area, especially for tobacco. It is also suited to most other uses. On this soil the hazard of further erosion is moderate. Capability unit IIe–5; woodland subclass 3o.

Matapeake Series

The Matapeake series consists of deep, well drained, level to moderately sloping soils. These soils are mostly on terraces above major rivers and streams and also on uplands. They formed in loamy deposits (fig. 15) over older and coarser sediment. The native vegetation is mixed upland hardwoods, mainly oaks.

In a representative profile, the surface layer, about 14 inches thick, is brown to yellowish-brown fine sandy loam. The subsoil, about 26 inches thick, is brown or dark-brown silty clay loam that is sticky. The underlying material, to a depth of 60 inches, is stratified silt loam and fine sandy loam of mixed colors.

Matapeake soils are easy to work when the moisture content is favorable, and they warm readily in spring. They have high available moisture capacity and are among the most suitable soils for farming in the county. These soils are suited to most uses. Slope and the hazard of further erosion are the main limitations to use.

Representative profile of Matapeake fine sandy loam, 0 to 2 percent slopes, in a cultivated area, one-half mile northwest of Wicomico Beach.

Figure 15.—**Matapeake silt loam on the left, grading to Chillum silt loam on the right. The Chillum soil is only about 2 feet deep over hard gravel. The Matapeake soil is entirely silty material to a depth of at least 5 feet.**

Ap—0 to 10 inches, brown (10YR 5/3) fine sandy loam; weak, fine, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

A2—10 to 14 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine, granular structure; friable; common roots; strongly acid; clear, wavy boundary.

B21t—14 to 34 inches, brown or dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; slightly firm, sticky and slightly plastic; common roots in upper part and a few in lower part; distinct, almost continuous clay films; a few fine, smooth pebbles; very strongly acid; gradual, wavy boundary.

B22t—34 to 40 inches, brown or dark-brown (7.5YR 4/4) silty clay loam; moderate, coarse, subangular blocky structure; firm, sticky and plastic, a few roots; patchy clay films; a few pinkish-gray (7.5YR 6/2) variegations or mottles; very strongly acid; clear, wavy boundary.

IIC—40 to 60 inches, variegated gray (10YR 5/1) and brownish-yellow (10YR 6/6) thinly stratified silt loam and fine sandy loam; friable to firm; very strongly acid.

The solum generally ranges from 24 to 40 inches in thickness. In places fine smooth pebbles occur in the profile, but they generally are only in the C horizon. The A horizon is 10YR or 2.5Y in hue, 3 to 6 in value, and 1 to 4 in chroma. Undisturbed A1 horizons less than 6 inches thick are 3 in value and 1 in chroma. The A horizon is either fine sandy loam or silt loam in texture. The B horizon is 10YR or 7.5YR in hue, 4 or 5 in value, and 4, 6, or 8 in chroma, but chroma is seldom 8. The Bt horizon is silt loam or silty clay loam. The clay content of this horizon is about 18 to 30 percent. The IIC horizon varies in color, and it is stratified in places. Where it is not stratified, texture ranges from loam to loamy sand.

Matapeake soils resemble Wickham, Chillum, Marr, and Sassafras soils in color and in natural drainage. The C horizon of Matapeake soils is more friable and contains less gravel than that of Chillum soils. Matapeake soils contain much more silt and less sand in the solum than Marr, Wickham, and Sassafras soils. They formed in the same kind of material as the well-drained Chillum soils, the moderately well drained Beltsville and Mattapex soils, and the poorly drained Leonardtown and Othello soils.

Matapeake fine sandy loam, 0 to 2 percent slopes (MmA).—The profile of this soil is the one described as representative of the series. This soil is somewhat easier to work and can be worked over a wider range of moisture than Matapeake silt loam. Under good management, this soil has few limitations that affect farming or other uses. This soil is one of the most productive in the county for tobacco. Capability unit I–5; woodland subclass 3o.

Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded (MmB2).—The fine sandy loam surface layer of this soil is only about 6 to 9 inches thick. Most of the original surface has been lost through erosion. If erosion is controlled, this soil is well suited to farming and other uses. Capability unit IIe–5; woodland subclass 3o.

Matapeake silt loam, 0 to 2 percent slopes (MnA).—This soil has a profile similar to that described as representative of the series except that the surface layer has considerably more silt and less fine sand than Matapeake fine sandy loam. For this reason, it is somewhat harder to work but retains more moisture for plants than fine sandy loam. Under good management, this soil has few limitations that affect use. Capability unit I–4; woodland subclass 3o.

Matapeake silt loam, 2 to 5 percent slopes, moderately eroded (MnB2).—The silt loam surface layer of this soil is only about 6 to 9 inches thick. Included in mapping are a few areas that are more severely eroded. Under good management, the soil is suited to most uses. The hazard of

further erosion is moderate in places where the soil is tilled. Capability unit IIe–4; woodland subclass 3o.

Matapeake silt loam, 5 to 10 percent slopes, moderately eroded (MnC2).—Much of the surface layer of this soil has been lost and in places plowing turns up a part of the subsoil which gives cultivated areas a spotty appearance. Included in mapping are small areas where the remaining surface layer is sandier than that described. The hazard of further erosion is severe in places where the soil is tilled. Under good management, this soil can be safely and regularly cultivated. It is also suited to pasture and trees. Capability unit IIIe–4; woodland subclass 3o.

Matapeake silt loam, 5 to 10 percent slopes, severely eroded (MnC3).—Most of the original surface layer of this soil has been washed away. In places where the soil is plowed, the new surface layer is sticky, and runs together when wet and crusts over when dry. The soil is not suited to cultivated crops. If carefully managed, it could be used for pasture or trees. Capability unit IVe–3; woodland subclass 3o.

Matawan Series

The Matawan series consists of soils that are nearly level to gently sloping, moderately well drained to well drained, and deep. They have a thick sandy surface layer and a clayey subsoil through which water moves slowly. These soils formed on uplands in a sandy mantle over loamy sediment. The native vegetation consists of hardwood, mainly oak, sweetgum, and red maple. Some Virginia pine also grows.

In a representative profile the surface layer, about 19 inches thick, is loamy sand. The upper 10 inches is light brownish gray, and the lower 9 inches is light yellowish brown. The upper layer of the subsoil, about 8 inches thick, is light yellowish-brown, firm sandy clay loam. The middle part of the subsoil, about 13 inches thick, is light olive-brown, very firm clay loam mottled with gray and other colors. The lower part of the subsoil, about 10 inches thick, is brownish-yellow sandy clay loam that is also mottled. The underlying material, to a depth of about 60 inches, is light brownish-gray, mottled, stratified silt loam.

Matawan soils are easy to work. For short periods in winter and spring, however, the water table is within 2 to 3 feet of the surface, so planting is delayed. Limitations for some nonfarm uses are moderate to severe because of seasonal wetness. Permeability is slow. These soils have a moderate available moisture capacity.

Representative profile of Matawan loamy sand, in a level cultivated area about 1 mile northwest of La Plata:

Ap—0 to 10 inches, light brownish-gray (2.5Y 6/2) loamy sand; weak, medium, granular structure; very friable; many roots; very strongly acid; abrupt, smooth boundary.

A2—10 to 19 inches, light yellowish-brown (2.5Y 6/4) heavy loamy sand; very weak, medium, subangular blocky structure; friable; many roots; about 5 percent fine smooth pebbles; very strongly acid; clear, smooth boundary.

B21t—19 to 27 inches, light yellowish-brown (10YR 6/4) sandy clay loam, variegated with yellowish-brown (10YR 5/8); weak, medium and coarse, subangular blocky structure; firm, sticky and slightly plastic; a few roots; thin, pale-brown (10YR 6/3) clay films; very strongly to extremely acid; clear, smooth boundary.

IIB22t—27 to 40 inches, light olive-brown (2.5Y 5/4) clay loam, many, medium, distinct mottles of gray or light gray (5Y 6/1), and a few, medium, distinct mottles of reddish brown (5YR 5/4); very weak, medium, platy structure and weak, medium, blocky structure; dense, very firm, sticky and plastic; a very few roots; light yellowish-brown (2.5Y 6/4) clay films; extremely acid; abrupt, wavy boundary.

IIB23t—40 to 50 inches, brownish-yellow (10YR 6/6) sandy clay loam; common, medium, distinct mottles of gray or light gray (5Y 6/1) and a few, medium, distinct mottles of strong brown (7.5YR 5/8); very weak, thick, platy structure; firm, sticky and slightly plastic; a few roots; thin patchy clay films; about 5 percent fine smooth gravel and some soft, white skeletans: extremely acid; clear, wavy boundary.

IIICg—50 to 60 inches, light brownish-gray (10YR 6/2) silt loam, common, fine, distinct mottles of brown (7.5 YR 5/2) and yellowish brown (10YR 5/8); stratified; firm, slightly sticky and slightly plastic; no roots; a few, soft, white skeletans; extremely acid.

The solum ranges from 30 to 50 inches in thickness. Depth to the first unconforming material is 22 to 34 inches. The A horizon is 10YR or 2.5Y in hue, 4 to 6 in value, and 2 to 6 in chroma. The A2 horizon is higher in chroma. The B21t horizon generally is 10YR in hue, but in places it is variegated with redder hues. It is 5 or 6 in value and 4 or 6 in chroma. The B22t horizon is 2.5Y or 5Y in hue, 5 or 6 in value, and 3 to 6 in chroma. The B22t horizon is clay loam to sandy clay. The B23t horizon, which is variable in color and in texture, is absent in places. The C horizon is 1 or 2 units higher in value and 2 or more units lower in chroma than in the B22t horizon. This horizon consists of unconforming stratified material of almost any texture or mixture of textures.

Matawan soils resemble Woodstown soils, but the A horizon of Matawan soils is thicker and coarser. They are also more slowly permeable in the B22t horizon. Matawan soils are somewhat better drained than Woodstown soils.

Matawan loamy sand (Ms).—This is the only Matawan soil mapped in the county. Included in mapping are a few small areas where the surface layer is fine sandy loam and also a few areas where the surface layer is somewhat gravelly. This soil is suited to common crops, but seasonal wetness and sandiness of the surface layer are limitations. It is also suited to pasture and trees, but it is seldom used for pasture. Capability unit IIw–10; woodland subclass 2o.

Mattapex Series

The Mattapex series consists of level to moderately sloping, deep, moderately well drained soils. These soils are chiefly in low-lying areas bordering major rivers of the county. They formed in loamy deposits underlain by older, coarser sediment. The native vegetation is mixed wetland hardwoods.

In a representative profile the surface layer, about 13 inches thick, is silt loam. It is grayish brown in the upper 7 inches and yellowish brown below. The subsoil, about 23 inches thick, is yellowish-brown silty clay loam or silt loam that is mottled with gray in the lower part. Underlying the subsoil, fine sandy loam mottled with yellowish brown and gravelly loamy sand extend to a depth of 72 inches.

Mattapex soils are easy to work, but in winter and in spring they are limited by the presence of a high water table. Available moisture capacity is high. Permeability is moderately slow on these soils. These soils generally are intensively farmed. Seasonal wetness and impeded drainage are limitations for nonfarm uses.

Representative profile of Mattapex silt loam, 0 to 2 percent slopes, in an idle area on Taylors Neck Road, about 3½ miles north of Riverside:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable, slightly sticky; many roots; medium acid (limed); abrupt, smooth boundary.

A2—7 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; strongly acid; clear, smooth boundary.

B21t—13 to 26 inches, yellowish-brown (10YR 5/8) heavy silt loam; weak, fine, subangular blocky structure; friable to firm, slightly sticky and slightly plastic; a few roots; faint, almost continuous clay films; very strongly acid; gradual, smooth boundary.

B22t—26 to 36 inches, yellowish-brown (10YR 5/6) silty clay loam; a few, medium, prominent mottles of light gray (2.5Y 7/2); weak, fine, blocky structure; firm, slightly sticky and slightly plastic; distinct continuous, pale-brown (10YR 6/3) clay films; strongly acid; clear, wavy boundary.

IIC1g—36 to 58 inches, light brownish-gray (2.5Y 6/2) fine sandy loam, variegated with pale olive (5Y 6/3); common, medium, prominent mottles of yellowish brown (10YR 5/8); massive, slightly sticky; a few roots; very strongly acid; abrupt, smooth boundary.

IIIC2—58 to 72 inches, brown or dark-brown (7.5YR 4/4) gravelly loamy sand; single grain; loose; pebbles mostly less than one-half inch in diameter; extremely acid.

The solum ranges from about 24 to 40 inches in thickness. It is either 10YR or 2.5Y in hue. The A horizon is fine sandy loam or silt loam. It is 3 to 5 in value and 1 to 4 in chroma. Where the A1 horizon less than 6 inches thick occurs in undisturbed areas, it is lowest in chroma, and the A2 horizon is highest in chroma. In the B horizon, the matrix is 5 or 6 in value, and 4 to 8 in chroma. The B22t horizon always has mottles of 2 or less in chroma. The Bt horizon is silt loam or silty clay loam that is 18 to 30 percent clay.

The IIC horizon commonly is variegated, and the material in this horizon is older and sandier than that in the solum. The IIIC horizon, whenever it is in the profile, is vastly different from the IIC horizon. The C horizon is gravelly in places.

Mattapex soils resemble Beltsville, Bourne, Exum, Iuka, Keyport, and Woodstown soils in color and in natural drainage. Iuka soils do not have a Bt horizon. Mattapex soils have a Bt horizon that is less clayey than that in Keyport soils. Beltsville and Bourne soils have a fragipan in the lower part of the subsoil. The Bt horizon of Mattapex soils contains more silt and less sand than that of Woodstown and Exum soils.

Mattapex fine sandy loam, 0 to 2 percent slopes (MtA).—This soil has a profile similar to that described as representative of the series, except that its surface layer has less silt and more fine sand. It is thus easier to work and is ready for planting earlier than Mattapex silt loam, 0 to 2 percent slopes. Improved drainage makes this soil well suited to crops and pasture. Undrained areas are limited to selected crops. Capability unit IIw–5; woodland subclass 3o.

Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded (MtB2).—This soil has lost most of its original surface layer and in many areas the subsoil is almost exposed, and shallow to deep gullies have formed. The profile otherwise is similar to that of the profile representative of the series. This soil is limited by seasonal wetness, and further erosion is moderate if it is tilled. Under good management, the soil is suited to crops, pasture, and trees. Capability unit IIe–36; woodland subclass 3o.

Mattapex silt loam, 0 to 2 percent slopes (MuA).—This soil has the profile described as representative of the series. Impeded drainage is the principal limitation to use. Improved drainage makes this soil well suited to crops. The choice of crops that can be grown on undrained areas is limited. Capability unit IIw–1; woodland subclass 3o.

Mattapex silt loam, 2 to 5 percent slopes, moderately eroded (MuB2).—The profile of this soil is like the one described as representative of the series, except that mottling in the lower subsoil is not so light and so prominent. This soil has good surface drainage and does not need improved drainage for some crops. The hazard of further erosion is moderate, and controlling erosion is the chief concern of management. Capability unit IIe–16; woodland subclass 3o.

Mattapex soils, 5 to 12 percent slopes (MxC).—The surface layer of this soil is fine sandy loam or silt loam. Included in mapping are many small, severely eroded areas where shallow gullies have cut into the soil. Also included are areas where the subsoil is more grayish than that of the soil described as representative of the series. The hazard of erosion is severe wherever crop residue is removed. Capability unit IIIe–16; woodland subclass 3o.

Ochlockonee Series

The Ochlockonee series consists of nearly level to gently sloping, deep, well-drained soils in upland depressions and on foot slopes. These soils formed in recently deposited material that was washed from soils on adjacent uplands. The native vegetation is mixed hardwoods, and the stands consist mainly of oaks.

In a representative profile the surface layer, about 17 inches thick, is brown or dark-brown fine sandy loam. The underlying material, to a depth of 60 inches, is yellowish brown and light yellowish brown. It is silt loam in the upper 22 inches and very gravelly fine sandy loam in the lower 21 inches, where it is mottled with strong brown and light gray.

Ochlockonee soils are easy to work. Seasonally, the water table may be within 40 inches of the surface, but most of the time it is much lower. The soils have moderate available moisture capacity and are moderately permeable. Limitations are slight to moderate for most nonfarm uses.

Representative profile of Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes, in a cultivated area about 2½ miles northwest of La Plata:

A1p—0 to 9 inches, brown or dark-brown (10YR 4/3) fine sandy loam; weak, medium and coarse, granular structure; friable, slightly sticky; many roots; medium acid (limed); abrupt, smooth boundary.

A12—9 to 17 inches, brown (10YR 5/3) fine sandy loam; weak, coarse, granular structure; friable, slightly sticky; common roots; strongly acid; clear, wavy boundary.

C1—17 to 39 inches, yellowish-brown (10YR 5/6) light silt loam; massive; friable, slightly sticky and slightly plastic; a few roots; very strongly acid; abrupt, smooth boundary.

C2—39 to 60 inches, light yellowish-brown (2.5Y 6/4) very gravelly fine sandy loam, many, medium, distinct mottles of light gray (5Y 7/1) and common, medium, prominent mottles of strong brown (7.5YR 5/6); single grain; very friable, slightly sticky; a few roots; about 50 percent, by volume, is pebbles as much as about 1 inch thick; extremely acid.

Above, the material is 10YR or 7.5YR in hue and about 40 inches below it commonly is 2.5Y. The A horizon is 4 or 5 in value and 2 to 4 in chroma. The C1 horizon is 4 to 6 in value and 3 to 6 in chroma. It ranges from sandy loam to silt loam in texture, or is stratified with two or more textures. The C2 horizon is about 3 feet deep or more and is commonly gravelly. This horizon generally is higher in value and lower in chroma than the C1 horizon and in places mottles are absent. Mottles with 2 or less than 2 in chroma generally are at least

40 inches below the soil surface. The texture of this horizon is highly variable. Clay in the C horizon is less than 18 percent.

Ochlockonee soils resemble Evesboro, Marr, Matapeake, Sassafras, Westphalia, and Wickham soils in color. Ochlockonee soils lack the Bt horizon of those soils. They are not so sandy as the excessively drained Evesboro soils. Associated with Ochlockonee soils are local alluvium phases of the moderately well drained Iuka soils.

Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes (OcB).—This is the only Ochlockonee soil mapped in the county. This soil is in and around slight upland depressions and at the bases of slopes of other upland soils. Included in mapping are a few areas where the soil is siltier than this soil. Also included are small areas where slopes are more than 5 percent. The hazard of erosion is moderate on the more sloping areas. This soil is well suited to most crops, but where it occurs in depressions, late planting is sometimes necessary because of frost pockets in spring. This soil is also suited to pasture and trees. Capability unit IIe-6; woodland subclass 1o.

Osier Series

The Osier series consists of nearly level, deep, poorly drained soils that formed in old deposits of loamy sand. These soils are wet, and most of them are near areas of very sandy soils that are better drained. The native vegetation is mainly wetland hardwoods, but pond pine grows in places.

In a representative profile the surface layer, about 12 inches thick, is light brownish gray loamy sand that is mottled with yellowish brown in the lower part. The underlying material, to a depth of about 60 inches, is loose loamy sand that is light gray to grayish brown and is mottled with yellowish brown and pale brown.

Osier soils are easy to work if they are artificially drained. Seasonal wetness and extreme sandiness are severe limitations to most uses. These soils have low available moisture capacity.

Representative profile of Osier loamy sand, in a level wooded area on the west side of River Road, about 1¾ miles south of Marshall Hall:

A11—0 to 5 inches, light brownish-gray (10YR 6/2) loamy sand; very weak, coarse, granular structure; very friable; many roots; very strongly acid; clear, smooth boundary.

A12—5 to 12 inches, light brownish-gray (10YR 6/2) loamy sand; common, medium, faint mottles of yellowish brown (10YR 5/6); very weak, medium, granular structure; very friable; many roots; very strongly acid; clear, smooth boundary.

C1—12 to 20 inches, light-gray (10YR 7/1) loamy sand; common, medium, faint mottles of light yellowish brown (2.5Y 6/4); single grain; loose; a few roots; very strongly acid; gradual, smooth boundary.

C2—20 to 48 inches, light brownish-gray (2.5Y 6/2) loamy sand; common, fine to medium, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8), and common, medium, faint mottles of pale brown (10YR 6/3); single grain; loose; a few roots in upper part; very strongly acid to extremely acid; clear, smooth boundary.

C3—48 to 60 inches, grayish-brown (10YR 5/2) loamy sand; single grain; loose; spherical inclusions of brown (10YR 5/3), heavy, loamy sand; very strongly to extremely acid.

The entire profile is 10YR or 2.5Y in hue. A few fine quartz pebbles are likely in all horizons. The A1 horizon is 3 to 6 in value and 1 or 2 in chroma. Very thin A11 horizons are 3 in value. The C horizon is 4 to 7 in value and 1 or 2 in chroma. Where present, mottles are 7.5YR to 2.5Y in hue and are as much as 8 in chroma. The C1 horizon is loamy sand, and the C2 and C3 horizons are either loamy sand, sand, or fine sand.

Osier soils resemble several soils of the county in color and in natural drainage, but they are looser and sandier throughout than those soils. The excessively drained Evesboro soils, the somewhat excessively drained Galestown soils, and Osier soils formed in similar material.

Osier loamy sand (Or).—This is the only Osier soil mapped in the county. It is nearly level, but in a few places slopes are as great as 3 percent. Included in mapping are small areas where the surface layer and the subsoil are browner than that described. These areas commonly are not so wet as this soil. Osier loamy sand is poorly suited to most crops and to pasture, but some corn and soybeans are grown, though yields generally are low. Most areas of this soil are idle or are in woodland. Capability unit IVw-6; woodland subclass 2w.

Othello Series

The Othello series consists of nearly level, deep, poorly drained soils on upland flats and on low terraces adjacent to some major streams. These soils formed in old loamy deposits that are underlain by older sandy sediments. The native vegetation is wetland hardwoods, but some loblolly pine and pond pine also grows.

In a representative profile the surface layer is silt loam about 11 inches thick. It is dark gray in the thinner upper part and light brownish gray mottled with yellowish brown in the lower part. The subsoil, about 18 inches thick, is gray or light-gray silt loam or silty clay loam. It is mottled with strong brown or yellowish brown. The underlying material, to a depth of 60 inches, is gray loamy sand streaked with grayish brown.

Othello soils are easy to work at a favorable moisture content. The seasonal water table, however, is high and these soils are wet for long periods. They have high available moisture capacity. Permeability is moderately slow. Artificial drainage is needed for most crops. Poor internal drainage and the high water table are severe limitations to nonfarm uses.

Representative profile of Othello silt loam, in a level wooded area about one-half mile southwest of Woodberry Beach:

A1—0 to 2 inches, dark-gray (5Y 4/1) silt loam; moderate, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; very strongly acid; abrupt, smooth boundary.

A2g—2 to 11 inches, light brownish-gray (2.5Y 6/2) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); weak, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; extremely acid; clear, smooth boundary.

B21tg—11 to 20 inches, gray or light-gray (5Y 6/1) heavy silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable to firm, sticky and plastic; a few roots; distinct gray (5Y 5/1) clay films; extremely acid; gradual, smooth boundary.

B22tg—20 to 29 inches, gray or light-gray (5Y 6/1) light silty clay loam; common, coarse, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, blocky structure; firm, sticky and plastic; a few roots; distinct, gray (5Y 5/1) clay films; extremely acid; abrupt, smooth boundary.

IICg—29 to 60 inches, gray (N 5/0) loamy sand, streaked with grayish brown (2.5Y 5/2); single grain; very friable; a few, fine, smooth pebbles; very strongly acid.

The thickness of the solum ranges from about 24 to 40 inches, but it generally is within the thinner part of this range. The matrix is 10YR in hue or yellower, and neutral in some horizons. The A horizon is 4 to 6 in value and 0 to 2 in chroma. It is either fine sandy loam or silt loam in texture. Undisturbed A2 horizons are highest in value. In the B horizon, the matrix is 5 to 7 in value and 0 or 1 in chroma. Mottles are 10YR or 7.5YR in hue, 5 or 6 in value and 3 to 8 in chroma. The Bt horizon is silt loam or silty clay loam in texture. It has an average clay content of 18 to 30 percent. In places, the lower part of this horizon is weak and platy. In texture, the C horizon is sandy loam or coarser and is similar to the B horizon in color. In some profiles it is gravelly.

Othello soils resemble the Bibb, Elkton, Fallsington, Leonardtown, and Osier soils in color and in natural drainage. They have a Bt horizon that is not present in Osier soils and Bibb soils on flood plains. The Bt horizons of Elkton soils are more clayey than those of Othello soils. Leonardtown soils have a dense fragipan in the lower part of the subsoil.

Othello fine sandy loam (Os).—This soil has a profile similar to that described as representative of the series, except that its surface layer contains less silt and more fine or very fine sand. Also, the subsoil is more clayey than in Othello silt loam. This soil is nearly level, but in a few places slopes are as great as 3 percent. Artificial drainage is needed for cultivated crops, pasture, and trees. The chief crops are corn and soybeans. Capability unit IIIw–6; woodland subclass 3w.

Othello silt loam (Ot).—This is the soil described as representative of the series. It is nearly level, but in a few places slopes are as great as 3 percent. It is not so easy to work and to drain as Othello fine sandy loam. Artificial drainage is needed for cultivated crops, pasture, and trees. The chief crops are corn and soybeans. Capability unit IIIw–7; woodland subclass 3w.

Rumford Series

The Rumford series consists of level to moderately sloping, deep, somewhat excessively drained soils on uplands. These soils formed in stratified, sandy marine deposits that contain small amounts of silt and clay and variable amounts of fine gravel. The native vegetation is chiefly mixed hardwoods and Virginia pine.

In a representative profile the surface layer, about 12 inches thick, is loamy sand. It is dark grayish brown in the thinner upper part and pale brown in the lower part. The subsoil, about 20 inches thick, is brown to strong-brown sandy loam or sandy clay loam. The underlying material, to a depth of 52 inches, is strong-brown light sandy loam that is stratified.

Rumford soils are easy to work. Permeability is rapid, and available moisture capacity is low to moderate. These soils warm quickly in spring and are among the first soils in the county to be ready for planting. They are well suited to tobacco. Sandiness and the hazard of further erosion are the chief limitations to use.

Representative profile of Rumford loamy sand, in a gently sloping wooded area on the north side of Taylors Neck Road, about 3 miles north of Riverside:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) loamy sand; very weak, medium, granular structure; very friable; many roots; a few clean, coarse sand grains; strongly acid; abrupt, smooth boundary.

A2—2 to 12 inches, pale-brown (10YR 6/3) loamy sand; very weak, fine, granular structure; very friable; common roots; strongly acid; clear, wavy boundary.

B2t—12 to 22 inches, brown (7.5YR 5/4) light sandy clay loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few roots; thin discontinuous clay films; very strongly acid; clear, smooth boundary.

B3—22 to 32 inches, strong-brown (7.5YR 5/6) sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; a few roots; a few faint clay films; sand grains coated; very strongly acid; clear, smooth boundary.

C—32 to 52 inches, strong-brown (7.5YR 5/6) light sandy loam; stratified; very friable; very strongly acid.

The solum ranges from about 28 to 40 inches in thickness. These soils generally are free of gravel, but in places they are as much as 20 percent fine quartz gravel. The A horizon ranges from loamy sand to sandy loam in texture and is less than 20 inches thick. This horizon is 10YR or 2.5Y in hue, 4 to 6 in value, and 2 to 4 in chroma. The value of 6 is confined to the A2 horizon. The B horizon is 10YR to 5YR in hue. In the transitional B1 and B3 horizons, hue is 10YR. The Bt horizon is 4 or 5 in value and 4 to 8 in chroma. It generally is sandy loam or light sandy clay loam. The clay content is less than 18 percent, and it is 10 inches or less in thickness. The C horizon generally is coarser than the B horizon. It is variegated and commonly is stratified.

Rumford soils resemble Westphalia soils, but they have a thicker and coarser A horizon, and the sand in Rumford soils is not so fine and uniform in size as in Westphalia soils. In Charles County some of the Rumford soils contain more gravel than the defined range for the series, but this difference does not alter the usefulness or behavior of these soils.

Rumford loamy sand, 0 to 5 percent slopes, moderately eroded (RdB2).—This soil has a profile similar to that described as representative of the series except that in most places its surface layer is thinner. In places it is somewhat gravelly below 3 feet from the surface. Included in mapping are small areas, mainly in the northwestern part of the county, where the subsoil is yellower than that of this soil. This soil is suited to cultivated crops, mainly tobacco, and also to pasture and trees. Available moisture capacity is low to moderate, which is the chief limitation to farming. Further erosion is a moderate hazard on sloping areas. Capability unit IIs–4; woodland subclass 3o.

Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RdC2).—This soil has a profile similar to that of the soil described as representative of the series except that its surface layer is 8 to 10 inches thick. This soil is nearly free of gravel. Included in mapping are areas where the surface layer is thinner than that of this soil and where plowing exposes the subsoil in places. This soil is suited to crops, pasture, and trees. Available moisture capacity is low to moderate. The hazard of further erosion is severe in places where the soil is tilled. The low to moderate available moisture capacity and the hazard of further erosion are chief limitations to use. Capability unit IIIe–33; woodland subclass 3o.

Rumford gravelly sandy loam, 0 to 5 percent slopes, moderately eroded (RgB2).—This soil has a profile similar to that described as representative of the series except that the surface layer is light sandy loam that is 15 to 20 percent fine quartz pebbles. Below the surface layer, the gravel content varies, but it generally is higher in the underlying material. The soil is suited to cultivated crops and is used mostly for tobacco. It is also suited to pasture and trees. Available moisture capacity is low to moderate and is the chief concern of management. The hazard of further erosion is moderate. Capability unit IIs–4; woodland subclass 3o.

Rumford gravelly sandy loam, 5 to 10 percent slopes, moderately eroded (RgC2).—This soil has lost a part of its original surface layer through erosion, and in most

places the remaining surface layer is 6 to 10 inches thick. Also, in places pebbles left behind by erosion are on the surface and in shallow gullies that have cut through the soil. This soil otherwise has a profile similar to that of the soil described as representative of the series. It generally is more gravelly than similar soils that are more gently sloping. The hazard of further erosion is severe in places where the soil is tilled. Under careful management, however, this soil is suited to cultivated crops, pasture, and trees. Capability unit IIIe–33; woodland subclass 3o.

Sandy Land

Sandy land consists of exposures of very sandy soils along the steep ravines and stream valleys, mainly in the eastern part of the county. Most of the sediment is similar to the sandy material that underlies the Evesboro, Galestown, and Westphalia soils.

The only mapping unit is Sandy land, steep (SaE). It is mostly sand or fine sand containing gravel that is pale yellow to yellowish brown. In places finer material extends to a moderate depth. Slopes range from about 12 percent to more than 40 percent. Some areas are severely eroded but are still in use. Most areas are rewooded, but others are idle, and still others are in brush. Sandy land, steep, is not well suited to farming. Limitations are severe for most nonfarm uses. Capability unit VIIs–1; woodland subclass 3s.

Sassafras Series

The Sassafras series consists of nearly level to moderately sloping, deep, well-drained soils on uplands. These soils formed in loose deposits of loamy and sandy sediment of marine and alluvial origin. The native vegetation is mixed hardwoods, mainly oaks, but Virginia pine and loblolly pine grow in some places.

In a representative profile the surface layer is sandy loam about 8 inches thick. This layer is grayish brown in the thinner upper part and brown in the lower part. The upper part of the subsoil, about 4 inches thick, is yellowish-brown fine sandy loam. The lower part, about 26 inches thick, is strong-brown sandy clay loam that is friable. The underlying material to a depth of 60 inches is loose loamy sand of various colors.

Sassafras soils are easy to work. They have moderate available moisture capacity and are moderately permeable. Slope and the hazard of further erosion are the chief limitations to farming and nonfarm uses.

Representative profile of Sassafras sandy loam, 0 to 2 percent slopes, in a wooded area about one-half mile west of Malcolm:

A1—0 to 3 inches, grayish-brown (10YR 5/2) sandy loam; weak, fine, granular structure; friable, many roots; strongly acid; clear, wavy boundary.

A2—3 to 8 inches, brown (10YR 5/3) sandy loam; weak, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) heavy fine sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; strongly acid; gradual, wavy boundary.

B21t—12 to 28 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thin, almost continuous clay films; strongly acid; gradual, wavy boundary.

B22t—28 to 38 inches, strong-brown (7.5YR 5/6) light sandy clay loam; weak, medium and coarse, subangular blocky structure; friable, slightly sticky; a few roots; thin, discontinuous clay films; strongly acid; gradual, wavy boundary.

C—38 to 60 inches, variegated yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) loamy sand; single grain; loose; very strongly acid.

The solum ranges from about 30 to 40 inches in thickness. The profile contains fine, smooth quartz pebbles, but these pebbles are abundant only in the C horizon. The A horizon is 10YR in hue, 3 to 5 in value, and 1 to 4 in chroma. The lowest value and chroma are confined to some A1 horizons less than 6 inches thick. The B horizon is 10YR to 5YR in hue, 5 or 6 in value, and 4 to 8 in chroma. The Bt horizon generally is sandy clay loam, but it ranges to heavy sandy loam and heavy loam. The clay content is 18 to 27 percent and the silt content is 20 to 35 percent. The C horizon is similar to the B horizon in color, but it is variegated in places and is coarser textured. The C horizon is as coarse or coarser than the A horizon. In some places the C horizon is moderately hard and brittle when dry.

Sassafras soils resemble Chillum, Marr, Matapeake, Rumford, and Wickham soils, but they contain less silt and more sand in the solum than Chillum and Matapeake soils. Sassafras soils have more clay in the Bt horizons than Rumford soils, and they contain more medium and coarse sand and weatherable minerals than Marr soils. Sassafras soils have a thinner solum than Wickham soils and commonly have less clay and more sand in the Bt horizon than those soils.

Sassafras sandy loam, 0 to 2 percent slopes (ShA).—The profile of this soil is the one described as representative of the series. Included with this soil in mapping are small areas where the surface layer is siltier than that of this soil. Also included are areas where the surface layer and the subsoil are redder than those of this soil. Under good management, this soil is suited to farming and to many nonfarm uses, and limitations to use are few. Capability unit I–5; woodland subclass 3o.

Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded (ShB2).—This soil has a thinner surface layer than that of the soil described as representative of the series but the two profiles otherwise are similar. In places this soil is severely eroded or is cut by shallow gullies. Included with this soil in mapping are silty areas where the surface layer and subsoil are redder than those of this soil. Also included are spots where the underlying material is hard and brittle. This soil is suited to cultivated crops, pasture, trees, and most other uses. The hazard of further erosion is moderate. Capability unit IIe–5; woodland subclass 3o.

Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded (ShC2).—This soil has lost most of its original surface layer through erosion, and in many places plowing exposes small amounts of subsoil, which gives the areas a spotty appearance. Under good management the soil is suited to most uses. The hazard of further erosion is severe in places where the soil is tilled. Capability unit IIIe–5; woodland subclass 3o.

Sassafras sandy loam, 5 to 10 percent slopes, severely eroded (ShC3).—This soil has lost most of its original surface layer, and in places some of its subsoil. The present surface layer is yellowish brown to strong brown and somewhat sticky. It is difficult to cultivate. This soil is marginal for tillage and should seldom be cultivated. It is better suited to pasture, hay crops, or trees. Capability unit IVe–5; woodland subclass 3o.

Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded (ShD2).—Most of this soil is in woodland. Where it has been cleared, moderate amounts of surface soil have been lost through erosion, and plowing exposes some of the subsoil. Included with this soil in mapping are areas where the surface layer contains more silt and less sand than this soil. Also included are a few areas where the surface layer is thicker and sandier than this soil. Spots where the lower part of the subsoil is mottled with gray are also included. The soil is suited to pasture, orchards, trees, and a few cultivated crops. Capability unit IVe–5, woodland subclass 3o.

Sassafras sandy loam, 10 to 15 percent slopes, severely eroded (ShD3).—The present surface layer of this soil consists mostly of material formerly in the subsoil. It is sticky and crusts when dry. The areas are cut by many gullies. Included with this soil in mapping are places where the subsoil is mottled with gray. Also included are areas where the underlying material is hard and brittle. The hazard of further erosion is severe. This soil is not suited to crops. Capability unit VIe–2; woodland subclass 3o.

Swamp

Swamp (Sx) consists of areas of very wet land that is covered by fresh water most of the time. These areas are mostly in depressions on flood plains or in former estuaries that are almost filled with silt, sand, gravel, and organic material. Swamp is not used for farming. It generally is wooded with such trees as red maple, swamp magnolia, ash, and pond pine. A few trees are suitable for wood products, but the trees generally have little value for commercial purposes. Cattails, sedges, and various herbs are in open areas. Included in mapping are a few brackish areas near the heads of tidal estuaries. Wetness is a severe limitation. The areas of Swamp are suited to some wetland wildlife habitat. Capability unit VIIw–1; woodland subclass not assigned.

Tidal Marsh

Tidal marsh (Tm) is in estuaries along the lower sides of streams and in low areas that border the major rivers (fig. 16). Some areas are flooded daily by tidal waters, and others are flooded less frequently. The tidal waters vary in salinity from almost fresh to strongly brackish. The soil material generally ranges from sand to clay, but in places it is peaty or mucky. The vegetation is marsh grasses and sedges that contain some salt-tolerant herbs and low shrubs. Tidal marsh is not suited to crops, pasture, or trees. It is suitable for use as habitat for wetland wildlife and for recreation. Capability unit VIIIw–1; woodland subclass not assigned.

Westphalia Series

The Westphalia series consists of gently sloping to strongly sloping, very deep, well-drained soils on uplands. These soils are mostly in the northeastern part of the county where they formed in old deposits containing sands that are uniform in size. The native vegetation is mixed upland hardwoods, but some Virginia pine and redcedar are in rewooded areas.

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In a representative profile the surface layer, about 9 inches thick, is yellowish-brown fine sandy loam. The upper part of the subsoil, about 9 inches thick, is strong-brown heavy fine sandy loam that is friable and slightly sticky. The lower part, about 7 inches thick, is brownish-yellow, very friable fine sandy loam. The underlying material, to a depth of 72 inches, is pale-yellow and light yellowish-brown loamy fine sand that is loose to very friable.

Westphalia soils are easy to work and they warm early in spring. Available moisture capacity is moderate to high. These soils are not very fertile, but they are well suited to tobacco and to early truck crops. Permeability is moderate to moderately rapid. Slope and the hazard of further erosion are chief limitations to nonfarm uses.

Representative profile of Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded, in a cultivated area near the end of Swanson Creek Road, 1¼ miles northwest of Benedict:

Ap—0 to 9 inches, yellowish-brown (10YR 5/4) fine sandy loam; very weak, coarse, granular structure; friable, slightly sticky; a few roots; very strongly acid; abrupt, smooth boundary.

B2t—9 to 18 inches, strong-brown (7.5YR 5/6) heavy fine sandy loam, that contains less silt and more clay than the Ap horizon; weak, medium, subangular blocky structure; friable, slightly sticky; a few roots; a few thin, dark-brown (7.5YR 4/4) clay films; very strongly acid; clear, smooth boundary.

B3—18 to 25 inches, variegated brownish-yellow (10YR 6/6) and yellow (10YR 7/6) light fine sandy loam; very weak, medium, subangular blocky structure; very friable; a few roots; very strongly to extremely acid; clear, smooth boundary.

C—25 to 72 inches, variegated pale-yellow (2.5Y 7/1) and light yellowish-brown (2.5Y 6/4) loamy fine sand; single grain; loose to very friable; a few roots in upper part; extremely acid.

The solum ranges from about 20 to 36 inches in thickness. The A horizon is 3 to 5 in hue and 2 to 4 in chroma. Undisturbed A1 horizons less than 6 inches thick are 3 in value. The B horizon is 10YR or 7.5YR in hue, 4 to 6 in value, and 6 or 8 in chroma. The Bt horizon is as much as 10 inches thick and is fine sandy loam or very fine sandy loam. It is low in silt and is about 10 to 18 percent clay. The C horizon is paler in hue than the solum. It is higher in value, and in places it is variegated. The C horizon is fine sand, loamy fine sand, or loamy very fine sand that is as much as 10 percent clay.

Westphalia soils resemble Marr and Rumford soils. The Bt horizon in Westphalia soils are thinner and contain less clay than that in Marr soils. They have a thinner and finer A horizon than Rumford soils and the sand throughout their profile is finer and more uniform in size.

Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded (WaB2).—This soil has the profile described as repersentative of the series. Included in mapping are areas that are little affected by erosion, and the surface layer is much thicker than that of this soil. Also included are areas where most of the surface layer has been washed away. This soil is well suited to tobacco. It is also suited to other crops, pasture, and trees. The hazard of further erosion is moderate in places where the soil is tilled. Capability unit IIe–5; woodland subclass 3o.

Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded (WaC2).—This soil is cut by shallow gullies that extend into the subsoil. Included in mapping are a few areas where the upper part of the subsoil is much thicker than that of the soil described as representative of

the series. This soil is well suited to tobacco. The hazard of further erosion is severe in places where the soil is tilled. Under good management, this soil is suited to crops, pasture, and trees. Capability unit IIIe–5; woodland subclass 3o.

Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded (WaC3).—Most of the surface layer of this soil has been washed away and in many places a part of the subsoil has been lost through erosion. Gullies are common, and a few have cut into the loose underlying material. Under good management, this soil is marginal for cultivated crops. It is better suited to pasture, orchards, or trees. Capability unit IVe–5; woodland subclass 3o.

Westphalia fine sandy loam, 12 to 20 percent slopes, moderately eroded (WaD2).—Slope and the severe hazard of further erosion are the main limitations on this soil. Under the best management, this soil is marginal for farming. Tobacco or other row crops are grown, but most of the time the soil should have a cover of protective vegetation; for example, pasture, sodded orchards, or trees. Capability unit IVe–5; woodland subclass 3r.

Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded (WaD3).—The surface layer of this soil has been lost through erosion, and gullies are fairly common. Slope and the erosion hazard limit cultivation. This soil is suited to pasture or trees. Capability unit VIe–2; woodland subclass 3r.

Westphalia-Evesboro complex, 2 to 6 percent slopes, moderately eroded (WeB2).—About 67 percent of this mapping unit is Westphalia soils and about 33 percent is

Figure 16.—Tidal marsh at the mouth of Mattawoman Creek. Indian Head is in the background.

Evesboro soils. The Evesboro soils are more sandy and droughty than Westphalia soils, and they are less productive. Capability unit IIe–5; woodland subclass 3o.

Westphalia-Evesboro complex, 6 to 12 percent slopes, moderately eroded (WeC2).—Westphalia soils make up 50 percent of this mapping unit, and Evesboro soils make up 50 percent. A large part of the surface layer of the Westphalia soils has been washed away, and shallow gullies occur in places. A part of the Evesboro soils has been lost through erosion caused by runoff and also by soil blowing. Where these soils are cultivated, tobacco is the chief crop. These soils are seldom used for pasture. Capability unit IIIe–5; woodland subclass 3o.

Westphalia-Evesboro complex, 6 to 12 percent slopes, severely eroded (WeC3).—Westphalia soils make up 50 percent of this mapping unit, and Evesboro soils make up 50 percent. The Westphalia soils have lost most of their original surface layer. The Evesboro soils consist of loamy sand or gravelly loamy sand that has been severely washed. Gullies are common in all areas, and some gullies are deep. Under good management, these soils are suited to a few cultivated crops, but they are little used for this purpose. Most areas are idle or are rewooded. Capability unit IVe–5; woodland subclass 3o.

Wickham Series

The Wickham series consists of gently sloping to moderately sloping, deep, well-drained soils on ancient terraces of the Potomac River. These soils formed in old loamy deposits that contain mica and other weatherable minerals and a small amount of silt. The native vegetation is mixed upland hardwoods and Virginia pine.

In a representative profile the surface layer, about 9 inches thick, is yellowish-brown fine sandy loam. The subsoil, about 46 inches thick, is yellowish red, and the lower part is variegated. The upper 11 inches is firm sandy clay loam, the next 16 inches is firm clay loam, and the lower 19 inches is friable fine sandy loam. The underlying material, to a depth of 64 inches, is a dominantly red, stratified sandy loam.

Wickham soils are easy to work except in places where they are severely eroded. They have high available moisture capacity and are moderately permeable. Slope and the hazard of further erosion are chief limitations to use.

Representative profile of Wickham fine sandy loam, 2 to 5 percent slopes, moderately eroded, in a rewooded area, on the east side of Maryland Point Road, about one-half mile south of Route 6:

Ap—0 to 9 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, coarse, granular structure; friable, slightly sticky; many roots; very strongly acid; abrupt, smooth boundary.

B21t—9 to 20 inches, yellowish-red (5YR 5/6) sandy clay loam; strong, fine and medium, subangular blocky structure; firm, sticky and slightly plastic; a few roots; thin, continuous clay films; strongly acid; clear, smooth boundary.

B22t—20 to 36 inches, yellowish-red (5YR 4/6) clay loam, faintly variegated with higher chroma in lower portion; moderate, fine, blocky structure; very weakly stratified; firm, sticky and slightly plastic; a few roots; thin, continuous clay films; very strongly acid; abrupt, smooth boundary.

B23t—36 to 55 inches, yellowish-red (5YR 5/6) fine sandy loam, variegated strong brown (7.5YR 5/6), with a few fine, light-gray (5Y 7/1) mottles in lower portion; weakly and thinly stratified; friable, slightly sticky; a few roots; thin, patchy clay films; very strongly acid; gradual, smooth boundary.

C—55 to 64 inches, variegated red (2.5YR 4/8 to 2.5YR 5/6) sandy loam; thinly stratified; friable, slightly sticky; extremely acid.

The solum ranges from about 40 to 60 inches in thickness. Fine smooth quartz pebbles are throughout the profile, but they are more common in the C horizon. The A horizon is 10YR or 7.5YR in hue, 4 to 6 in value, and 2 to 4 in chroma. It is fine sandy loam in texture, but in severely eroded soils the surface layer (Ap horizon) generally is sandy clay loam. The B horizon is 5YR in hue, but in some subhorizons hue is 2.5YR. It is 4 to 6 in value and 4 to 8 in chroma. It is variegated with high chroma in any part and mottled with low chroma in the extreme lower part. The upper 20 inches of the Bt horizon is sandy clay loam to clay loam in texture and is about 25 to 30 percent clay. The lower part of the Bt horizon commonly is less clayey. The C horizon is variable in color but it mainly is red. It generally is sandy loam or sandy clay loam, but in places it consists of stratified material of various textures. Mica is in this horizon in places.

Wickham soils resemble Sassafras soils, but they are thicker and contain more clay and less sand in the Bt horizon than Sassafras soils, and they are somewhat redder.

Wickham fine sandy loam, 2 to 5 percent slopes, moderately eroded (WkB2).—The profile of this soil is the one described as representative of the series. Included with this soil in mapping are small areas that are more nearly level and a few severely eroded areas that are cut by shallow gullies. This soil is suited to cultivated crops, pasture, and trees. The hazard of further erosion is moderate. Capability unit IIe–5; woodland subclass 2o.

Wickham fine sandy loam, 5 to 10 percent slopes, moderately eroded (WkC2).—A few areas of this soil are cut by shallow gullies. This soil is suited to cultivated crops, pasture, and trees. The hazard of further erosion is severe in places where the soil is tilled. Capability unit IIIe–5; woodland subclass 2o.

Wickham fine sandy loam, 10 to 15 percent slopes, moderately eroded (WkD2).—Included with this soil in mapping are some areas where the subsoil is yellower and less red than this soil. In these areas, the lower part of the subsoil is somewhat firm and brittle and has many grayish spots and streaks. Also included are areas that are cut by shallow gullies. This soil is marginal for cultivated crops because of the severe hazard of further erosion on sloping areas. It is better suited to pasture or trees than to other uses. Capability unit IVe–5; woodland subclass 2o.

Wickham sandy clay loam, 5 to 10 percent slopes, severely eroded (WmC3).—This soil has lost most or all of its original surface layer of fine sandy loam through erosion. In many places part of the subsoil has been lost, and shallow to deep gullies are fairly common. In places where the soil is cultivated, the surface layer is sticky sandy clay loam that crusts over when it is dry. Under good management, this soil is suited to pasture and trees and to a few cultivated crops. Capability unit IVe–5; woodland subclass 2o.

Wickham sandy clay loam, 10 to 15 percent slopes, severely eroded (WmD3).—The surface layer of this soil is sticky sandy clay loam that is difficult to work, even under good conditions. Gullies are common to abundant. Included with this soil in mapping are a few areas where the lower part of the subsoil is hard and brittle. The hazard of further erosion is severe. This soil is not suited

to cultivated crops and is little used for farming. Most areas are rewooded or are in weeds and brush. Capability unit VIe–2; woodland subclass 2o.

Woodstown Series

The Woodstown series consists of level to moderately sloping, deep, moderately well drained soils on uplands and on low terraces bordering major rivers. These soils formed in loamy sediment containing moderate amounts of silt and clay. The native vegetation is mainly mixed hardwoods that can tolerate some wetness, but some loblolly pine grows in places.

In a representative profile the surface layer, about 15 inches thick, is sandy loam. This layer is grayish brown in the upper part and yellowish brown in the lower part. The subsoil, about 19 inches thick, is heavy fine sandy loam. It is yellowish brown, and the lower part is mottled with gray and strong brown. The underlying material to a depth of 60 inches is light-gray, mottled loamy sand that has a few pebbles.

Woodstown soils are easy to work, but they have a seasonal water table that is within 2 feet of the surface, and plowing and planting of crops is sometimes delayed. Wetness is a moderate to severe limitation to some nonfarm uses. These soils have moderate available moisture capacity. Permeability is moderate.

Representative profile of Woodstown sandy loam, 0 to 2 percent slopes, in a cultivated area south of Budds Creek Road, about 1¾ miles southwest of Newport:

Ap—0 to 9 inches, grayish-brown (2.5Y 5/2) sandy loam; weak, coarse, granular structure; very friable; many roots; strongly acid; abrupt, smooth boundary.

A2—9 to 15 inches, yellowish-brown (10YR 5/4) sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; very strongly acid; clear, smooth boundary.

B21t—15 to 25 inches, yellowish-brown (10YR 5/6) heavy fine sandy loam; weak, medium and coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thin, continuous clay films; very strongly acid; clear, smooth boundary.

B22t—25 to 34 inches, yellowish-brown (10YR 5/6) heavy fine sandy loam; common, medium, prominent mottles of gray or light gray (5Y 6/1), and a few, medium, distinct mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; a few roots; thin patchy clay films; very strongly acid; abrupt, wavy boundary.

C—34 to 60 inches, light-gray (2.5Y 7/2) loamy sand; many, coarse, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); single grain; very friable; about 3 percent smooth pebbles as much as 2 inches thick and some fine iron concretions; strongly acid.

The solum ranges from about 24 to 42 inches in thickness. In some places as much as 10 percent fine smooth pebbles is in the solum, about 20 percent in the C horizon, or both. Hue generally is 10YR or 2.5Y throughout the profile, but in places it is as much as 5Y in the C horizon. The A horizon is 3 to 6 in value and 1 to 4 in chroma. Undisturbed A1 horizons less than 6 inches thick are 3 in value. The matrix of the B horizon is 5 or 6 in value and 4 to 8 in chroma. This horizon is always mottled with chroma of 2 or less in the lower part of the B horizon. Mottles high in chroma are likely anywhere in the horizon. The texture of the Bt horizon is either loam, sandy loam, fine sandy loam, or more commonly sandy clay loam. This horizon is 18 to 27 percent clay and 20 to 35 percent silt. The C horizon generally is higher in value and lower in chroma than the B horizon, and in some profiles it is not mottled. The C horizon ranges from sandy loam to sand.

Woodstown soils resemble Matawan soils, but they have a thinner, finer textured A horizon than those soils, and their B22t horizon is coarser and more permeable. Seasonally, Woodstown soils generally are a little wetter than Matawan soils. These soils also resemble Beltsville, Bourne, Exum, Iuka, Keyport, and Mattapex soils in color and in natural drainage. The Bt horizon of Woodstown soils is lacking in Iuka soils. A fragipan that is in the lower part of the subsoil of Beltsville and Bourne soils is not present in Woodstown soils. These soils have less clay in the Bt horizons than Keyport soils. The solum in Woodstown soils is thinner than that of Exum soils, and it is less silty and more sandy than that of Mattapex soils.

Woodstown sandy loam, 0 to 2 percent slopes (WoA).—The profile of this soil is the one described as representative of the series. Included with this soil in mapping are small areas where the surface layer is more silty and less sandy than that of this soil. Also included are areas where the surface layer is somewhat gravelly. This soil is suited to cultivated crops, pasture, and trees. Artificial drainage is of benefit to most crops except those that are planted late. Capability unit IIw–5; woodland subclass 2o.

Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded (WoB2).—In this soil the surface layer is about 6 to 8 inches thick, but the profile otherwise is similar to that described as representative of the series. In a few areas, the soil is severely eroded and is cut by shallow gullies. Included in mapping are small areas where the surface layer is more silty and less sandy than that of this soil. Also included are areas where the surface layer is slightly gravelly. This soil is suited to cultivated crops, pasture, and trees. When cultivated regularly, protective measures are needed to help control further erosion. Drainage is of benefit to some crops. Capability unit IIe–36; woodland subclass 2o.

Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded (WoC2).—This soil has lost some of its original surface layer through erosion, and in places plowing exposes small amounts of subsoil, which gives the areas a spotty appearance. This soil is severely eroded in places and is also cut by gullies. Included in mapping are some areas that are more silty and gravelly than this soil. This soil is suited to cultivated crops, pasture, and trees, but the erosion hazard is severe in places where the soil is tilled. Drainage improvement is not needed for some crops. Capability unit IIIe–36; woodland subclass 2o.

Use and Management of the Soils

This section briefly explains the system of capability classification used by the Soil Conservation Service. Table 2 gives estimated yields of principal crops grown in the county. This section then discusses the use and management of the soils as woodland and as wildlife habitat and explains engineering uses of the soils. It also discusses use of the soils in town and country planning and for recreational purposes.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and

the way they respond to treatment. The grouping does not take into account major and generally expensive land-forming 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 horticultural crops, or other crops requiring special management.

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

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife (none in this county).

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

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.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, 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 a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth for cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, 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–7. 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 Charles County are described, and suggestions for the use and management of the soils are given.

Capability unit I–4

This unit consists of deep, level or nearly level, well-drained soils of the Magnolia and Matapeake series. The surface layer is friable silt loam about 15 inches thick. It is underlain by firm clay loam or silty clay loam that is moderately permeable. All of the soils have high available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are well suited to crops and pasture. These soils require no special management practices, and general crops respond well to good management.

Capability unit I–5

This unit consists of deep, level or nearly level, well drained soils of the Matapeake and Sassafras series. The surface layer, about 8 to 15 inches thick, is friable sandy loam or fine sandy loam. In the Matapeake soils, the surface layer is underlain by firm silty clay loam and in the Sassafras soils it is underlain by friable sandy clay loam. Sassafras soils have a subsoil that is moderately permeable. The soils in this unit have moderate to high available moisture capacity. They are strongly acid to very strongly acid.

These soils are well suited to crops and sown pasture. They are among the best soils in the county for tobacco. These soils do not require special conservation practices or other measures, and under good management, general crops can be grown year after year. They can be worked and planted earlier in the year than soils that are less sandy or less well drained.

Capability unit IIe–4

This unit consists of deep, gently sloping, well-drained soils of the Magnolia and Matapeake series. A moderate amount of surface soil has been lost through erosion. The rest generally is about 8 to 12 inches thick and is friable silt loam. It is underlain by firm clay loam or silty clay loam that is moderately permeable. Available moisture capacity is high in these soils. These soils are strongly acid to very strongly acid.

The soils in this unit are well suited to cultivated crops and sown pasture. The erosion hazard is moderate unless a close-growing plant cover is maintained, or unless other comparatively simple conservation measures are used.

These measures include planting alternate strips of clean-tilled and close-growing crops on the contour, keeping tillage to a minimum, using a suitable cropping system, and returning all available crop residue to the soil. If erosion is controlled, all common crops can be grown year after year.

Capability unit IIe–5

This unit consists of deep, gently sloping, well-drained soils of the Evesboro, Marr, Matapeake, Sassafras, Westphalia, and Wickham series. These soils have lost a moderate amount of their surface layer through erosion. Except in the Evesboro soils, the remaining surface layer, about 6 to 12 inches thick, is friable sandy loam or fine sandy loam. This layer is underlain by friable to firm subsoil ranging from fine sandy loam to silty clay loam. Permeability in this subsoil is moderate to moderately rapid. Available moisture capacity is moderate to high in these soils. These soils are strongly acid to extremely acid.

The Evesboro soils make up a minor part of this unit. They are sandy throughout, excessively drained and rapidly permeable. Available moisture capacity is low. Evesboro soils are so closely intermingled with Westphalia soils that it is impractical to manage the two soils separately.

Except for the Evesboro soils, these soils are well suited to cultivated crops and sown pasture. For tobacco, they are among the best soils in the county. They can be worked and planted earlier in the year than soils that are less sandy or less well drained. The hazard of further erosion is moderate, and simple, easily applied conservation measures are needed. Planting on the contour, using alternate strips of clean-tilled and close-growing crops, keeping tillage to a minimum, using suitable cropping systems, and returning all available crop residue to the soil are ways of helping to control erosion. If erosion is controlled, all common crops can be grown year after year.

Capability unit IIe–6

The only soil in this unit is Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes. It consists of deep, level to gently sloping, well-drained soil on foot slopes and in and around upland depressions. The surface layer is about 17 inches of friable fine sandy loam, and it is underlain by a friable subsoil ranging from sandy loam to silt loam. Available moisture capacity is moderate in this soil. It is strongly acid to very strongly acid. Permeability is moderate throughout.

This soil is well suited to cultivated crops and to sown pasture, except in upland depressions where frost is late in spring and early in fall. The hazard of further erosion is moderate in sloping areas, and in depressed areas erosional debris from adjacent soils accumulates. The small individual areas make planting or tilling on the contour impractical, except in conjunction with surrounding soils. Keeping tillage to a minimum, using suitable cropping systems, and returning all available crop residue to the soil are ways of helping to control further erosion.

Capability unit IIe–13

This unit consists of deep, gently sloping, moderately well drained soils of the Beltsville and Keyport series. The surface layer, about 10 inches thick, is friable silt loam. It is underlain by a thin layer of heavy silt loam that is friable to firm. Below this layer Beltsville soils have a very firm fragipan of heavy silt loam, and Keyport soils have a firm layer of silty clay. Both of these layers are slowly permeable. Available moisture capacity is moderate in Beltsville soils and high in Keyport soils. These soils are strongly acid to very strongly acid.

The soils in this unit are well suited to a few crops and to sown pasture. They are not suited to such perennial plants as alfalfa that are damaged by frost heaving in winter and in spring. The water table is seasonally high, and additional drainage is needed for good growth of some crops. Especially in Keyport soils, drainage ditches generally are more suitable than tile lines for the disposal of excess water. Controlling the erosion hazard is of greater concern to management than drainage improvement. Constructing interceptors and diversions for the disposal of runoff from adjacent soils, keeping tillage to a minimum, using suitable cropping systems, and returning all available crop residue to the soil are ways of helping to control further erosion and to improve drainage.

Capability unit IIe–16

This unit consists of the deep, gently sloping, moderately well drained soils of the Beltsville, Exum, and Mattapex series. The surface layer of these soils, about 5 to 12 inches thick, is friable silt loam. It is underlain by clay loam or heavy silt loam that is friable to firm. In the Beltsville soils, the lower part of the subsoil is a very firm fragipan of heavy silt loam. In all the soils except Beltsville soils available moisture capacity is high, and permeability is moderately slow. In the Beltsville soils available moisture capacity is moderate, and permeability is slow. All of these soils are strongly acid to extremely acid.

The soils in this unit are well suited to most crops and to sown pasture. They are not suited to such perennial plants as alfalfa, which are damaged by frost heaving in winter and in spring. The water table is seasonally high, and additional drainage is needed for good growth of some crops. In most of these soils, tile drains or drainage ditches are suitable for the disposal of excess water, but in Beltsville soils, ditches are more effective. Controlling the hazard of further erosion generally is of greater concern to management than improving drainage. Constructing interceptors and diversions for the disposal of runoff from adjacent soils, keeping tillage to a minimum, using suitable cropping systems, and returning all available crop residue to the soil are ways of helping to control further erosion and to improve drainage.

Capability unit IIe–36

This unit consists of deep, gently sloping, moderately well drained soils of the Bourne, Keyport, Mattapex, and Woodstown series. The surface layer, about 8 to 12 inches thick, is friable sandy loam or fine sandy loam. It is underlain by friable to firm material ranging from heavy loam or fine sandy loam to silty clay. In Bourne soils the lower part of the subsoil is very hard, firm fine sandy loam. Available moisture capacity is low or moderate in Bourne and Woodstown soils and high in Keyport and Mattapex soils. All of these soils are strongly acid to extremely acid.

The soils in this unit are suited to most crops (fig. 17) and to sown pasture. They are not suited to alfalfa and

Figure 17.—**Planting tobacco in contour strips on Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded.**

to other perennial plants that are damaged by frost heaving in winter and in spring. These soils generally are easier to drain and can be worked and planted earlier than other moderately well drained soils that are less sandy. The water table is seasonally high, and drainage is needed for some crops. In most of these soils tile drains are suitable for the disposal of excess water, but in Keyport soils ditches are more effective. Controlling the hazard of further erosion is of greater concern to management than improving drainage. Constructing interceptors and diversions to reduce runoff from adjacent soils, keeping tillage to a minimum, using suitable cropping systems, and returning all available crop residue to the soil are ways of helping to control erosion.

Capability unit IIw–1

The only soil in this unit is Mattapex silt loam, 0 to 2 percent slopes. It is deep, level or nearly level, and moderately well drained. The surface layer is about 13 inches of friable silt loam. It is underlain by heavy silt loam that is friable to firm and is moderately slow in permeability. This soil has high available water capacity. It is medium acid to very strongly acid.

This soil is well suited to most crops and to sown pasture. It is not suited to such perennial plants as alfalfa, which are damaged by frost heaving in winter and in spring. The water table is seasonally high, and additional drainage is needed for good growth of most crops, especially tobacco, and planting is sometimes delayed. Ditches and tile lines are suitable for the disposal of excess water. Good management on this soil consists of providing artificial drainage, keeping tillage to a minimum, and returning available crop residue to the soils. If this soil is well managed, the hazard of erosion is none to slight.

Capability unit IIw–5

This unit consists of deep, level or nearly level, moderately well drained soils of the Mattapex and Woodstown series. The surface layer is about 12 to 15 inches of friable sandy loam or fine sandy loam. It is underlain by friable to firm heavy fine sandy loam, sandy clay loam, or heavy silt loam that is moderately permeable to moderately slowly permeable. These soils have moderate to high available water capacity. They are strongly acid to extremely acid.

The soils in this unit are well suited to most crops and to sown pasture. They are not suited to such perennial plants as alfalfa, which are damaged by frost heaving in winter and in spring. The water table is seasonally high. Additional drainage is needed for good growth of most crops, especially tobacco, and planting is sometimes delayed. Tile lines are suitable for the disposal of excess water on these soils. Drainage ditches can also be used, provided they do not penetrate into the loose, sandy material that generally is at a depth of about 2 to 3 feet. Good management on these soils consists of providing artificial drainage, keeping tillage to a minimum, and returning available crop residue to the soil. If these soils are well managed, the hazard of erosion is none to slight.

Capability unit IIw–7

This unit consists of deep, level or nearly level, and moderately well drained soils of the Iuka series. Some of these soil are on flood plains and are flooded at irregular and infrequent intervals. The other soils are on foot slopes or in slight depressions on uplands. The surface layer of these soils, about 18 inches thick, is friable sandy loam, fine sandy loam, or silt loam. The underlying material is similar to that of the surface layer in texture. These soils are moderately permeable and have high available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are well suited to most crops and to sown pasture. In upland depressions, they are not suited to crops, as crops are damaged by frost later in spring and earlier in fall than the adjacent soils. They are not suited to perennial plants that are susceptible to damage by frost heaving. The water table is seasonally high, and additional drainage is needed for most crops, especially tobacco, and planting is sometimes delayed. Ditches and tile lines are suitable drainage outlets. Good management on these soils consists of providing artificial drainage, keeping tillage to a minimum, and returning available crop residue to the soil. If these soils are well managed, the hazard of erosion is none to slight.

Capability unit IIw–8

This unit consists of deep, level or nearly level, moderately well drained Beltsville and Keyport soils. The surface layer of these soils is about 10 to 12 inches of friable silt loam. It is underlain by a relatively thin layer of heavy silt loam that is friable to firm. Beneath this layer, the Beltsville soils have a very firm fragipan of heavy silt loam, and the Keyport soils have a firm layer of silty clay. These layers are slowly permeable. Available moisture capacity is moderate in Beltsville soils and high in Keyport soils. All of the soils are strongly acid to extremely acid.

These soils are well suited to some crops and to sown pasture. They are not suited to perennial plants; for example alfalfa, that are damaged by frost heaving in winter and in spring. The water table is seasonally high, and additional drainage is needed for most crops, especially tobacco, and planting is sometimes delayed. Especially in the Keyport soils, ditches generally are more suitable than tile lines for the disposal of excess water. Good management on these soils consists of providing artificial drain-

age, keeping tillage to a minimum, and returning available crop residue to the soil. If these soils are well managed, the hazard of erosion is none to slight.

Capability unit IIw–9

The only soil in this unit is Keyport fine sandy loam, 0 to 2 percent slopes. It is deep, level or nearly level, and moderately well drained. The surface layer is about 10 to 12 inches of friable fine sandy loam that is underlain by firm heavy silt loam. Below this layer is a firm layer of silty clay that is slowly permeable. This soil has high available moisture capacity. It is strongly acid to extremely acid.

This soil is well suited to some crops and to sown pasture. It is not suited to such perennial plants as alfalfa, which are susceptible to damage by frost heaving in winter and in spring. The water table is seasonally high, and additional drainage is needed for most crops, especially tobacco, and planting is sometimes delayed. For this soil, drainage ditches are more suitable than tile lines because its subsoil is slowly permeable and because clay prevents water from entering the tile. Good management on this soil consists of keeping tillage to a minimum, returning all available crop residue, and providing artificial drainage. If these soils are well managed, the hazard of erosion is none to slight.

Capability unit IIw–10

The only soil in this unit is Matawan loamy sand. It is deep, nearly level to gently sloping, and moderately well drained to well drained. The surface layer is about 20 inches of friable to very friable loamy sand that is underlain by firm sandy clay loam. Below this layer is a very firm layer of slowly permeable clay loam. This soil has moderate available moisture capacity. It is very strongly acid to extremely acid.

This soil is well suited to most crops and to sown pasture. It is not suited to such perennial plants as alfalfa, which are subject to damage by frost heaving in winter and in spring, but crop damage generally is not so great on this soil as on other moderately well drained soils. The water table is seasonally high, and additional drainage is needed for some crops, especially tobacco. If suitable outlets are available, tile systems function very well if they are placed no deeper than about 20 to 24 inches. Good management on this soil consists of providing artificial drainage, keeping tillage to a minimum, and turning under green-manure crops and crop residue. If this soil is well managed, the hazard of erosion is none to slight.

Capability unit IIs–4

This unit consists of soils of the Rumford series. They are deep, level to gently sloping, and somewhat excessively drained. The surface layer is about 12 inches of loamy sand or gravelly light sandy loam that is very friable. It is underlain by sandy loam or light sandy clay loam that is gravelly in places. Permeability is rapid. These soils have low to moderate available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are suited to most crops, especially to tobacco, and to sown pasture. They can be worked and planted earlier in the year than soils that are not so sandy or well drained. They are somewhat droughty in seasons of low or poorly distributed rainfall, which generally is the major limitation to use and management. The hazard of erosion is moderate except in nearly level areas. If erosion is controlled and soil moisture is conserved, common crops can be grown year after year. Planting on the contour, growing clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, returning all available crop residue to the soil, and using supplemental irrigation in seasons of low or poorly distributed rainfall are ways of helping to control erosion and to conserve moisture in the soil. A suitable cropping system is one that includes cover and green manure crops to be turned under.

Capability unit IIs–7

This unit consists of deep, gently sloping, well-drained soils of the Chillum and Croom series. The surface layer, about 6 to 10 inches thick, is silt loam or gravelly loam. The subsoil in Chillum soils is friable silt loam or loam, and the underlying material is massive, very hard and firm gravelly sandy loam. The subsoil in Croom soils is massive, extremely hard, very firm gravelly sandy clay loam. Depth to the hard, massive layer generally is about 12 to 24 inches, but in places it is shallower or deeper. These soils are moderately permeable or moderately slowly permeable. They have low to high available moisture capacity, and they are strongly acid to extremely acid.

The soils in this unit are suited to most crops and to sown pasture. They are somewhat droughty in seasons of low or poorly distributed rainfall, and droughtiness is a major concern of management. Also, the hazard of erosion is moderate. If measures are used to conserve soil moisture, crops can be grown year after year. Planting on the contour, planting clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, returning all available residue to the soil, and providing supplemental irrigation in seasons of low or poorly distributed rainfall are ways of helping to conserve moisture in the soil. A suitable cropping system is one that includes cover crops and green manure crops that can be worked into the soil.

Capability unit IIIe–4

This unit consists of deep, gently sloping to moderately sloping, moderately eroded, well-drained soils of the Magnolia and Matapeake series. The surface layer of these soils is generally about 6 to 10 inches thick and is friable silt loam. It is underlain by firm clay loam or silty clay loam that is moderately permeable. Because plowing turns up part of the subsoil in places, many freshly worked areas have a spotted appearance. These soils have high available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are well suited to cultivated crops and to sown pasture. If erosion is controlled, all common crops can be grown year after year. Further erosion is a severe hazard unless a cover of close-growing plants is maintained. Planting on the contour, growing clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, and returning all available crop residue to the soil are ways of helping to control erosion. A suitable cropping system is one that includes close-growing crops on each strip for half or more than half of the time.

Capability unit IIIe-5

This unit consists of deep, gently sloping to moderately sloping, moderately eroded, well-drained soils of the Evesboro, Sassafras, Westphalia, and Wickham series. Part of the surface layer has been lost through erosion, and except in the Evesboro soil, the remaining surface layer, about 5 to 10 inches thick, is friable sandy loam or fine sandy loam. In places plowing exposes part of the subsoil, which gives the areas a spotted appearance. Below the surface layer is a friable to firm subsoil ranging from fine sandy loam to clay loam. This layer is moderately permeable to moderately rapidly permeable. These soils have moderate to high available moisture capacity. They are strongly acid to extremely acid.

The Evesboro soils makes up a minor part of this unit. Unlike the other soils in the unit, they are sandy throughout, excessively drained, and rapidly permeable. Available moisture capacity is low. This soil is in a complex with Westphalia soils, and generally it is impractical to use and manage it separately from the other soils.

All these soils except the Evesboro soils are well suited to common crops and to sown pasture. For high-quality tobacco, these soils are among the best in the county. They can be worked and planted earlier than soils that are less sandy or less well drained. The hazard of further erosion is severe unless a cover of close-growing plants is maintained.

Planting on the contour, planting clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, including in the cropping system close-growing crops on each strip for half or more than half of the time, and returning all available crop residue to the soil are ways of helping to control erosion and of promoting good growth of crops.

Capability unit IIIe-7

This unit consists of moderately sloping, well-drained soils of the Chillum and Croom series. The surface layer, about 5 to 8 inches thick, is silt loam or gravelly loam. In places plowing exposes a part of the subsoil, giving freshly worked areas a spotted appearance. In Chillum soils the subsoil is friable silt loam or loam, and the underlying material is massive, very hard and firm gravelly sandy loam. In Croom soils the subsoil is massive, extremely hard gravelly sandy clay loam or gravelly sandy loam that overlies gravelly loamy coarse sand. In most places depth to the extremely hard, massive layer is about 10 to 20 inches, but in places it is shallower or deeper. These soils are moderately permeable or moderately slowly permeable. Available moisture capacity is low to high. They are strongly acid to extremely acid.

These soils are suited to most crops and to sown pasture. If erosion is controlled and soil moisture is conserved, all common crops can be grown year after year. Planting on the contour, planting clean-tilled, close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, returning all available crop residue to the soil, and providing supplemental irrigation in seasons of low or poorly distributed rainfall are ways of helping to control erosion and of conserving and making use of available moisture in the soil. A suitable cropping system is one that includes close-growing crops on each strip for half or more than half of the time.

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Capability unit IIIe-9

The only soil in this unit is Aura gravelly sandy loam, 5 to 10 percent slopes, moderately eroded. It is deep and well drained. The surface layer, about 7 inches thick, is gravelly sandy loam. In places plowing exposes a part of the subsoil, which gives freshly worked areas a spotted appearance. The upper part of the subsoil is friable to firm gravelly loam, and the lower part is sandy clay loam. Permeability is moderately slow. This soil has moderate available moisture capacity, and it is very strongly acid.

This soil is suited to most crops and to sown pasture. It is well suited to tobacco. This soil can be worked and planted earlier than similar but less sandy soils. If erosion is controlled and soil moisture is conserved, common crops can be grown year after year. Planting on the contour, planting clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, returning all available crop residue to the soil, and providing supplemental irrigation in seasons of low or poorly distributed rainfall are ways of helping to control erosion, and of conserving moisture in the soil. A suitable cropping system is one that includes close-growing crops on each strip for half or more than half of the time.

Capability unit IIIe-13

This unit consists of moderately sloping, moderately eroded, moderately well drained soils of the Beltsville and Keyport series. The surface layer, about 6 to 8 inches thick, is friable silt loam. In places plowing exposes a part of the subsoil, which gives a spotted appearance to freshly worked areas. The surface layer is underlain by a relatively thin layer of heavy silt loam that is friable to firm. Below this layer in Beltsville soils is a very firm fragipan of heavy silt loam, and in Keyport soils is firm silty clay. These layers are slowly permeable. Available moisture capacity is moderate in Beltsville soils and high in Keyport soils. These soils are strongly acid to extremely acid.

The soils in this unit are suited to a few crops and to sown pasture. They are not suited to such perennial plants as alfalfa, which are damaged by frost heaving in winter and in spring. The water table is seasonally high, but surface drainage is good, and additional drainage is not needed for pasture plants and most crops.

Further erosion is a severe hazard on these soils unless a cover of close-growing plants is maintained or suitable conservation measures are provided and carefully maintained. If erosion is controlled, common crops can be grown year after year. Planting on the contour, planting close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage at a minimum, providing interceptors and diversions in sodded waterways, and returning all available crop residue to the soil are ways of helping to control erosion. A suitable cropping system is one that includes close-growing crops on each strip for half or more than half of the time.

Capability unit IIIe-16

This unit consists of deep, gently sloping to moderately sloping, moderately eroded, moderately well drained soils of the Exum and Mattapex series. The surface layer is about 5 to 8 inches of friable silt loam or fine sandy loam. In places plowing exposes a part of the subsoil, which gives

a spotted appearance to freshly worked areas. The subsoil is clay loam or heavy silt loam that is friable to firm. These soils are moderately slowly permeable. They have high available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are suited to most crops and to sown pasture. They are not suited to perennial plants; for example alfalfa, that are damaged by frost heaving in winter and in spring. The water table is seasonally high, but surface drainage is good, and additional drainage is not needed for pasture plants and most crops.

The hazard of further eroson is severe unless the areas are kept under a cover of close-growing plants. Controlling further erosion is the chief concern of management. Planting on the contour, planting clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, using a cropping system that includes close-growing crops on each strip for half or more than half of the time, using interceptors and diversions in sodded waterways, and returning all available crop residue to the soil are ways of helping to control erosion. If erosion is controlled, crops can be grown year after year.

Capability unit IIIe–33

This unit consists entirely of soils of the Rumford series. These soils are deep, gently sloping to moderately sloping, moderately eroded, and somewhat excessively drained. The surface layer, about 8 to 10 inches thick, is loamy sand or gravelly light sandy loam that is very friable. It is underlain by sandy loam or light sandy clay loam that is gravelly in many places. Permeability is rapid, and available moisture capacity is low to moderate. These soils are strongly acid or very strongly acid.

The soils in this unit are suited to most crops and to sown pasture. These soils can be worked and planted earlier in the year than soils that are not so sandy or well drained. They are somewhat droughty in seasons of low or poorly distributed rainfall.

Further erosion is a severe hazard unless a cover of close-growing plants is maintained. Planting on the contour, planting clean-tilled and close-growing crops in narrow, alternate strips that are laid out on the contour, keeping tillage to a minimum, using a cropping system that includes close-growing crops on each strip half or more than half of the time, providing supplemental irrigation in seasons of low or poorly distributed rainfall, and returning all available crop residue to the soil are ways of helping to control erosion. If erosion is controlled, crops can be grown year after year.

Capability unit IIIe–36

This unit consists of gently sloping to moderately sloping, moderately eroded, moderately well drained soils of the Bourne and Woodstown series. The surface layer, about 6 to 10 inches thick, is friable sandy loam. In places plowing exposes a part of the subsoil, which gives a spotted appearance to freshly worked areas. The surface layer is underlain by friable heavy loam or heavy fine sandy loam. In the Bourne soil, the lower part of the subsoil is very hard, firm fine sandy loam or loam. In the Bourne soil the subsoil is slowly permeable, and in the Woodstown soil it is moderately permeable. These soils have low to moderate available moisture capacity. They are very strongly acid or extremely acid.

The soils in this unit are suited to most crops and to sown pasture. Tobacco can be grown, but it generally is more suited to well-drained sandy soils. These soils are not suited to such perennial plants as alfalfa, which are damaged by frost heaving in winter and in spring. These soils generally are easier to drain and can be worked and planted a little earlier than other moderately well drained soils that are less sandy. The water table is seasonally high, but surface drainage is good, and additional internal drainage is not needed for pasture plants and most crops.

The hazard of further erosion is severe on these soils unless a cover of close-growing plants is maintained. Controlling erosion is the chief concern of management. Growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, using a cropping system that includes close-growing crops on each strip for half or more than half of the time, providing interceptors and diversions in sodded waterways, and returning all available crop residue to the soil are ways of helping to control erosion. If erosion is controlled, crops can be grown year after year.

Capability unit IIIw–6

This unit consists of deep, nearly level, poorly drained soils of the Fallsington and Othello series. The surface layer, about 8 to 12 inches thick, is friable sandy loam or fine sandy loam. It is underlain by friable to firm heavy sandy loam, sandy clay loam, or heavy silt loam that is moderately permeable to moderately slowly permeable. These soils have moderate to high available moisture capacity. They are very strongly acid or extremely acid. The water table is within the surface for very long periods, and undrained areas are seasonally ponded.

If artificial drainage is provided, these soils are well suited to some crops and to sown pasture. They are not well suited to crops that demand good soil aeration. Little or no tobacco, alfalfa, or small grains are grown. These soils are not difficult to drain, either by ditches or by tile drains, if good drainage outlets are available. Ditches should not penetrate into the loose, sandy material that generally is at a depth of about 2½ feet. Good management on these soils consists of keeping tillage to a minimum, returning all available crop residue to the soil, and providing artificial drainage. If these soils are well managed, the hazard of erosion is slight to none.

Capability unit IIIw–7

This unit consists of deep, nearly level, poorly drained soils of the Bibb and Othello series. The surface layer, about 11 to 14 inches thick, is friable silt loam. It is underlain by friable to firm silt loam that is moderately permeable to moderately slowly permeable. The water table is within the soil surface for long periods, and undrained areas are seasonally ponded. The Bibb soil of this unit floods when streams overflow. The Bibb soil is used mostly for woodland and wildlife habitat in places where it is frequently or severely flooded. These soils have high available moisture capacity. They are very strongly acid or extremely acid.

If artificial drainage is provided, these soils are well suited to some crops and to sown pasture. They are not well suited to crops that need good soil aeration. Little or no

tobacco, alfalfa, or small grains is grown on these soils. These soils are moderately difficult to drain, either by ditches or by tile drains, where good drainage outlets are available. Ditches should not penetrate into the loose, sandy material that generally is at a depth of about 2½ feet.

Good management on these soils consists of providing artificial drainage, keeping tillage to a minimum, and returning all available crop residue to the soil. Special measures are needed to protect Bibb soils against flooding. Such measures probably are beyond the means and abilities of individual land holders, but they can be provided through group participation. It these soils are well managed, the hazard of erosion is none to slight.

Capability unit IIIw–9

The only soil in this unit is Elkton silt loam. It is deep, nearly level, and poorly drained. The surface layer, about 6 to 8 inches thick, is friable, slightly sticky silt loam. Below this layer is a thin layer of heavy silt loam that is also friable and sticky. The underlying material is very firm, sticky silty clay that is slowly to very slowly permeable. This soil has high available moisture capacity. It is very strongly acid or extremely acid. The water table is at or near the soil surface for very long periods, and undrained areas are seasonally ponded.

If artificial drainage is installed, this soil is suited to some crops and to sown pasture. It is poorly suited to crops that need good soil aeration. Almost no tobacco, alfalfa, or small grain is grown. The soil is difficult to drain. Ditches are more suitable than tile drains for the disposal of excess water because the subsoil is slowly permeable and clay prevents the entrance of water into the tile. Ditches should not penetrate into the looser, sandier material that generally is at a depth of 2½ to 3½ feet. Good management on this soil consists of providing artificial drainage, keeping tillage to a minimum, and returning all available crop residue to the soil. If this soil is well managed, the hazard of erosion is slight to none.

Capability unit IVe–3

This unit consists of deep, gently sloping to moderately sloping, severely eroded, well-drained soils of the Magnolia and Matapeake series. The surface layer is 6 to 8 inches thick in recently plowed areas, but it generally is thinner in areas that have not been recently cultivated. The surface layer consists of silt loam or clay loam that is sticky and is commonly quite firm. Below this layer is firm clay loam that is moderately permeable. These soils have high available moisture capacity. They are strongly acid to very strongly acid.

The soils in this unit are suited to a few crops and to sown pastures. The sandier soils of this unit are suited to tobacco of good quality. The hazard of further erosion is very severe unless a cover of close-growing plants is maintained or unless intensive conservation practices are followed. Consequently, little or no soybeans are grown on these soils.

Growing clean-tilled crops for intervals in a cropping system that includes close-growing crops or pasture plants, planting clean-tilled and close-growing crops in narrow alternate strips that are laid out on the contour, keeping tillage to a minimum, and returning all available crop residue to the soil are ways of helping to control erosion. Even with these measures, the growing of clean-tilled crops is marginal. The soils are more suitable for hay, pasture, or woodland.

Capability unit IVe–5

This unit consists of deep, well-drained soils in the Evesboro, Sassafras, Westphalia, and Wickham series. Some of these soils are moderately sloping to strongly sloping and severely eroded. Others are strongly sloping and are only moderately eroded. The surface layer of all these soils, except the Evesboro soils, to about plow depth varies from sandy loam to sandy clay loam. In many areas, particularly where the soils are severely eroded, this plow layer contains some of the material in the subsoil. It generally is less friable and more firm and sticky than in places where the subsoil has not been disturbed. Below the surface layer is the subsoil, which is friable to firm and ranges from fine sandy loam to clay loam. It is moderately permeable to moderately rapidly permeable. Because plowing exposes part of the subsoil in places, many recently worked areas have a spotted or marbled to bright-colored appearance. These soils have a moderate to high available moisture capacity. They are strongly acid to extremely acid.

The Evesboro soils make up a minor part of this unit. Unlike the other soils, they are sandy throughout, excessively drained and rapidly permeable. Available moisture capacity is low. They are so closely intermingled with Westphalia soils that it generally is impractical to use and manage these soils separately from the other soils.

All the soils, except the Evesboro soils, are suited to some crops and to sown pasture. Further erosion is a severe hazard. Conservation measures include growing clean-tilled crops for long intervals, using a cropping system that includes close-growing crops or pasture plants, growing clean-tilled crops in narrow strips that are laid out on the contour, keeping tillage to a minimum, and returning all available crop residue to the soil. Even if erosion is controlled, these soils are marginal for clean-tilled crops. The soils are better suited to hay, pasture, or woodland.

Capability unit IVe–7

This unit consists of moderately sloping, well drained or moderately well drained soils in the Aura, Bourne, and Croom series. All these soils, except the Aura soils, are severely eroded. The surface layer to about plow depth varies from gravelly sandy loam or gravelly loam to sandy clay loam. In most places, this layer contains some of the material in the subsoil. It generally is less friable and more firm and sticky than it is in places where the subsoil has not been disturbed.

In the Bourne soils, below the surface layer is friable heavy loam. The lower part of the subsoil is very hard, firm fine sandy loam or loam. In the Aura and Croom soils, the surface layer is underlain by very firm to massive gravelly loam or gravelly sandy clay loam. Because plowing exposes part of the subsoil in places, worked areas have a spotted or marbled to bright-colored appearance. The subsoil is moderately slowly permeable to slowly permeable. The soils in this unit have a low to moderate available moisture capacity. They are very strongly acid or extremely acid.

These soils are suited to some crops and to sown pasture. They are very seldom used for soybeans and alfalfa, and only locally are they used for tobacco. Further erosion is a

severe hazard unless a cover of close-growing plants is maintained or unless very intensive conservation measures are provided and very carefully maintained.

The growing of clean-tilled crops for long intervals in a cropping system that includes close-growing crops or pasture plants, growing clean-tilled crops in narrow strips that are laid out on the contour, keeping tillage to a minimum, and returning all available crop residue to the soil are ways of helping to control erosion. Even if erosion is controlled, these soils are marginal for clean-tilled crops. These soils are better suited to hay, pasture, or woodland.

Capability unit IVe–9

This unit consists of moderately sloping to strongly sloping, moderately eroded to severely eroded, moderately well drained soils in the Beltsville and Exum series. The surface layer, to about plow depth, is friable to firm. It is somewhat sticky silt loam or clay loam that contains some of the subsoil. Recently worked areas have a spotted or marbled to bright-colored appearance. The surface layer is underlain by heavy silt loam or clay loam that is sticky and friable to firm and sticky. In the Beltsville soils, the lower part of the subsoil is a very firm fragipan of heavy silt loam. The soils in this unit have moderate to high available mosture capacity, and permeability is moderately slow to slow. They are strongly acid to very strongly acid.

The soils in this unit are suited to some crops and to sown pasture. The water table is seasonally high, but because surface drainage is good and tilled crops are only occasionally grown, drainage improvement is seldom necessary.

Further erosion is a severe hazard unless a cover of close-growing plants is maintained. Growing of clean-tilled crops for long intervals in a cropping system that includes close-growing crops or pasture plants, growing clean-tilled crops in narrow strips that are laid out on the contour, keeping tillage to a minimum, using interceptors and diversions in sodded waterways, and returning all available crop residue to the soil are ways of helping to control erosion. Even if erosion is controlled, these soils are marginal for clean-tilled crops. These soils are better suited to hay, pasture, or woodland.

Capability unit IVw–3

The only soil in this unit is Leonardtown silt loam. It is a moderately deep, nearly level, poorly drained soil that has a hard, dense silt loam fragipan at a depth of about 16 inches. The fragipan is very slowly permeable and resists root penetration by many kinds of plants. The surface layer, about 8 inches thick, is friable silt loam. Between the surface layer and the fragipan is a layer, about 8 inches thick, of firm, slightly sticky silt loam. This soil has a moderate available moisture capacity. It is very strongly acid or extremely acid. The water table is at or near the surface for long periods, and undrained areas are seasonally ponded in places (fig. 18).

If artificial drainage is provided, this soil is suited to some crops and to sown pasture, but yields are low even under the best management. This soil is difficult to drain. Shallow V-type ditches help to remove excess water that accumulates above the fragipan. Tile drains do not function well if they are placed below the upper surface of the fragipan. If they are above the fragipan, they are likely to be damaged by freezing.

Figure 18.—Water table temporarily above the surface on Leonardtown silt loam.

Good management on this soil consists of providing artificial drainage, keeping tillage to a minimum, and returning available crop residue to the soil. If this soil is well managed, the hazard of erosion is slight to none.

Capability unit IVw–6

The only soil in this unit is Osier loamy sand. It is a deep, nearly level, poorly drained soil. To a depth of 60 inches or more commonly is loamy sand, but in places the material is coarser textured below about 20 inches. This soil is rapidly permeable. It has low available moisture capacity, and is very strongly acid. The water table is near or at the surface for fairly long periods, and undrained areas are seasonally ponded.

If artificial drainage is provided, this soil is suited to some crops and to sown pasture. Little or no tobacco, alfalfa, or small grain is grown. The soil is relatively easy to drain if adequate outlets are available, but outlets are difficult to obtain in depressional areas. Tile drains are effective in this soil. Ditches cave and become obstructed with sand.

Keeping tillage to a minimum and returning all available crop residue to the soil are chief concerns of management. This soil is especially low in available plant nutrients, and crops respond well to fertilizer applied according to needs indicated by tests. There is little or no hazard of erosion, though in places surface washes and accumulations occur locally.

Capability unit IVs–1

This unit consists of deep, level to gently sloping, somewhat excessively drained and excessively drained soils of the Evesboro and Galestown series. To a depth of 60 inches or more commonly is loamy sand or gravelly loamy sand, but in places the material below about 20 inches is coarse textured. These soils are rapidly permeable, and have low available moisture capacity. They are strongly acid to extremely acid.

These soils are suited to most crops and to sown pasture. They can be worked and planted earlier in the year than other soils of the county. They are especially suitable for the early truck crops. They are droughty, however, in seasons of low or poorly distributed rainfall.

Further erosion by water is only a slight hazard on these soils. Soil blowing is a hazard on loose, dry, unprotected areas during seasons of high winds.

Keeping tillage to a minimum, returning all available crop residue to the soil, and providing supplemental irrigation are important in use and management. Growing strips of tall, close-growing plants at right angles to the direction of prevailing seasonal strong winds helps to prevent sand cutting of seedlings or other tender vegetation. The soils of this unit are especially low in available plant nutrients, and crops respond well to fertilizers applied according to needs indicated by tests.

Capability unit VIe–2

This unit consists of the deep, moderately sloping to strongly sloping, severely eroded, moderately well drained and well drained soils of the county. These soils are of the Exum (fig. 19), Keyport, Sassafras, Westphalia, and Wickham series. Both the surface layer and the underlying layer vary considerably, but these soils are not commonly cultivated. Available moisture capacity is moderate to high. All the soils except Keyport soils are moderately permeable. The Keyport soils are slowly permeable. The soils in this unit are strongly acid to extremely acid.

These soils are poorly suited to very poorly suited to tilled crops because of severe erosion. They are suited to sown pasture, limited hay production, range grazing, and woodland. Overgrazing compacts the soil surface, damages the sod, and promotes erosion. It is especially damaging when the soil is too wet. Using diversions in sodded waterways and outlets, mowing, and controlling brush are ways of improving pasture.

Capability unit VIw–1

This unit consists only of Alluvial land. It is nearly level and occurs throughout the county on flood plains of most of the smaller streams and some of the larger ones. Alluvial land is very strongly acid to extremely acid and is generally somewhat poorly drained to very poorly drained, but most of its other characteristics are variable.

Figure 19.—**Partly improved pasture on Exum clay loam, 10 to 15 percent slopes, severely eroded, in capability unit VIe–2.**

This land is used mostly for trees and as wildlife habitat. If it is artificially drained and protected from excessive flooding, Alluvial land is suitable for pasture and some hay. Some areas are free of floods long enough for late corn to be grown, especially corn for silage. Providing open ditches, interceptors, and diversions on adjacent uplands are ways of improving drainage. Dikes can likely provide suitable protection against flooding, but they are not economically feasible if the areas are used for farming.

Capability unit VIIe–2

This unit consists of severely eroded soils of the Aura series. It also consists of Eroded land, steep, and Gravelly land, steep. Most of the surface layer of these soils has been lost through erosion. The subsoil is exposed, and in many places gullies are deep. The subsoil commonly is hard, massive, and gravelly to very gravelly.

Most cleared areas are idle, supporting only sparse vegetation of weeds and brush. Others have scattered to dense stands of trees that are mainly Virginia pine or scrub-type hardwoods.

The soils and land types of this unit are not suited to farming. Some areas probably can be improved and used for limited grazing if care is taken to prevent overgrazing. Otherwise these soils are more suitable for woodland, although areas that are presently idle are likely to need special treatment for seedlings to grow. Some areas could be used for parks or for other recreational purposes.

Capability unit VIIw–1

This unit consists only of Swamp. The areas are almost filled with sand, silt, gravel, organic material, or mixtures of these. The areas are covered by water most of the time.

Swamp has no value for farming. It is too wet, and artificial drainage provided for that purpose is impractical and expensive. Some timber or other woodland products are obtained, but woodland management for commercial purposes generally is not feasible. Swamp is suited to wildlife habitat, and some areas have limited use for recreation.

Capability unit VIIs–1

This unit consists of Sandy land, steep, and moderately sloping soils of the Evesboro series. These soils are on uplands and are deep, excessively drained, very sandy, and rapidly permeable. They are strongly acid to extremely acid. Available moisture capacity and natural fertility are low.

These soils are not suited to general cultivation and are poorly suited to pasture and grazing. They are suitable for woodland and for some kinds of wildlife habitat.

Capability unit VIIIw–1

This unit consists only of Tidal marsh. It is often flooded by saline to brackish tidewater. It is not suited to crops, pasture, or trees. It is suitable for wildlife habitat, fishing, boating, and other recreational activities.

Capability unit VIIIs–2

This unit consists only of areas of Coastal beaches which are made up mostly of noncoherent loose sand that is al-

TABLE 2.—*Estimated average acre yields of*

[Absence of a figure indicates crop is not suited to the soil specified or is not commonly grown. Alluvial land (Ad), Coastal beaches (Co), and pasture are not grown on these areas. The symbol

Soil	Corn (grain)	Corn (silage)	Wheat
	Bu.	*Tons*	*Bu.*
Aura gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	90	18	40
Aura gravelly sandy loam, 10 to 15 percent slopes, moderately eroded	80	16	35
Aura gravelly sandy loam, 5 to 15 percent slopes, severely eroded			
Beltsville silt loam, 0 to 2 percent slopes	95	19	45
Beltsville silt loam, 2 to 5 percent slopes, moderately eroded	95	19	45
Beltsville silt loam, 5 to 10 percent slopes, moderately eroded	80	16	40
Beltsville silt loam, 5 to 10 percent slopes, severely eroded	70	14	35
Bibb silt loam	120	24	
Bourne sandy loam, 2 to 5 percent slopes, moderately eroded	85	17	40
Bourne sandy loam, 5 to 10 percent slopes, moderately eroded	80	16	35
Bourne sandy clay loam, 5 to 10 percent slopes, severely eroded	70	14	30
Chillum silt loam, 2 to 6 percent slopes, moderately eroded	130	26	50
Chillum silt loam, 6 to 12 percent slopes, moderately eroded	120	24	45
Croom gravelly loam, 3 to 8 percent slopes, moderately eroded	70	14	35
Croom gravelly loam, 8 to 15 percent slopes, moderately eroded	65	13	30
Croom gravelly loam, 8 to 15 percent slopes, severely eroded			
Elkton silt loam	105	21	
Eroded land, steep			
Evesboro loamy sand, 0 to 8 percent slopes	60	12	25
Evesboro loamy sand, 8 to 15 percent slopes			
Evesboro gravelly loamy sand, 0 to 8 percent slopes	60	12	25
Evesboro gravelly loamy sand, 8 to 15 percent slopes			
Exum silt loam, 5 to 10 percent slopes, moderately eroded	90	18	35
Exum silt loam, 10 to 15 percent slopes, moderately eroded	80	16	30
Exum clay loam, 5 to 10 percent slopes, severely eroded	70	14	25
Exum clay loam, 10 to 15 percent slopes, severely eroded			
Exum-Beltsville silt loams, 2 to 5 percent slopes, moderately eroded	95	19	40
Fallsington sandy loam	120	24	
Galestown loamy sand, 0 to 8 percent slopes	70	14	30
Gravelly land, steep			
Iuka fine sandy loam	130	26	45
Iuka sandy loam, local alluvium	130	26	45
Iuka silt loam, local alluvium	130	26	45
Keyport fine sandy loam, 0 to 2 percent slopes	110	22	40
Keyport fine sandy loam, 2 to 5 percent slopes, moderately eroded	110	22	40
Keyport silt loam, 0 to 2 percent slopes	110	22	40
Keyport silt loam, 2 to 5 percent slopes, moderately eroded	110	22	40
Keyport silt loam, 5 to 12 percent slopes, moderately eroded	90	18	35
Keyport silty clay loam, 5 to 12 percent slopes, severely eroded			
Leonardtown silt loam	70	14	
Magnolia silt loam, 0 to 2 percent slopes	140	28	50
Magnolia silt loam, 2 to 5 percent slopes, moderately eroded	140	28	50
Magnolia silt loam, 5 to 12 percent slopes, moderately eroded	130	26	45
Magnolia clay loam, 5 to 12 percent slopes, severely eroded	110	22	40
Marr fine sandy loam, 2 to 5 percent slopes, moderately eroded	130	26	50
Matapeake fine sandy loam, 0 to 2 percent slopes	140	28	50
Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	140	28	50
Matapeake silt loam, 0 to 2 percent slopes	140	28	50
Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	140	28	50
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	130	26	45
Matapeake silt loam, 5 to 10 percent slopes, severely eroded	110	22	40
Matawan loamy sand	120	24	40
Mattapex fine sandy loam, 0 to 2 percent slopes	135	27	45
Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	135	27	45
Mattapex silt loam, 0 to 2 percent slopes	135	27	45
Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	135	27	45
Mattapex soils, 5 to 12 percent slopes	120	24	35
Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes	130	26	45
Osier loamy sand	60	12	
Othello fine sandy loam	115	23	
Othello silt loam	115	23	
Rumford loamy sand, 0 to 5 percent slopes, moderately eroded	110	22	45
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	100	20	40

See footnote at end of table.

principal crops under improved management

Cut and fill land (Cu), Gravel and borrow pits (Gp), Swamp (Sx),and Tidal marsh (Tm) are not included in this table, because crops < means less than and the symbol > means more than]

Soybeans	Hay		Tall grass and legume pasture	Yields of tobacco	Quality of tobacco
	Alfalfa and grass	Clover and grass			
Bu.	*Tons*	*Tons*	*Cow-acre-days* [1]	*Lbs.*	
30	3.0	2.5	170	700–1,500	High.
	3.0	2.5	170		
			130		
35		3.0	170	1,100–1,500	Low.
35		3.0	170	1,100–1,500	Low.
30		3.0	170	1,110–1,500	Low.
		2.5	145	1,100–1,500	Low.
35		3.0	170		
30		2.5	170	700–1,500	Medium.
30		2.5	170	700–1,500	Medium.
		2.0	145	700–1,500	Medium.
45	5.0	3.5	285	1,100–1,500	Low.
40	4.5	3.5	255	1,100–1,500	Low.
25		2.5	145	<700	Medium.
		2.5	145	<700	Medium.
		2.0	115	<700	Medium.
40		3.5	200		
20	2.5	2.0	145	700–1,100	Very high.
			115		
20	2.5	2.0	145	700–1,100	Very high.
			115		
30		3.0	200	1,100–1,500	Low.
		2.5	170	1,100–1,500	Low.
		2.0	145	700–1,100	Low.
			115		
35		3.0	200	1,100–1,500	Low.
35		3.0	170		
20	2.5	2.0	145	700–1,100	Very high.
40		3.5	255		
40		3.5	255	1,100–1,500	Medium.
40		3.5	255	1,100–1,500	Low.
40		3.0	170	700–1,500	Medium.
40		3.0	170	700–1,500	Medium.
40		3.0	170	1,100–1,500	Low.
40		3.0	170	1,100–1,500	Low.
30		3.0	170	1,100–1,500	Low.
			115		
25		2.5	145		
45	5.5	3.5	315	>1,500	Low.
45	5.5	3.5	315	>1,500	Low.
40	5.0	3.5	285	>1,500	Low.
	4.5	3.0	255	1,100–1,500	Low.
45	5.5	3.5	315	1,100–1,500	High.
45	5.5	3.5	315	1,100–1,500	High.
45	5.5	3.5	315	1,100–1,500	High.
45	5.5	3.5	315	>1,500	Low.
45	5.5	3.5	315	>1,500	Low.
40	5.0	3.5	285	>1,500	Low.
	4.5	3.0	255	1,100–1,500	Low.
40	4.5	3.5	255	1,100–1,500	Medium.
45	4.5	3.5	255	1,100–1,500	Medium.
45	4.5	3.5	255	1,100–1,500	Medium.
45	4.5	3.5	255	>1,500	Low.
45	4.5	3.5	255	>1,500	Low.
	4.0	3.0	215	1,100–1,500	Medium.
40	5.0	3.5	285	1,100–1,500	Medium.
20		2.0	115		
40		3.5	200		
40		3.5	200		
40	5.0	3.5	285	700–1,100	Very high.
35	4.5	3.0	255	700–1,100	Very high.

TABLE 2—*Estimated average acre yields of*

Soil	Corn (grain)	Corn (silage)	Wheat
	Bu.	*Tons*	*Bu.*
Rumford gravelly sandy loam, 0 to 5 percent slopes, moderately eroded	110	22	45
Rumford gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	100	20	40
Sandy land, steep			
Sassafras sandy loam, 0 to 2 percent slopes	130	26	50
Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	130	26	50
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	120	24	45
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	100	20	40
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	100	20	40
Sassafras sandy loam, 10 to 15 percent slopes, severely eroded			
Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	130	26	50
Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	115	23	45
Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	95	19	40
Westphalia fine sandy loam, 12 to 20 percent slopes, moderately eroded	95	19	40
Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded			
Westphalia-Evesboro complex, 2 to 6 percent slopes, moderately eroded	95	19	40
Westphalia-Evesboro complex, 6 to 12 percent slopes, moderately eroded	80	16	35
Westphalia-Evesboro complex, 6 to 12 percent slopes, severely eroded	65	13	30
Wickham fine sandy loam, 2 to 5 percent slopes, moderately eroded	120	24	45
Wickham fine sandy loam, 5 to 10 percent slopes, moderately eroded	110	22	40
Wickham fine sandy loam, 10 to 15 percent slopes, moderately eroded	90	18	40
Wickham sandy clay loam, 5 to 10 percent slopes, severely eroded	90	18	40
Wickham sandy clay loam, 10 to 15 percent slopes, severely eroded			
Woodstown sandy loam, 0 to 2 percent slopes	130	26	40
Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	130	26	40
Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	120	24	40

[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 provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

most barren. These areas border tidal parts of the rivers and larger streams of the county.

They are suitable for various kinds of recreation, but they are not suitable for farming. Also they are feeding areas for some kinds of animals and waterfowl.

Capability Unit VIIIs–4

This unit consists of areas of Gravel and borrow pits. The soils in these areas have been removed and the underlying material can be used for road construction or other purposes.

Without complete reclamation, areas of these pits are not suitable for farming. Some areas are used for further excavation for sand, gravel, or road fill. Depending upon relief and other factors, some pits can be used as sites for disposal of waste and some can be reclaimed and used for other purposes.

Estimated Yields

Table 2 gives the estimates of the average yields of the principal crops grown in Charles County. Yields are given for each soil of the county that is used in farming. Yields are averages expected over a period of years in which there is a wide range of rainfall and other climatic conditions. Yields listed are those that are expected by following the best current management practices. These practices include:

1. Contour tillage, stripcropping, keeping tillage to a minimum, cropping systems, or similar measures to control erosion; the soils that need drainage are drained (those already artificially drained must have drainage systems that are well maintained); excess water is disposed of safely, and supplemental irrigation is given to soils that need it during periods of short moisture supply.
2. Winter cover crops are used as seasonal protection for soils that are intensively used for crops during the regular growing seasons. Besides furnishing protection from winter erosion, this cover crop helps to improve or maintain soil structure, tilth, and fertility. It also supplies organic matter to the soil when it is turned under.
3. Manure and crop residue are turned under to supply nitrogen, other nutrients, and organic matter. This also improves the physical condition of the soil and helps to reduce erosion.
4. Fertilizers and lime are applied according to the needs of crops and the levels of lime and plant nutrients in the soil as indicated by soil tests. The Extension Service can be consulted about making the tests. Applications of fertilizer in excess of needs are wasted, and may contribute to pollution of water resources.
5. The soils are cultivated as seldom as possible, as cultivation breaks down soil structure. Suitable methods of plowing, preparing the seedbed, and cultivating are used as needed.
6. Planting, cultivating, and harvesting are done at the proper time and in the proper way.
7. Weeds, diseases, and insects are controlled.

The yield estimates in table 2 are not the highest obtainable, but they set a minimum goal that is practical and

principal crops under improved management—Continued

Soybeans	Hay		Tall grass and legume pasture	Yields of tobacco	Quality of tobacco
	Alfalfa and grass	Clover and grass			
Bu.	*Tons*	*Tons*	*Cow-acre-days* [1]	*Lbs.*	
40	5. 0	3. 5	285	700–1, 100	High.
35	4. 5	3. 0	255	700–1, 100	High.
45	5. 5	3. 5	315	1, 100–1, 500	High.
45	5. 5	3. 5	315	1, 100–1, 500	High.
40	5. 0	3. 5	285	1, 100–1, 500	High.
	4. 5	3. 0	255	1, 100–1, 500	High.
	4. 5	3. 0	255	1, 100–1, 500	High.
			230		
45	5. 0	3. 5	285	1, 100–1, 500	Very high.
40	4. 5	3. 0	255	1, 100–1, 500	Very high.
	4. 0	3. 0	230	1, 100–1, 500	Very high.
	4. 0	3. 0	230	1, 100–1, 500	Very high.
			200		
35	4. 0	3. 0	215	700–1, 100	Very high.
30	3. 5	2. 5	200	700–1, 100	Very high.
	3. 0	2. 0	170	700–1, 100	Very high.
40	5. 0	3. 5	285	700–1, 500	High.
35	4. 5	3. 0	255	700–1, 500	High.
	4. 0	3. 0	230	700–1, 500	High.
	4. 0	3. 0	230	700–1, 100	Medium.
			200		
40	4. 5	3. 5	285	1, 100–1, 500	Medium.
40	4. 5	3. 5	285	1, 100–1, 500	Medium.
40	4. 0	3. 5	255	1, 100–1, 500	Medium.

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

that have been reached or surpassed by many farmers of the county. Yields on any kind of soil vary even under the best management. Differences in the weather, in crop varieties used, and in the prevalence of insects and diseases account for variations in crop yields. Variations in average yields, however, should not be greater than 10 percent for tilled crops, or 20 percent for hay crops and pasture.

Yields in table 2 reflect the status of technology in 1970. Adjustments in estimated yields must be made to keep abreast of technology. However, relative differences in yields on different kinds of soils should remain approximately the same.

Use of the Soils as Woodland [2]

In 1967 most of the 185,000 acres of commercial woodland in Charles County was privately owned. Almost two-thirds of the county was wooded.

Some holdings are too small to be efficiently operated for timber production alone. Woodland constantly is used for residential or other economically profitable uses. At present, timberland has a uniform assessment for tax purposes on all kinds of soil.

Oak-hickory-poplar and yellow pine are the main forest types. The latter consists mostly of Virginia pine, a shallow-rooted species that is well adapted to most of the soils of the county. This also includes soils that are only moderately deep to a root-inhibiting layer (for example, the Beltsville soils).

[2] Mr. C. S. DENNIS of the Maryland Department of Forests and Parks, assisted in the preparation of this section.

Yellow-poplar has the most excellent market, especially for veneer production. In 1970, nine permanent sawmills were in the county, producing about 20 million board feet annually, of all species.

Management of woodland

Table 3 lists all of the soils of the county that are suited to wood crops and gives the factors that affect woodland management. It also gives the woodland subclass of each soil and the estimated site index for oaks and other suitable species. In addition, table 3 identifies the species to be favored in existing stands and those suitable for planting.

The hazards and limitations of the soils that affect woodland management are rated slight, moderate, or severe. Equipment limitations vary according to slope, wetness, and other soil characteristics that restrict the use of heavy equipment commonly used in tending and harvesting trees. Seedling mortality refers to the loss of naturally ocurring or planted tree seedlings as a result of unsuitable soil properties. Plant competition refers to invasion by or growth of undesirable vegetation, such as weeds, shrubs, and vines, when openings are made in the forest canopy. Such competition particularly affects desirable species in the seedling and sapling stages.

Erosion hazard refers to the degree of potential soil erosion following cutting operations and also where the soil is exposed along roads, skid trails, fire lanes, and log decking areas. The degree of hazard varies with the slope and the erodibility of a particular kind of soil. Windthrow hazard is an evaluation of soil characteristics that affect tree root development which influences the probability of trees being blown down by wind.

TABLE 3.—*Factors affecting*

[Absence of an entry in a column means that information was not available. Coastal beaches (Co), Cut and fill land (Cu),

Soil series and map symbols	Woodland subclass	Management concerns—					
		Equipment limitations	Seedling mortality	Competition for—		Erosion hazard	Windthrow hazard
				Conifers	Hardwoods		
Alluvial land: Ad	2w	Severe: high water table; flooding.	Moderate	Severe	Moderate	Slight	Slight
Aura: AuC2, AuD2, AuD3	3d	Slight	Moderate	Moderate	Slight	Slight to moderate.	Slight
Beltsville: B1A, B1B2, B1C2, B1C3.	3w	Moderate: perched water table.	Moderate	Moderate	Slight	Slight	Slight
Bibb: Bo	2w	Severe: high water table; flooding.	Severe	Severe	Severe	Slight	Slight
Bourne: BrB2, BrC2, BuC3	3w	Moderate: perched water table.	Moderate	Moderate	Slight	Slight	Slight
Chillum: ChB2, ChC2	3o	Slight	Slight	Moderate	Slight	Slight	Slight
Croom: CrB2, CrC2, CrC3	4d	Slight	Moderate	Moderate	Slight	Slight	Slight
Elkton: Ek	3w	Severe: high water table; plastic subsoil.	Slight	Severe	Severe	Slight	Slight
Eroded land, steep: ErE	3r	Moderate to severe: slopes.	Moderate	Moderate	Slight	Moderate	Slight
Evesboro: EvB, EvC, EwB, EwC.	3s	Moderate: loose sand.	Moderate	Moderate	Slight	Slight	Slight
Exum: ExC2, ExD2	3o	Slight	Slight	Moderate	Slight	Slight	Slight
EyC3, EyD3	4o	Slight	Moderate	Slight	Slight	Slight	Slight
Exum-Beltsville: EzB2	3o	Slight to moderate: perched water table.	Slight to moderate.	Moderate	Slight	Slight	Slight
Fallsington: Fs	2w	Severe: high water table.	Severe	Severe	Severe	Slight	Slight
Galestown: GaB	3s	Moderate: loose sand.	Moderate	Moderate	Slight	Slight	Slight
Gravelly land, steep: GvE	4f	Moderate to severe: slopes.	Moderate	Slight	Slight	Moderate	Slight
Iuka: Ik, Im, In	1o	Slight	Slight	Severe	Moderate	Slight	Slight
Keyport: KeA, KeB2, KpA, KpB2, KpC2, KrC3.	3w	Moderate: seasonal water table; plastic subsoil.	Slight	Moderate	Slight	Slight	Slight

woodland management

Gravel and borrow pits (Gp), Swamp (Sx), and Tidal marsh (Tm) are too variable to rate and are not suited to wood crops]

Site index				Preferred species		
Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	In planting	For Christmas trees
75–85	85–95			Loblolly pine, sweetgum, red maple; mixed oaks.	Loblolly pine, white pine, sweetgum.	Scotch pine, white pine.
65–75	75–85		65–75	Red oak, Virginia pine	Loblolly pine, Virginia pine.	Scotch pine, Austrian pine, white pine.
60–75	65–75		65–75	Virginia pine, loblolly pine, red oak.	Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
70–80	85–95			Loblolly pine, red oak, sweetgum.	Loblolly pine, sweetgum.	Scotch pine, white pine, Norway spruce.
65–75	70–80		65–75	Virginia pine, loblolly pine, red oak.	Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
65–75		75–85	65–75	Loblolly pine, red oak, Virginia pine.	White pine, loblolly pine, Virginia Pine, yellow-poplar.	Scotch pine, Norway spruce, Austrian pine, white pine.
55–65			55–65	Red oak, Virginia pine	Virginia pine, loblolly pine.	Scotch pine, Austrian pine, white pine.
75–85	75–85			Lowland oaks, loblolly pine, sweetgum, red maple.	Loblolly pine, white pine.	Scotch pine, white pine.
65–75			65–75	Virginia pine, red oak	Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
65–75	80–90		65–75	Red oak, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine.	Scotch pine, white pine.
65–75	75–85		65–75	Red oak, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine.	Scotch pine, Austrian pine, white pine.
55–65			55–65			
65–75	70–85		65–75	Red oak, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine, white pine.	Scotch pine, Austrian pine, white pine.
75–85	80–90			Red oak, red maple, sweetgum, yellow-poplar, loblolly pine.	Loblolly pine, white pine, sweetgum, yellow-poplar.	Scotch pine, white pine, Norway spruce.
65–75	75–85		65–75	Red oak, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine.	Scotch pine, white pine.
55–65		65–75	55–65	Virginia pine, red oak	Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
	>95	>95		Yellow-poplar, loblolly pine, red oak.	Loblolly pine, yellow-poplar.	Scotch pine, Austrian pine, white pine, Norway spruce.
65–75	75–85		65–75	Red oak, sweetgum, loblolly pine, Virginia pine.	Loblolly pine, white pine, sweetgum.	Scotch pine, Austrian pine, white pine.

TABLE 3.—*Factors affecting*

Soil series and map symbols	Woodland subclass	Management concerns—					
		Equipment limitations	Seedling mortality	Competition for—		Erosion hazard	Windthrow hazard
				Conifers	Hardwoods		
Leonardtown: Le	3w	Severe: high perched water table.	Severe	Severe	Severe	Slight	Moderate
Magnolia: MgA, MgB2, MgC2, MkC3.	2o	Slight	Slight	Moderate	Slight	Slight	Slight
Marr: MlB2	3o	Slight	Slight	Moderate	Slight	Slight	Slight
Matapeake: MmA, MmB2, MnA, MnB2, MnC2, MnC3.	3o	Slight	Slight	Moderate	Slight	Slight	Slight
Matawan: Ms	2o	Slight	Slight	Severe	Moderate	Slight	Slight
Mattapex: MtA, MtB2, MuA, MuB2, MxC.	3o	Slight	Slight	Moderate to severe.	Slight to moderate.	Slight	Slight
Ochlockonee: OcB	1o	Slight	Slight	Severe	Moderate	Slight	Slight
Osier: Or	2w	Severe: high water table; loose sand.	Severe	Severe	Severe	Slight	Slight to moderate.
Othello: Os, Ot	3w	Severe: high water table.	Severe	Severe	Severe	Slight	Slight
Rumford: RdB2, RdC2, RgB2, RgC2.	3o	Slight	Slight	Moderate	Slight	Slight	Slight
Sandy land, steep: SaE	3s	Severe: loose sand; slopes.	Moderate	Moderate	Slight	Slight to moderate.	Slight
Sassafras: ShA, ShB2, ShC2, ShC3, ShD2, ShD3.	3o	Slight	Slight	Moderate	Slight	Slight	Slight
Westphalia: WaB2, WaC2, WaC3	3o	Slight	Slight	Moderate	Slight	Slight	Slight
WaD2, WaD3	3r	Slight to moderate: slope.	Slight	Moderate	Slight	Moderate	Slight
Westphalia-Evesboro: WeB2, WeC2, WeC3.	3o	Slight to moderate: loose sand in Evesboro.	Slight to moderate.	Moderate	Slight	Slight	Slight
Wickham: WkB2, WkC2, WkD2, WmC3, WmD3.	2o	Slight	Slight	Severe	Moderate	Slight	Slight
Woodstown: WoA, WoB2, WoC2.	2o	Slight	Slight	Severe	Moderate	Slight	Slight

woodland management—Continued

Site index				Preferred species		
Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	In planting	For Christmas trees
----------	75–85	----------	----------	Loblolly pine, red maple, sweetgum.	Loblolly pine	Scotch pine, Norway spruce.
70–80	85–95	----------	----------	Loblolly pine, yellow-poplar, red oak.	Loblolly pine, yellow-poplar.	Scotch pine, white pine, Austrian pine.
65–75	75–85	75–85	65–75	Red oak, loblolly pine, Virginia pine, yellow-poplar, sweetgum.	White pine, loblolly pine, Virginia pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
70–80	75–85	85–95	70–80	Red oak, yellow-poplar, sweetgum, loblolly pine, Virginia pine.	Loblolly pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
75–85	85–95	85–95	----------	Red oak, loblolly pine, sweetgum, yellow-poplar.	Loblolly pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Norway spruce.
70–80	75–85	75–85	----------	Red oak, yellow-poplar, sweetgum, loblolly pine.	White pine, yellow-poplar, sweetgum, loblolly pine.	Scotch pine, white pine.
75–85	>95	80–90	----------	Loblolly pine, yellow-poplar, red oak, sweetgum, red maple.	Loblolly pine, yellow-poplar.	Scotch pine, Norway spruce, Austrian pine, white pine, Douglas fir.
70–80	80–90	----------	----------	Loblolly pine, sweetgum, black gum, red oak, red maple.	Loblolly pine	Scotch pine, white pine.
70–80	75–85	----------	----------	Loblolly pine, red oak, red maple, sweetgum.	Loblolly pine, sweetgum.	Scotch pine, white pine.
65–75	75–85	----------	65–75	Loblolly pine, Virginia pine, red oak.	Loblolly pine, Virginia pine.	Scotch pine, white pine, Austrian pine.
65–75	80–90	----------	65–75	Red oak, Virginia pine	Virginia pine, loblolly pine.	Scotch pine, white pine.
70–80	70–82	80–90	70–80	Red oak, loblolly pine, Virginia pine, yellow-poplar, sweetgum.	Loblolly pine, Virginia pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
65–75	----------	75–85	65–75	Red oak, Virginia pine, loblolly pine, yellow-poplar, sweetgum.	Loblolly pine, Virginia pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
----------	----------	----------	----------	----------	----------	----------
65–75	80–90	75–85	65–75	Red oak, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine.	Scotch pine, white pine.
75–85	----------	85–95	75–85	Red oak, yellow-poplar, Virginia pine, loblolly pine, black walnut.	White pine, yellow-poplar, black walnut loblolly pine.	Scotch pine, white pine, Austrian pine.
75–85	80–90	85–95	----------	Red oak, loblolly pine, yellow-poplar, sweetgum, red maple.	Loblolly pine, white pine, yellow-poplar, sweetgum.	Scotch pine, Norway spruce, white pine.

Woodland classes and subclasses

The soils of Charles County have been evaluated and grouped according to a nationwide system put into effect by woodland conservationists of the Soil Conservation Service. This system is known as ordination. In it, soils are placed in woodland classes according to their potential productivity for woodland species. They are also placed in subclasses according to their inherent limitations for woodland management.

Potential productivity is expressed as a site index, which is the height, in feet, that a specified kind of tree growing on that soil will reach in 50 years.

The woodland classification of soils is based mainly on the site index classes for economic species of oaks and Virginia pine. Important oaks of the county are red oak, black oak, white oak, and pin oaks. However, the classification is based in part on the site index classes for loblolly pine and yellow-poplar. Loblolly pine is not abundant, but it thrives well on many soils, and is perhaps the most important tree for planting. Determinations of site indexes for the index species were made in parts of Maryland, Delaware, Virginia, and New Jersey.

On the basis of productivity, the soils of the county have been placed in four classes: class 1, made up of soils very high in productivity (site index greater than 85 for oaks and Virginia pine); class 2, made up of soils high in productivity (site index 75 to 85 for oaks and Virginia pine); class 3, made up of soils of medium productivity (site index 65 to 75 for oaks and Virginia pine) and class 4, made up of soils of low productivity (site index 55 to 65 for oaks and Virginia pine). Some miscellaneous land types in the county are not suited to wood crops, and they are not classified.

The soils of Charles County are in 6 subclasses which are identified as follows: subclass *w*, limitations due to wetness or a high water table; subclass *d*, limitations due to soil shallowness or restricting rooting depth; subclass *s*, limitations due to excessive sandiness; subclass *f*, limitations due to large amounts of coarse fragments, smaller than stones, in the soil profile; subclass *r*, limitations due to relief or steep slope; subclass *o*, no limitations. Where a soil has more than one limitation, the more serious limitation is used as the basis in designating its subclass.

There are 11 combinations of class and subclass in Charles County. Descriptions of the resultant 11 woodland subclasses follow. The names of the soil series represented are mentioned in the description of each woodland subclass. The listing of a series name does not mean that all the soils of a series are always in the same woodland subclass.

The woodland subclass of individual soils is shown at the end of each mapping unit description and also in the "Guide to Mapping Units" at the back of this publication.

WOODLAND SUBCLASS 1o

This subclass consists of soils in the Iuka and Ochlockonee series that are moderately well drained to well drained and are level to gently sloping. These soils are very highly productive and have no significant limitations to woodland use and management. In some places on the Iuka soils, the hazard of flooding is moderate, but this is not a serious limitation.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 370 for mixed oak, 640 for yellow-poplar, and 900 (or 1.5 cords of pulpwood) for loblolly pine. At the same age, a normal stand of mixed oaks has a total yield per acre of about 18,500 board feet; yellow-poplar, 32,000 board feet, and loblolly pine, 27,000 board feet or 77 cords of pulpwood.

No reliable estimates of growth or yields are available for Virginia pine grown on the soils in this subclass.

WOODLAND SUBCLASS 2o

This subclass consists of soils of the Magnolia, Matawan, Wickham, and Woodstown series. These soils are highly productive and have no significant limitations to woodland use and management. These soils are well drained or moderately well drained and have slopes of no more than 15 percent.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 275 for mixed oak, 680 (or 1.3 cords of pulpwood) for loblolly pine, 490 for yellow-poplar, and for Virginia pine, 1.9 cords of pulpwood.

At the same age, a normal stand of mixed oaks has a total of about 13,750 board feet; loblolly pine, 18,800 board feet (or 63 cords of pulpwood); and yellow-poplar, 24,400 board feet. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 57 cords of pulpwood, and at 50 years of age, it has about 95.

The Magnolia and Wickham soils of this subclass are suited to the production of black walnut, but no reliable estimates of yields are available.

WOODLAND SUBCLASS 2w

This subclass consists of soils of the Bibb, Fallsington, and Osier series, and Alluvial land. These soils are highly productive but have a moderate to severe limitation to heavy equipment because of seasonal wetness or the presence of a high water table. Seedling mortality and plant competition for woodland species are severe on some of these soils. The hazard of flooding is severe on Bibb soils and on Alluvial land.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 275 for oaks, and about 680 (or 1.3 cords of pulpwood) for loblolly pine. At the same age, a normal stand of oaks has a total yield per acre of about 13,750 board feet and loblolly pine, 18,800 board feet or 63 cords of pulpwood.

Some areas of these soils have good natural stands of yellow-poplar, sweetgum, or red maple, but no reliable estimates of yields are available. Virginia pine is seldom found on these soils.

WOODLAND SUBCLASS 3o

This subclass consists of soils of the Chillum, Exum, Marr, Matapeake, Mattapex, Rumford, Sassafras, and Westphalia series. Some complex units mainly of Exum and Westphalia soils are also in this subclass. They are well drained, moderately well drained, or somewhat excessively drained and have a slope of no more than 15 percent, or 12 percent for the more readily erodible Westphalia soils. These soils are moderately productive and have no significant limitations to woodland use and management.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 200 for mixed

oaks, 470 (or 1 cord of pulpwood) for loblolly pine, 350 for yellow-poplar, and 1.1 cords of pulpwood for Virginia pine.

At the same age, a normal stand of mixed oaks has a total yield per acre of 9,750 board feet; loblolly pine, 11,400 board feet (or 51 cords of pulpwood); and yellow-poplar, 17,600 board feet. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 33 cords of pulpwood, and at 50 years of age, it has about 54.

No reliable estimates of yields are available for stands of sweetgum grown on the soils in this subclass.

WOODLAND SUBCLASS 3r

This subclass consists of some soils of the Westphalia series and the miscellaneous land type, Eroded land, steep. All areas are well drained. Slopes range from 12 to 20 percent for the Westphalia soils and from 15 to more than 40 percent for Eroded land, steep. These soils are medium in woodland productivity, but they have slight to severe limitations for woodland use and management because slopes in places restrict the use of heavy equipment, and hazard of erosion is moderate.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 200 for mixed oaks, 350 for yellow-poplar in Westphalia soils; and 1.1 cords of pulpwood for Virginia pine.

At the same age, a normal stand of mixed oaks has a total yield per acre of about 9,750 board feet, and yellow-poplar, about 17,600 board feet on Westphalia soils only. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 33 cords of pulpwood, and at 50 years of age it has about 54.

No reliable estimates of yields are available for sweetgum on the soils in this subclass.

WOODLAND SUBCLASS 3w

This subclass consists of soils of the Beltsville, Bourne, Elkton, Keyport, Leonardtown, and Othello series. The soils are moderately well drained to poorly drained. They are level to moderately sloping and have slopes of no more than 12 percent. These soils are moderately productive but have moderate to severe limitations to heavy equipment because of seasonal wetness or the presence of a high water table. Seedling mortality and plant competition for woodland species are severe on some of these soils.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 200 for mixed oaks, 470 (or 1 cord of pulpwood) for loblolly pine, and 1.1 cords of pulpwood for Virginia pine.

At the same age, a normal stand of mixed oaks has a total yield per acre of 9,750 board feet; and loblolly pine, 11,400 board feet, or 51 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 33 cords of pulpwood, and at 50 years of age it has about 54.

Yellow-poplar is not well suited to most of these soils. Some areas have fairly good stands of sweetgum or red maple, and no reliable estimates of yields on these soils are available. Although few native stands of loblolly pine grow on the soils of woodland subclass 3w, these soils are well suited to this species (fig. 20).

Figure 20.—**Planted loblolly pine in the Cedarville State Forest. The soil is Beltsville silt loam, in woodland subclass 3w.**

WOODLAND SUBCLASS 3s

This subclass consists of soils of the Evesboro and Galestown series, and the miscellaneous land type, Sandy land, steep. These are excessively drained or somewhat excessively drained, and in places they have slopes of more than 40 percent. They are moderately productive, but have moderate to severe limitations to heavy equipment because of sandiness or slope. Seedling mortality is moderate because of seasonal droughtiness.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 200 for mixed oaks, 470 (or 1 cord of pulpwood) for loblolly pine, and 1.1 cords of pulpwood for Virginia pine.

At the same age, a normal stand of mixed oaks has a total yield per acre of about 9,750 board feet; and loblolly pine, 11,400 board feet or 51 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 33 cords of pulpwood, and at 50 years of age it has about 54.

This subclass generally is not well suited to the production of other timber trees.

WOODLAND SUBCLASS 3d

The only soils of this subclass are those of the Aura series. These soils are well drained, and have a slope of no more than 15 percent. They are moderately or severely eroded. They are moderately productive, but have a limited rooting zone due to moderate depth to a very hard, massive, gravelly subsoil. Roots anchor well into the subsoil but do not penetrate deeply enough to utilize all of its moisture.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 200 for mixed

oaks, 470 or 1 cord of pulpwood for loblolly pine, and 1.1 cords of pulpwood for Virginia pine.

At the same age, a normal stand of mixed oaks has a total yield per acre of 9,750 board feet, and loblolly pine, 11,400 board feet or 51 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine has a total yield of 33 cords of pulpwood, and at 50 years of age it has about 54.

The soils of this subclass generally are not well suited to the production of other timber trees.

WOODLAND SUBCLASS 4o

This subclass consists of the severely eroded soils of the Exum series. These soils are moderately well drained and have slopes ranging from 5 percent to 15 percent. These soils are low in woodland productivity but have no significant limitations to woodland use and management.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 125 for mixed oaks, and 0.6 cord of pulpwood for Virginia pine. At the same age, a normal stand of mixed oaks has a total yield per acre of about 6,300 board feet. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 19 cords of pulpwood, and at 50 years of age it has about 31.

The soils of this subclass are generally not well suited to the production of other timber trees.

WOODLAND SUBCLASS 4d

This subclass consists of soils of the Croom series. They are well drained and have slopes of no more than 15 percent. These soils are poor in woodland productivity, and have a limited rooting zone that is underlain by extremely hard, massive, gravelly subsoil. Roots anchor well into the subsoil, but they do not penetrate deeply enough to utilize most of its moisture.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 125 for mixed oaks, and 0.6 cord of pulpwood for Virginia pine. At the same age, a normal stand of mixed oaks has a total yield per acre of about 6,300 board feet. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 19 cords of pulpwood, and at 50 years of age it has about 31.

The soils of this subclass generally are not well suited to the production of other timber trees.

WOODLAND SUBCLASS 4f

This subclass consists of only Gravelly land, steep. It is well drained to excessively drained and has a slope ranging from 15 to 50 percent. It is low in productivity because of the very low available moisture capacity caused by excess gravel.

In a normal stand 50 years of age, the average annual growth in board feet of timber per acre is 125 for mixed oaks, and 0.6 cord of pulpwood for Virginia pine. At the same age, a normal stand of mixed oaks has a total yield per acre of about 6,300 board feet. At 30 years of age, a fully stocked stand of Virginia pine has a total yield per acre of about 19 cords of pulpwood, and at 50 years of age it has about 31.

In places yellow-poplar thrives well. Otherwise, the soil in this subclass generally is poorly suited to the production of other timber trees.

Wildlife

Food, cover, and water are the essentials of wildlife habitat. Birds and animals frequent the areas they prefer or those that are necessary for their survival. Habitat is created, improved, or maintained by planting appropriate vegetation, or by managing the existing vegetation, or both. For many species, providing water or managing existing water is also important.

In Charles County most areas are suitable for use as habitat for a few kinds of wildlife, and others are suitable for many kinds. About 86 percent of the land area has fair to good potential for use as habitat for open-land wildlife that includes rabbits, a few deer, and quail and other kinds of upland birds. About 91 percent is equally suitable for woodland wildlife that includes deer, squirrel, turkey, and other animals and birds. Another 15 percent has the same potential for wetland wildlife, including raccoon and muskrat, and rail, duck, geese, and other waterfowl.

Table 4 lists the soils in the county and rates their suitability for eight elements of wildlife habitat and for three classes, or groups, of wildlife. The ratings used are good, fair, poor, or not suited.

On soils rated *good*, habitat generally is easily created, improved, or maintained. The soils have few or no limitations in habitat management, and satisfactory results are dependable.

On soils rated *fair*, habitat generally is created, improved or maintained, but the soils have moderate limitations that affect the creation, improvement, or maintenance of the habitat. A moderate intensity of management and fairly frequent attention is required to assure satisfactory results.

On soils rated *poor*, habitat generally is created, improved, or maintained, but soil limitations are fairly severe. Habitat management is difficult and expensive and requires intensive effort. Satisfactory results are uncertain.

On soils rated *not suited*, it is impractical to create, improve, or maintain habitat because of very severe soil limitations. Unsatisfactory results are probable.

In the ratings, the present land use, the location of a soil in relation to other soils, and the mobility of wildlife are not considered.

Habitat elements

Each soil is rated in table 4 according to its suitability for various kinds of plants and other elements that make up wildlife habitat.

Grain and seed crops include corn, sorghum, millet, soybeans, wheat, oats, rye, barley, buckwheat, cowpeas, and other plants commonly grown for grain or for seed used by wildlife.

Grasses and legumes include lespedeza, alfalfa, clover, tall fescue, bromegrass, orchardgrass, bluegrass, and timothy. All of these grasses and legumes can be planted for forage or especially to provide food and cover for wildlife.

Wild herbaceous upland plants include panicgrass and other native grasses, partridgepea, beggarticks, native lespedezas, and other native herbs that are commonly grown in upland areas.

Hardwood woody plants are native or planted trees and shrubs that grow vigorously and usually produce good

crops of seeds or make good cover, or both. These plants include dogwood, persimmon, sumac, sassafras, hazelnut, shrub lespedezas, autumn-olive, multiflora rose, wild cherry, black walnut, hickory, bayberry, blueberry, huckleberry, blackhaw, sweetgum, and various species of oak and holly.

Coniferous woody plants are cone-bearing evergreens and shrubs that are used by wildlife primarily as cover, but they also furnish browse and seeds. They include Virginia pine, white pine, loblolly pine, pond pine, Scotch pine, Norway spruce, redcedar, and Atlantic whitecedar.

Wetland food and cover plants consist of vegetation that provides food and cover for waterfowl and furbearing animals. They include smartweed, wildrice, barnyard grass, bulrush, pondweed, duckweed, duckmillet, arrowarum, pickerelweed, cattail, waterwillow, wetland grasses, and various sedges, including especially three-square in marshy areas.

Shallow-water developments are impoundments in which shallow water is maintained very close to the natural ground level. They are of special importance as habitat for waterfowl because they are shallow and support many kinds of vegetation that produce food for this kind of wildlife. They generally are too shallow to produce fish.

Excavated ponds are dug-out ponds that depend not on runoff, but on ground water. They furnish water for many kinds of wildlife. Migratory waterfowl are especially attracted to these ponds. Farm ponds of the impounded type are not considered in table 4, but they are important for fresh water fish and recreational activities. Such ponds should be at least 6 feet deep in most places. Table 4 gives features of each soil in the county that affect the construction and maintenance of ponds.

Classes of wildlife

Table 4 lists the soils of the county that are rated according to their suitability for three classes of wildlife in the county: open-land, woodland, and wetland wildlife.

Open-land wildlife includes quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals generally make their home in areas of cropland, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, and shrubs.

Woodland wildlife includes ruffed grouse, woodcock, thrush, vireo, scarlet tanager, gray and red squirrels, gray fox, white-tailed deer, raccoon, and wild turkey. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these.

Wetland wildlife includes ducks, geese, rails, herons, shore birds, and muskrat that generally make their home in wet areas, such as ponds, marshes, and swamps.

Each rating under "Kinds of Wildlife" in table 4 is based on the suitability of the soil for the habitat elements indicated in the first part of the table.

For open-land wildlife, the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous woody plants. For woodland wildlife, it is based on the ratings listed for grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. For wetland wildlife, it is based on the ratings for wetland food and cover plants, shallow-water developments, and excavated ponds.

Engineering Uses of the Soils [3]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Some of those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are slope and depth to the water table and to bedrock. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigations systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples. This information, along with the soil map and other parts of this survey, can be used to make interpretations in addition to those given in tables 5, 6, and 7. It also can be used to make other useful maps.

The engineering interpretations reported in this survey do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Estimates generally are made to a depth of about 5 feet and interpretations do not apply to greater depths. Investigation of each site is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering. Even in these situations, however, the soil map is useful in planning more de-

[3] By THEODORE IFFT, conservation engineer, Soil Conservation Service.

TABLE 4.—*Suitability of soils for elements of*

[The land types Cut and fill land (Cu) and Gravel

Soil series and map symbol	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Alluvial land: Ad	Not suited	Poor	Poor	Good
Aura: AuC2, AuD2, AuD3	Poor	Fair	Fair	Fair
Beltsville:				
BlA	Fair	Good	Good	Good
BlB2, BlC2	Fair	Good	Good	Good
BlC3	Poor	Fair	Fair	Good
Bibb: Bo	Poor	Fair	Fair	Good
Bourne:				
BrB2, BrC2	Fair	Good	Good	Good
BuC3	Poor	Fair	Fair	Good
Chillum: ChB2, ChC2	Fair	Good	Good	Good
Coastal beaches: Co	Not suited	Poor	Poor	Not suited
Croom: CrB2, CrC2, CrC3	Poor	Fair	Fair	Fair
Elkton: Ek	Poor	Fair	Fair	Good
Eroded land, steep: ErE	Not suited	Poor	Good	Good
Evesboro: EvB, EvC, EwB, EwC	Poor	Poor	Poor	Poor
Exum:				
ExC2, ExD2	Fair	Good	Good	Good
EyC3	Poor	Fair	Fair	Good
EyD3	Not suited	Poor	Fair	Good
Exum-Beltsville: EzB2	Fair	Good	Good	Good
Fallsington: Fs	Poor	Fair	Fair	Good
Galestown: GaB	Poor	Poor	Poor	Poor
Gravelly land, steep: GvE	Poor	Fair	Fair	Fair
Iuka: Ik, Im, In	Fair	Good	Good	Good
Keyport:				
KeA, KpA	Fair	Good	Good	Good
KeB2, KpB2, KpC2	Poor	Fair	Fair	Good
KrC3	Not suited	Poor	Fair	Good
Leonardtown: Le	Poor	Fair	Fair	Fair
Magnolia:				
MgA	Good	Good	Good	Good
MgB2, MgC2	Fair	Good	Good	Good
MkC3	Poor	Fair	Fair	Good
Marr: MlB2	Fair	Good	Good	Good
Matapeake:				
MmA, MnA	Good	Good	Good	Good
MmB2, MnB2, MnC2	Fair	Good	Good	Good
MnC3	Poor	Fair	Fair	Good
Matawan: Ms	Fair	Good	Good	Fair
Mattapex:				
MtA, MuA	Fair	Good	Good	Good
MtB2, MuB2, MxC	Fair	Good	Good	Good
Ochlockonee: OcB	Good	Good	Good	Good
Osier: Or	Poor	Poor	Fair	Fair
Othello: Os, Ot	Poor	Fair	Fair	Good
Rumford: RdB2, RdC2, RgB2, RgC2	Fair	Fair	Fair	Fair
Sandy land, steep: SaE	Not suited	Not suited	Poor	Poor
Sassafras:				
ShA	Good	Good	Good	Good
ShB2, ShC2	Fair	Good	Good	Good
ShC3, ShD2	Poor	Fair	Good	Good
ShD3	Not suited	Poor	Good	Good
Swamp: Sx	Not suited	Poor	Not suited	Good
Tidal marsh: Tm	Not suited	Not suited	Not suited	Not suited
Westphalia:				
WaB2, WaC2	Fair	Good	Good	Good
WaC3, WaD2	Poor	Fair	Good	Good
WaD3	Not suited	Poor	Good	Good
Westphalia-Evesboro:				
WeB2, WeC2	Poor-Fair	Fair	Fair	Fair
WeC3	Poor	Poor-Fair	Fair	Fair

wildlife habitat and kinds of wildlife

and borrow pits (Gp) are too variable to be rated]

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Open-land	Woodland	Wetland
Good	Good	Not suited	Not suited	Poor	Good	Poor.
Fair	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Fair	Fair	Poor	Poor	Fair	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Not suited	Not suited	Not suited	Not suited	Not suited	Not suited	Not suited.
Fair	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Good	Not suited	Not suited	Not suited	Poor	Poor	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Fair	Good	Good	Good	Fair	Good	Good.
Good	Not suited	Not suited	Not suited	Poor	Poor	Not suited.
Fair	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Fair	Poor	Not suited	Not suited	Fair	Good	Not suited.
Fair	Poor	Not suited	Not suited	Poor	Good	Not suited.
Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Poor	Poor	Poor	Good	Fair	Poor.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Fair	Good	Fair	Good	Fair	Fair	Good.
Fair	Good	Good	Good	Fair	Good	Good.
Fair	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Fair	Not suited	Not suited	Not suited	Not suited	Poor	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Not suited	Good	Good	Good	Not suited	Poor	Good.
Not suited	Good	Poor	Not suited	Not suited	Not suited	Fair.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Fair	Not suited.

TABLE 4.—*Suitability of soils for elements of*

Soil series and map symbol	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Wickham:				
WkB2, WkC2	Fair	Good	Good	Good
WkD2, WmC3	Poor	Fair	Good	Good
WmD3	Not suited	Poor	Good	Good
Woodstown:				
WoA	Fair	Good	Good	Good
WoB2, WoC2	Fair	Good	Good	Good

TABLE 5.—*Estimated engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in instructions for referring to other series that appear in the first column of this table. The land types Alluvial land (Ad), Coastal beaches variable to be rated. The symbol > means more than; the symbol < means less than]

Soil series and map symbol	Depth to high water table	Depth from surface [1]	Classification		
			USDA texture	Unified	AASHO
	Feet	*Inches*			
Aura: AuC2, AuD2, AuD3	>4	0–7	Gravelly sandy loam	SM, SC, SP–SM	A–2, A–4
		7–24	Gravelly loam	SM, SC	A–2, A–4
		24–54	Gravelly sandy clay loam	SM, SC	A–2, A–4
		54–66	Gravelly sandy loam	SM, SC, SP–SM	A–2, A–4
Beltsville: BlA, BlB2, BlC2, BlC3	1½–2½	0–16	Silt loam	ML	A–4
		16–54	Loam, silt loam, silty clay loam (fragipan).	ML, CL	A–4, A–6
		54–72	Loam, gravelly loam	SM, ML	A–2, A–4
Bibb: Bo	0–1	0–28	Silt loam, loam	ML	A–4
		28–60	Gravelly sandy loam to silty clay loam.	SM, ML, CL	A–2, A–4, A–6
Bourne: BrB2, BrC2, BuC3	1½–2½	0–13	Sandy loam, sandy clay loam	SM, SC, ML	A–2, A–4, A–6
		13–23	Loam, sandy clay loam	SC, CL	A–4, A–6
		23–60	Loam, fine sandy loam (fragipan).	SM, SC, ML	A–2, A–4, A–6
Chillum: ChB2, ChC2	>5	0–28	Silt loam, loam, silty clay loam.	ML, CL	A–4, A–6
		28–60	Gravelly sandy loam	SM, SC, GM	A–2
Croom: CrB2, CrC2, CrC3	>5	0–11	Gravelly loam	GM, GC, GP–GM	A–1, A–2
		11–35	Gravelly sandy clay loam, loam, clay loam.	GM, GC	A–2, A–4
		35–72	Gravelly sandy loam	GM, GP–GM	A–1, A–2

See footnotes at end of table.

wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Open-land	Woodland	Wetland
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Not suited	Not suited	Fair	Good	Not suited.
Fair	Not suited	Not suited	Not suited	Poor	Good	Not suited.
Poor	Poor	Poor	Poor	Good	Good	Poor.
Poor	Not suited	Not suited	Not suited	Good	Good	Not suited.

properties of soils

such mapping units may have different properties and different limitations, and for this reason it is necessary to follow carefully the (Co), Cut and fill land (Cu), Eroded land, steep (ErE), Gravel and borrow pits (Gp), Swamp (Sx), and Tidal marsh (Tm) are too

Percentage passing sieve—				Permeability[2]	Available water capacity	Reaction (unlimed)	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH*	
60–100	50–100	30–70	10–50	0. 20–6. 3	0. 12–0. 16	4. 0–5. 0	Low.
60–100	50–100	30–80	20–50	0. 20–2. 0	0. 12–0. 18	4. 0–5. 0	Low.
65–100	55–100	35–80	30–50	0. 20–0. 63	0. 12–0. 18	4. 0–5. 0	Low.
50–100	30–100	30–100	10–50	0. 20–2. 0	0. 08–0. 12	4. 0–5. 0	Low.
95–100	90–100	75–100	60–90	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	Low.
95–100	90–100	90–100	65–95	<0. 20	0. 10–0. 18	4. 0–5. 0	Low.
75–100	65–100	55–100	25–80	0. 20–6. 3	0. 08–0. 16	4. 0–5. 0	Low.
95–100	90–100	80–100	50–80	0. 63–2. 0	0. 18–0. 24	4. 0–5. 0	Low.
50–100	45–100	40–90	25–80	0. 63–2. 0	0. 10–0. 20	4. 0–5. 0	Low.
75–100	55–100	50–100	25–75	0. 63–2. 0	0. 10–0. 18	4. 0–5. 0	Low.
80–100	60–100	55–100	35–80	0. 63–2. 0	0. 08–0. 18	4. 0–5. 0	Low.
75–100	65–100	60–100	25–60	<0. 20	0. 08–0. 18	4. 0–5. 0	Low.
80–100	65–100	60–100	55–90	0. 20–2. 0	0. 18–0. 27	4. 0–5. 0	Low.
60–95	55–90	30–60	15–35	0. 63–2. 0	0. 08–0. 12	4. 0–5. 5	Low.
50–70	40–60	20–40	5–35	0. 63–2. 0	0. 08–0. 16	4. 0–5. 0	Low.
45–80	40–70	35–65	30–60	0. 20–0. 63	0. 12–0. 18	4. 0–5. 0	Low.
40–70	35–60	30–50	5–30	2. 0–6. 3	0. 6–0. 12	4. 0–5. 0	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbol	Depth to high water table	Depth from surface [1]	Classification		
			USDA texture	Unified	AASHO
	Feet	*Inches*			
Elkton: Ek	0–1	0–12	Silt loam	ML, CL	A–4, A–6
		12–40	Clay, silty clay, silty clay loam.	MH, CL, CH	A–6, A–7
		40–70	Loamy sand to clay	SM, SC, ML, CL	A–2 to A–7
Evesboro: EvB, EvC, EwB, EwC	>5	0–60	Loamy sand, gravelly loamy sand.	SM, SP–SM	A–1, A–2, A–3
*Exum: ExC2, ExD2, EyC3, EyD3, EzB2. For the Beltsville part of unit EzB2, see the Beltsville series.	1½–2½	0–8	Silt loam, clay loam	ML, CL	A–4, A–6, A–7
		8–43	Clay loam, silty clay loam	CL	A–6, A–7
		43–96	Clay loam, loam	ML, CL	A–4, A–6, A–7
Fallsington: Fs		0–16	Sandy loam	SM, SC, ML	A–2, A–4
		16–28	Sandy clay loam, loam, sandy loam.	SM, SC, ML	A–2, A–4
		28–60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SP–SM	A–2, A–3
Galestown: GaB	>10	0–60	Loamy sand, sand, fine sand	SP, SM, SP–SM	A–1, A–2, A–3
Gravelly land, steep: GvE	>5	0–60	Gravelly to very gravelly loam.	SM, GM, GC, GP–GM.	A–1, A–2, A–4
Iuka: Ik, Im, In	1–2	0–60	Sandy loam to silty clay loam.	SM, ML, CL	A–2, A–4, A–6
Keyport: KeA, KeB2, KpA, KpB2, KpC2, KrC3.	1½–2½	0–16	Fine sandy loam, silt loam, silty clay loam.	SM, ML, CL	A–4, A–6
		16–39	Silty clay loam, silty clay, clay.	MH, CL, CH	A–6, A–7
		39–66	Fine sandy loam, gravelly sandy loam.	SM, SC	A–2, A–4
Leonardtown: Le		0–16	Silt loam	ML, CL	A–4
		16–40	Silt loam, silty clay loam (fragipan).	ML, CL	A–4, A–6
		40–72	Sandy loam to silty clay loam.	ML, CL	A–4, A–6, A–7
Magnolia: MgA, MgB2, MgC2, MkC3	>4	0–16	Silt loam, clay loam	ML, CL, SM	A–4, A–6
		16–65	Clay loam	CL, ML	A–6, A–7
		65–76	Sandy clay loam, sandy clay	CL, ML	A–6, A–7
		76–90	Gravelly sandy loam	SM, SC	A–2, A–4
Marr: MlB2	>4	0–17	Fine sandy loam, very fine sandy loam.	SM, ML	A–4
		17–38	Sandy clay loam, fine sandy loam.	SC, CL	A–4, A–6
		38–60	Fine sandy loam, loamy fine sand.	SM, ML	A–2, A–4
Matapeake: MmA, MmB2, MnA, MnB2, MnC2, MnC3.	>4	0–14	Fine sandy loam, silt loam	ML, CL	A–4, A–6
		14–42	Silty clay loam, silt loam	ML, CL	A–4, A–6, A–7
		42–60	Loamy sand to silt loam	SM, SC, ML	A–2, A–4
Matawan: Ms	2–3	0–19	Loamy sand	SM, SC	A–2
		19–50	Sandy clay loam, clay loam, sandy clay.	SC, CL	A–6, A–7
		50–60	Loamy sand to silt loam	SM, SC, ML	A–2, A–4

See footnotes at end of table.

properties of soils—Continued

Percentage passing sieve—				Permeability[2]	Available water capacity	Reaction (unlimed)	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	*Inches per hour*	*Inches per inch of soil*	*pH*	
90–100	85–100	80–100	55–90	0. 20–2. 0	0. 18–0. 27	4. 0–5. 0	Low.
95–100	80–100	80–100	70–100	<0. 20	0. 18–0. 24	4. 0–5. 0	Moderate.
90–100	85–100	65–100	30–100	0. 20–6. 3	0. 08–0. 24	4. 0–6. 0	Low to moderate.
75–100	60–100	40–95	5–15	>6. 3	0. 06–0. 10	4. 0–5. 0	Low.
95–100	90–100	90–100	65–95	0. 20–2. 0	0. 12–0. 24	4. 0–5. 5	Low to moderate.
95–100	95–100	90–100	70–100	0. 20–2. 0	0. 12–0. 18	4. 0–5. 5	Low to moderate.
95–100	90–100	80–100	65–95	0. 20–2. 0	0. 10–0. 18	4. 0–5. 0	Low.
95–100	90–100	70–100	20–60	0. 63–6. 3	0. 10–0. 20	4. 0–5. 0	Low.
95–100	90–100	70–100	20–60	0. 63–2. 0	0. 10–0. 18	4. 0–5. 0	Low.
90–100	70–100	50–100	5–30	>2. 0–6. 3	0. 06–0. 12	4. 0–5. 0	Low.
90–100	80–100	50–95	0–20	>6. 3	0. 06–0. 10	4. 0–5. 5	Low.
35–85	20–80	15–60	10–50	0. 20–2. 0	0. 04–0. 10	4. 0–5. 0	Low.
95–100	90–100	40–95	20–70	0. 20–2. 0	0. 12–0. 24	4. 0–5. 0	Low.
95–100	90–100	70–100	40–100	0. 20–2. 0	0. 12–0. 24	4. 0–5. 5	Low to moderate.
85–100	75–100	70–100	65–100	<0. 20	0. 12–0. 24	4. 0–5. 5	Moderate.
90–100	70–100	60–90	25–50	0. 63–2. 0	0. 10–0. 16	4. 0–5. 0	Low.
95–100	95–100	95–100	90–100	0. 20–0. 63	0. 18–0. 24	4. 0–5. 0	Low.
95–100	95–100	90–100	80–100	<0. 20	0. 18–0. 24	4. 0–5. 0	Low.
90–100	85–100	70–95	50–85	0. 20–2. 0	0. 12–0. 24	4. 0–5. 0	Low.
95–100	95–100	70–95	40–70	0. 63–2. 0	0. 12–0. 18	4. 5–5. 5	Low.
95–100	90–100	60–95	50–80	0. 63–2. 0	0. 14–0. 20	4. 5–5. 5	Low to moderate.
95–100	90–100	70–90	55–80	0. 63–2. 0	0. 12–0. 20	4. 0–5. 0	Low to moderate.
50–85	30–80	30–60	10–50	0. 63–2. 0	0. 08–0. 16	4. 0–5. 0	Low.
95–100	95–100	70–95	40–65	2. 0–6. 3	0. 14–0. 20	4. 5–5. 5	Low.
95–100	95–100	75–90	35–80	0. 63–2. 0	0. 16–0. 24	4. 5–5. 5	Low.
95–100	95–100	80–95	30–60	0. 63–6. 3	0. 12–0. 18	4. 5–5. 5	Low.
95–100	95–100	80–100	55–90	0. 63–2. 0	0. 14–0. 24	4. 5–5. 5	Low.
95–100	95–100	80–100	65–90	0. 20–2. 0	0. 18–0. 24	4. 5–5. 5	Low.
95–100	95–100	60–100	15–60	0. 63–6. 3	0. 06–0. 20	4. 5–5. 5	Low.
90–100	90–100	70–90	20–35	0. 63–6. 3	0. 10–0. 16	4. 0–5. 0	Low.
95–100	95–100	75–100	35–60	<0. 20	0. 14–0. 24	4. 0–5. 0	Low to moderate.
95–100	95–100	60–100	15–60	0. 63–6. 3	0. 06–0. 20	4. 0–5. 0	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbol	Depth to high water table	Depth from surface [1]	Classification		
			USDA texture	Unified	AASHO
	Feet	*Inches*			
Mattapex: MtA, MtB2, MuA, MuB2, MxC.	1½–2½	0–13	Silt loam, fine sandy loam	ML, CL	A–4
		13–36	Silt loam, silty clay loam	ML, CL	A–4, A–6
		36–58	Fine sandy loam	SM, ML	A–2, A–4
		58–72	Gravelly loamy sand to sandy loam.	SM	A–2
Ochlockonee: OcB	>4	0–17	Fine sandy loam	SM, ML	A–2, A–4
		17–39	Sandy loam to silt loam	SM, ML	A–4
		39–60	Loamy sand to silt loam (in places gravelly).	SM, ML	A–2, A–4
Osier: Or		0–20	Loamy sand	SM, SP–SM	A–2, A–3
		20–60	Loamy sand, sand, fine sand	SP, SM, SP–SM	A–2, A–3
Othello: Os, Ot		0–11	Silt loam, fine sandy loam	ML, CL	A–4, A–6
		11–29	Silt loam, silty clay loam	ML. CL	A–4, A–6
		29–60	Loamy sand to sandy loam	SM, SC	A–2, A–4
Rumford: RdB2, RdC2, RgB2, RgC2	>4	0–12	Loamy sand, gravelly sandy loam.	SM	A–2
		12–32	Sandy loam, sandy clay loam (may be gravelly).	SM, SC	A–2, A–4
		32–52	Loamy sand to sandy loam (may be gravelly).	SM, SP–SM	A–2, A–4
Sandy land, steep: SaE	>5	0–60	Sand to fine sandy loam	SM, SP–SM	A–2, A–3, A–4
Sassafras: ShA, ShB2, ShC2, ShC3, ShD2, ShD3.	>4	0–12	Sandy loam	SM	A–2, A–4
		12–38	Sandy clay loam, loam, sandy loam.	SM, SC, ML, CL	A–2, A–4, A–6
		38–60	Loamy sand to sandy loam	SM, SP–SM	A–2, A–4
*Westphalia: WaB2, WaC2, WaC3, WaD2, WaD3, WeB2, WeC2, WeC3. For the Evesboro part of WeB2, WeC2, and WeC3 see the Evesboro series.	>5	0–25	Fine sandy loam	SM, SC, ML	A–2, A–4
		25–72	Fine sand, loamy fine sand	SP–SM, SM, ML	A–2, A–3, A–4
Wickham: WkB2, WkC2, WkD2, WmC3, WmD3.	>6	0–9	Fine sandy loam, sandy clay loam.	SM, ML, CL	A–4, A–6
		9–36	Clay loam, sandy clay loam	SC, CL, MH	A–4, A–6, A–7
		36–64	Sandy loam to sandy clay loam.	SM, SC, CL	A–2, A–4, A–6
Woodstown: WoA, WoB2, WoC2	1½–2½	0–15	Sandy loam	SM, ML	A–2, A–4
		15–34	Sandy clay loam, fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A–2, A–4, A–6
		34–60	Sand to sandy loam	SM, SP–SM	A–2, A–3, A–4

[1] Depths given are for the representative profile (see descriptions of the soils). For any given layer, the figures are estimates of the range of the series within the county.

properties of soils—Continued

Percentage passing sieve—				Permeability[2]	Available water capacity	Reaction (unlimed)	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	*Inches per hour*	*Inches per inch of soil*	*pH*	
95–100	95–100	80–100	55–90	0. 20–2. 0	0. 14–0. 24	4. 0–5. 5	Low.
95–100	95–100	80–100	60–100	0. 20–2. 0	0. 18–0. 24	4. 5–5. 5	Low.
95–100	90–100	75–100	30–80	0. 63–2. 0	0. 12–0. 18	4. 0–5. 0	Low.
90–100	80–100	70–100	15–35	0. 63–6. 3	0. 06–0. 12	4. 0–5. 0	Low.
95–100	95–100	80–95	25–60	0. 63–2. 0	0. 14–0. 20	4. 0–5. 0	Low.
95–100	95–100	80–95	40–70	0. 63–2. 0	0. 14–0. 24	4. 0–5. 0	Low.
90–100	80–100	70–95	15–70	>0. 63	0. 06–0. 18	4. 0–5. 0	Low.
95–100	95–100	60–90	5–30	>6. 3	0. 04–0. 08	4. 0–5. 0	Low.
95–100	95–100	60–90	0–30	>6. 3	0. 04–0. 08	4. 0–5. 0	Low.
95–100	95–100	90–100	60–100	0. 63–2. 0	0. 16–0. 27	4. 0–5. 0	Low.
95–100	95–100	90–100	60–100	0. 20–0. 63	0. 12–0. 24	4. 0–5. 0	Low.
85–100	80–100	50–100	15–50	0. 63–6. 3	0. 06–0. 12	4. 0–5. 0	Low.
90–100	80–100	55–80	15–30	2. 0–6. 3	0. 06–0. 12	4. 5–5. 5	Low.
90–100	80–100	60–85	25–50	2. 0–6. 3	0. 12–0. 18	4. 5–5. 5	Low.
90–100	80–100	50–80	10–40	2. 0–6. 3	0. 06–0. 12	4. 5–5. 5	Low.
95–100	90–100	50–100	5–50	2. 0–6. 3	0. 04–0. 14	4. 0–5. 0	Low.
80–100	80–100	60–100	15–50	0. 63–6. 3	0. 12–0. 20	4. 0–5. 5	Low.
75–100	55–100	50–100	25–75	0. 63–2. 0	0. 12–0. 24	4. 0–5. 5	Low.
90–100	60–100	50–80	10–40	0. 63–6. 3	0. 06–0. 12	4. 0–5. 0	Low.
90–100	85–100	70–100	20–70	0. 63–2. 0	0. 12–0. 24	4. 0–5. 0	Low.
80–100	70–100	50–100	5–60	0. 63–6. 3	0. 08–0. 16	4. 0–5. 0	Low.
80–100	80–100	75–100	45–75	0. 63–6. 3	0. 12–0. 24	4. 5–5. 5	Low.
85–100	85–100	65–100	40–80	0. 63–2. 0	0. 14–0. 24	4. 5–5. 5	Low to moderate.
85–100	85–100	75–100	15–65	0. 63–2. 0	0. 10–0. 18	4. 0–5. 0	Low.
90–100	90–100	45–100	15–60	0. 63–6. 3	0. 08–0. 14	4. 0–5. 0	Low.
95–100	90–100	70–100	25–75	0. 63–2. 0	0. 10–0. 24	4. 0–5. 0	Low.
95–100	90–100	50–100	5–50	0. 63–6. 3	0. 04–0. 14	4. 0–5. 0	Low.

[2] Classes of soil permeability in inches of water per hour are as follows: Rapid, more than 6.3; moderately rapid, 2.0–6.3; moderate, 0.63–2.0; moderately slow, 0.20–0.63; and slow or very slow, less than 0.20.

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TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in tions for referring to other series that appear in the first column of this table. The land types Alluvial land (Ad), Coastal beaches (Co),

Soil series and map symbol	Suitability as source of—			Soil features affecting—	
				Highway and road location	Ponds
	Topsoil	Sand and gravel	Road fill		Reservoir areas
Aura: AuC2, AuD2, AuD3	Poor: gravelly.	Fair for gravel, excessive fines; unsuitable for sand.	Good: A–2 and A–4.	Cuts and fills needed.	Moderately slow to moderate seepage; gravelly.
Beltsville: BlA, BlB2, BlC2, B1C3.	Fair to a depth of 10 inches.	Locally fair for gravel in substratum; silty; unsuitable for sand.	Poor to fair: A–6, A–4, A–2.	Perched water table at a depth of 1½ to 2½ feet; high potential frost action; seepage problem in cuts; cuts and fills needed.	Slow seepage in subsoil; variable seepage in substratum.
Bibb: Bo	Fair to a depth of 2 feet.	Locally fair for gravel in substratum; silty; unsuitable for sand.	Poor to fair: A–6, A–4, A–2.	Seasonal water table at 0 to 1 foot; high potential frost action; flood hazard.	Seasonal water table at 0 to 1 foot; moderate seepage; flood hazard.
Bourne: BrB2, BrC2, BuC3	Fair to a depth of 10 inches.	Unsuitable	Fair: A–2, A–4, A–6.	Perched water table at a depth of 1½ to 2½ feet; high potential frost action; seepage problems in cuts; cuts and fills needed.	Slow seepage
Chillum: ChB2, ChC2	Good to a depth of 2 feet.	Locally fair for sand and gravel in substratum.	Fair: A–4, A–6, above 28 inches; good (A–2) below a depth of 28 inches.	Moderate potential frost action; cuts and fills needed.	Moderate seepage.
Croom: CrB2, CrC2, CrC3	Poor: gravelly.	Good for gravel; poor to unsuitable for sand.	Good A–1, A–2, A–4.	Cuts and fills needed.	Moderate seepage in subsoil, and high in substratum; gravelly.
Elkton: Ek	Fair to a depth of 10 inches.	Unsuitable	Poor: A–7, A–6, A–4, A–2.	Seasonal water table at a depth of 0 to 1 foot; high potential frost action; plastic materials.	Seasonal water table at a depth of 0 to 1 foot; slow seepage.

interpretations of the soils

such mapping units may have different properties and different limitations, and for this reason it is necessary to follow carefully the instruc. Cut and fill land (Cu), Eroded land, steep (ErE), Gravel and borrow pits (Gp), Swamp (Sx), and Tidal marsh (Tm) are too variable to rate]

Soil features affecting—Continued						
Ponds—Con. Embankments	Drainage	Sprinkler irrigation	Terraces or diversions	Sodded waterways	Winter grading	Pipeline construction and maintenance
Good stability and compaction; fair to good resistance to piping.	Not needed; well drained.	Moderate to moderately slow intake and permeability; moderate available water capacity.	Good stability; moderately erodible.	Moderate available water capacity; moderately erodible.	Good trafficability.	No special problems.
Fair stability and compaction; poor to fair resistance to piping.	Perched water table; slow subsoil permeability.	Drainage needed; moderate available water capacity; moderate intake; slow subsoil permeability.	Fair stability; highly erodible; perched water table and seepage in cuts.	Perched water table and seepage; moderate available water capacity; highly erodible.	Poor trafficability; perched water table at a depth of 1½ to 2½ feet.	Perched water table and seepage plane at a depth of 1½ to 2½ feet; trenches subject to slumping.
Poor to fair stability; fair compaction; poor resistance to piping.	Seasonal water table at 0 to 1 foot; moderate permeability; flood hazard; limited outlets.	Drainage needed; high available water capacity; moderate intake and permeability; flood hazard.	Not needed; nearly level.	Not needed; nearly level.	Poor trafficability; seasonal water table at 0 to 1 foot; flood hazard.	Seasonal water table at 0 to 1 foot; trenches subject to slumping; flood hazard.
Good stability, compaction, and resistance to piping.	Perched water table; slow subsoil permeability.	Drainage needed; low to moderate available water capacity; moderate intake; slow subsoil permeability.	Good stability; highly erodible; perched water table and seepage in cuts.	Perched water table and seepage; low to moderate available water capacity; highly erodible.	Fair trafficability; perched water table at a depth of 1½ to 2½ feet.	Perched water table and seepage plane at a depth of 1½ to 2½ feet.
Fair stability, compaction, and resistance to piping to a depth of 28 inches. Good stability, compaction, and resistance to piping below a depth of 28 inches.	Not needed; well drained.	Moderate intake; moderate to moderately slow permeability; moderate available water capacity.	Fair stability above a depth of 28 inches; moderately erodible.	Moderate available water capacity; moderately erodible.	Fair trafficability.	Only fair stability above a depth of 28 inches.
Good stability, compaction, and resistance to piping.	Not needed; well drained.	Moderate intake; moderately slow permeability; moderate available water capacity.	Good stability; moderately erodible.	Moderate available water capacity; moderately erodible.	Good trafficability.	No special problems.
Poor stability and compaction; moderate compressibility; good resistance to piping.	Seasonal water table at a depth of 0 to 1 foot; slow permeability.	Drainage needed; high available water capacity; slow intake and permeability.	Not needed; nearly level.	Not needed; nearly level.	Very poor trafficability; plastic; seasonal water table at a depth 0 to 1 foot.	Seasonal water table at a depth of 0 to 1 foot; poor stability; plastic materials.

TABLE 6.—*Engineering*

Soil series and map symbol	Suitability as source of—			Soil features affecting—	
				Highway and road location	Ponds
	Topsoil	Sand and gravel	Road fill		Reservoir areas
Evesboro: EvB, EvC, EwB, EwC	Poor: sandy; droughty.	Good for sand; fair for gravel.	Good, with binder: A–1, A–2, A–3.	Loose; subject to blowing; cuts and fills needed; difficult to vegetate.	Excessive seepage.
*Exum: ExC2, ExD2, EyC3, EyD3, EzB2. For Beltsville part of EzB2, see the Beltsville series.	Fair to a depth of 8 inches.	Unsuitable	Poor: A–6 and A–4.	Water table at a depth of 1½ to 2½ feet; high potential frost action; cuts and fills needed.	Moderately slow seepage.
Fallsington: Fs	Fair to a depth of 10 inches.	Fair for sand and gravel below a depth of 28 inches.	Good to fair: A–2, A–3, A–4.	Seasonal water table at surface; high potential frost action; local ponding.	Seasonal water table at surface; moderate to high seepage in substratum.
Galestown: GaB	Poor; sandy, droughty.	Good for sand; unsuitable for gravel.	Good, with binder: A–1, A–2, A–3.	Loose; subject to blowing; cuts and fills needed; difficult to vegetate.	Excessive seepage.
Gravelly land, steep: GvE	Unsuitable	Good for gravel; poor to unsuitable for sand.	Good: A–1, A–2, A–4.	Cuts and fills needed.	Moderately slow to moderate seepage; gravelly.
Iuka: Ik, Im, In	Good to a depth of 20 inches.	Mostly unsuitable.	Good to fair: A–2, A–4, A–6.	Seasonal water table at a depth of 1 to 2 feet; high potential frost action; flood hazard on Ik unit.	Seasonal water table at a depth of 1 to 2 feet; moderate seepage; flood hazard on Ik unit.
Keyport: KeA, KeB2, KpA, KpB2, KpC2, KrC3.	Fair to a depth of 10 inches.	Unsuitable	Poor: A–7, A–6, A–4, A–2.	Seasonal water table at depth of 1½ to 2½ feet; high potential frost action; plastic material; cuts and fills needed.	Seasonal water table at a depth of 1½ to 2½ feet; very slow seepage.
Leonardtown: Le	Poor to fair to a depth of 10 inches.	Unsuitable	Poor to fair: A–6 and A–4.	Perched water table at surface; high potential frost action; seepage problem in cuts.	Perched water table at surface; very slow seepage in subsoil, variable in substratum.

interpretations of the soils—Continued

Soil features affecting—Continued						
Ponds—Con. Embankments	Drainage	Sprinkler irrigation	Terraces or diversions	Sodded waterways	Winter grading	Pipeline construction and maintenance
Fair stability and compaction; porous; poor resistance to piping.	Not needed; excessively drained.	Rapid intake and permeability; low available water capacity.	Loose; subject to blowing; low fertility; droughty.	Low available water capacity; low fertility.	No special problems.	Loose; trenches subject to caving.
Poor to fair stability and compaction; poor resistance to piping.	Seasonal water table at a depth of 1½ to 2½ feet; moderately slow permeability.	Drainage needed; high available water capacity; moderately slow intake and permeability.	Poor to fair stability; highly erodible; seepage in cuts.	High available water capacty; highly erodible.	Poor trafficability; seasonal water table at a depth of 1½ to 2½ feet.	Seasonal water table at a depth of 1½ to 2½ feet; trenches subject to slumping.
Fair stability; good compaction; fair resistance to piping.	Seasonal water table at surface; moderate permeability; flowage in substratum.	Drainage needed; moderate intake, permeability, and available water capacity.	Not needed; nearly level.	Not needed; nearly level.	Poor trafficability; seasonal water table at surface.	Seasonal water table at surface; trenches subject to caving; flowage in substratum.
Fair stability and compaction; porous; poor resistance to piping.	Not needed; somewhat excessively drained.	Rapid intake and permeability; low available water capacity.	Loose; subject to blowing; low fertility; droughty.	Low available water capacity and fertility.	No special problems.	Loose; trenches subject to caving.
Good stability, compaction, and resistance to piping.	Not needed; well drained.	Not applicable----	Good stability; moderately erodible.	Moderate available water capacity; moderately erodible.	Good trafficability.	No special problems.
Fair stability, compaction, and resistance to piping.	Seasonal water table at a depth of 1 to 2 feet; moderate to moderately slow permeability; flood hazard on Ik unit.	Drainage needed; moderate to moderately slow intake and permeability; high available water capacity.	Not needed; nearly level.	Not needed; nearly level.	Fair trafficability; seasonal water table at a depth of 1 to 2 feet; flood hazard on Ik unit.	Seasonal water table at a depth of 1 to 2 feet; flood hazard on Ik unit.
Poor to fair stability and compaction; moderate compressibility; good resistance to piping.	Seasonal water table at a depth of 1½ to 2½ feet; slow permeability.	Drainage needed; moderate to slow intake; slow permeability; high available water capacity.	Poor to fair stability; highly erodible; plastic materials difficult to vegetate.	High available water capacity; highly erodible; plastic materials difficult to vegetate.	Poor trafficability; seasonal water table at a depth of 1½ to 2½ feet; plastic materials.	Seasonal water table at a depth of 1½ to 2½ feet; poor to fair stability; plastic materials.
Poor to fair stability, compaction, and resistance to piping.	Perched water table; slow subsoil permeability.	Drainage needed; moderately slow intake; slow permeability; moderate available water capacity; limited rooting depth.	Perched water table at surface; poor to fair stability; highly erodible; seepage above fragipan.	Perched water table at surface; highly erodible; seepage above fragipan.	Poor trafficability; perched water table at surface.	Perched water table at surface; poor to fair stability; seepage above fragipan.

TABLE 6.—*Engineering*

Soil series and map symbol	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir areas
Magnolia: MgA, MgB2, MgC2, MkC3.	Good to a depth of 16 inches.	Unsuitable	Fair to good: A–4, A–6, A–2.	Moderate potential frost action; cuts and fills needed.	Moderate seepage.
Marr: MlB2	Good to a depth of 16 inches.	Unsuitable	Fair to good: A–4, A–6, A–2.	Moderate potential frost action.	Moderate to high seepage in substratum.
Matapeake: MmA, MmB2, MnA, MnB2, MnC2, MnC3.	Good to a depth of 14 inches.	Locally fair for sand in substratum; unsuitable for gravel.	Fair: A–4, A–6 (rarely A–7), to A–2 in substratum.	Moderate potential frost action; cuts and fills needed.	Moderate to high seepage in substratum.
Matawan: Ms	Poor: loamy sand.	Unsuitable	Fair: A–2, A–4, A–6, A–7.	Seasonal water table at a depth of 2 to 3 feet; high potential frost action.	Slow to high seepage in substratum.
Mattapex: MtA, MtB2, MuA MuB2, MxC.	Good to a depth of 12 inches.	Unsuitable to locally fair for sand and gravel in substratum.	Fair: A–2, A–4, A–6; good: A–2, in substratum.	Seasonal water table at a depth of 1½ to 2½ feet; high potential frost action.	Seasonal water table at a depth of 1½ to 2½ feet; moderate to moderately slow seepage, to high in substratum.
Ochlockonee: OcB	Good to a depth of 3 feet.	Unsuitable to locally fair for sand and gravel in substratum.	Good to fair: A–2 and A–4.	Moderate potential frost action.	Moderate to moderately high seepage.
Osier: Or	Poor: loamy sand.	Fair to good for sand; unsuitable for gravel.	Good, with binder; A–2 and A–3.	Seasonal water table at surface; high potential frost action; loose; difficult to vegetate.	Seasonal water table at surface; excessive seepage.
Othello: Os, Ot	Fair to a depth of 12 inches.	Locally fair for sand in substratum; unsuitable for gravel.	Fair: A–4, A–6, A–2.	Seasonal water table at surface; high potential frost action.	Seasonal water table at surface; moderately slow to rapid seepage in substratum.
Rumford: RdB2, RdC2, RgB2, RgC2.	Fair to poor in gravelly phases.	Locally fair for sand and gravel.	Good to fair: A–2 and A–4.	Cuts and fills needed.	Rapid seepage

interpretations of the soils—Continued

Soil features affecting—Continued						
Ponds—Con. Embankments	Drainage	Sprinkler irrigation	Terraces or diversions	Sodded waterways	Winter grading	Pipeline construction and maintenance
Good stability, compaction, and resistance to piping.	Not needed; well drained.	Moderate intake; moderate permeability; high available water capacity.	Moderately erodible.	Moderately erodible.	Fair trafficability; some plastic materials.	No special problems.
Fair to good stability and compaction; good resistance to piping in subsoil, and poor in substratum.	Not needed; well drained.	Moderate intake and permeability; high available capacity.	Moderately erodible.	Moderately erodible.	Good trafficability.	No special problems.
Fair stability, compaction, and resistance to piping.	Not needed; well drained.	Moderate intake; moderate permeability; high available water capacity.	Fair stability; moderately erodible.	Moderately erodible.	Fair trafficability.	No special problems.
Fair stability; fair to good compaction and resistance to piping.	Seasonal water table at a depth of 2 to 3 feet; slow permeability.	Moderate to rapid intake; slow permeability; moderate available water capacity.	Fair stability; low water capacity in upper 20 inches.	Low available water capacity in upper 20 inches.	Fair trafficability; seasonal water table at a depth of 2 to 3 feet.	Seasonal water table at a depth of 2 to 3 feet; seepage plane above subsoil.
Fair stability and compaction; poor to fair resistance to piping.	Seasonal water table at a depth of 1½ to 2½ feet; moderately slow permeability.	Drainage needed; moderate intake rate; moderately slow permeability; high available water capacity.	Fair stability; moderately erodible.	Moderate erodible.	Poor trafficability; seasonal water table at a depth of 1½ to 2½ feet.	Seasonal water table at a depth of 1½ to 2½ feet.
Fair to good stability, compaction, and resistance to piping.	Not needed; well drained.	Moderate intake and permeability; high available water capacity.	Fair to good stability.	No special problems.	Fair to good trafficability.	No special problems.
Poor stability, compaction, and resistance to piping; porous.	Seasonal water table at surface; rapid permeability; ditches subject to caving.	Drainage needed; rapid intake and permeability; low available water capacity.	Not needed; nearly level.	Not needed; nearly level.	Fair trafficability; seasonal water table at surface.	Seasonal water table at surface; trenches subject to caving.
Fair stability, compaction, and resistance to piping.	Seasonal water table at surface; moderately slow permeability.	Drainage needed; moderate intake; moderately slow permeability; high available water capacity.	Not needed; nearly level.	Not needed; nearly level.	Poor trafficability; seasonal water table at surface.	Seasonal water table at surface; subject to caving in substratum.
Fair stability; good compaction; poor resistance to piping.	Not needed; somewhat excessively drained.	Moderately rapid to rapid intake and permeability; moderate available water capacity.	Fair stability; moderate available water capacity.	Moderate available water capacity.	Good trafficability.	Fair stability; substratum tends to cave locally.

TABLE 6.—*Engineering*

Soil series and map symbol	Suitability as source of—			Soil features affecting—	
				Highway and road location	Ponds
	Topsoil	Sand and gravel	Road fill		Reservoir areas
Sandy land, steep: SaE	Poor: sandy; droughty.	Fair to good for sand; unsuitable for gravel.	Good, with binder; A-2 and A-3 (rarely A-4).	Subject to soil blowing; cuts and fills needed; difficult to vegetate.	High to excessive seepage.
Sassafras: ShA, ShB2, ShC2, ShC3, ShD2, ShD3	Good to a depth of 12 inches.	Locally fair for sand in substratum; unsuitable for gravel.	Good: A-2, A-4, A-6.	Cuts and fills needed.	Moderate seepage in subsoil and rapid in substratum.
*Westphalia: WaB2, WaC2, WaC3, WaD2, WaD3, WeB2, WeC2, WeC3. For Evesboro part of WeB2, WeC2, and WeC3, see the Evesboro series.	Good to a depth of 2 feet.	Poor to fair for sand; unsuitable for gravel.	Good to fair: A-2, A-3, A-4.	Cuts and fills needed.	Moderate seepage in subsoil and rapid in substratum.
Wickham: WkB2, WkC2, WkD2, WmC3, WmD3.	Good to a depth of 9 inches.	Unsuitable	Good to fair: A-2, A-4, A-6, A-7.	Moderate potential frost action; cuts and fills needed.	Moderate seepage.
Woodstown: WoA, WoB2, WoC2	Good to a depth of 15 inches.	Locally fair for sand; unsuitable for gravel.	Good to fair: A-2, A-3, A-4, A-6.	Seasonal water table at a depth of 1½ to 2½ feet; high potential frost action.	Seasonal water table at a depth of 1½ to 2½ feet; moderate to high seepage in substratum.

interpretations of the soils—Continued

Soil features affecting—Continued						
Ponds—Con. Embankments	Drainage	Sprinkler irrigation	Terraces or diversions	Sodded waterways	Winter grading	Pipeline construction and maintenance
Fair stability and compaction; porous in part; poor resistance to piping.	Not needed; well drained to excessively drained.	Not applicable	Subject to blowing; fair stability; generally droughty.	Generally droughty.	No special problems.	Trenches generally subject to caving.
Good stability and compaction; fair resistance to piping.	Not needed; well drained.	Moderate to moderately rapid intake; moderate permeability; moderate to high available water capacity.	No special problems.	No special problems.	Good trafficability.	Substratum tends to cave locally.
Fair stability and compaction; poor resistance to piping.	Not needed; well drained.	Moderate intake; moderate to moderately rapid permeability; moderate to high available water capacity.	No special problems.	No special problems.	Good trafficability.	Fair stability; substratum tends to cave.
Good stability, compaction, and resistance to piping.	Not needed; well drained.	Moderate intake and permeability; high available water capacity.	No special problems.	No special problems.	Good trafficability.	No special problems.
Good stability and compaction; fair resistance to piping.	Seasonal water table at a depth of 1½ to 2½ feet; moderate permeability.	Drainage needed; moderate intake, permeability, and available water capacity.	No special problems.	No special problems.	Fair trafficability; seasonal water table at a depth of 1½ to 2½ feet.	Seasonal water table at a depth of 1½ to 2½ feet; substratum tends to cave.

TABLE 7.—*Engineering test data*

[Tests performed by Soil Consultants, Incorporated, in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*). Absence of entry indicates that no determination was made]

Soil name and location	SCS report no.	Depth	Mechanical analyses [1]								Liquid limit	Plasticity index	Classification	
			Percentage passing sieve—				Percentage smaller than—						AASHO	Unified [2]
			No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
		Inches									*Percent*			
Bourne sandy loam:	69MD–8–3–2	2–13		100	99	57	53	45	23	15	[3]	[3]	A–4	ML
East side of Route 232, 3 miles east of Newport. (Modal profile)	69MD–8–3–4	23–42		100	99	36	32	30	23	17	[3]	[3]	A–4	SM
	69MD–8–3–6	51–60			100	50	47	44	34	31	34	12	A–6	SC
Exum silt loam:														
2 miles southeast of La Plata in Woodhaven Park. (Modal profile)	68MD–8–17–2	5–8			100	83	80	74	57	51	48	19	A–7–6	ML
	68MD–8–17–4	16–43			100	71	64	47	33	28	36	15	A–6	CL
	68MD–8–17–5	43–68		100	99	69	63	54	40	35	42	20	A–7–6	CL
Leonardtown silt loam:														
West of Popes Creek Road, 1 mile southwest of Faulkner. (Modal profile)	68MD–8–2–2	1–8			100	88	86	73	37	23	28	8	A–4	CL
	68MD–8–2–4	16–24	[4] 98	98	97	86	84	72	39	26	31	10	A–4	CL
	68MD–8–2–6	40–72			100	74	72	67	53	44	46	24	A–7–6	CL
Magnolia silt loam:														
2.5 miles southeast of Nanjemoy at Grayton Post Office. (Modal profile)	67MD–8–6–1	0–6	[5] 99	98	92	67	63	52	27	18	25	7	A–4	ML–CL
	67MD–8–6–3	16–43	100	99	95	76	74	67	52	46	46	18	A–7–6	ML
	67MD–8–6–4	43–65	100	99	94	75	72	62	48	43	47	18	A–7–6	ML
Wickham fine sandy loam:														
East side of Maryland Point Road, 0.5 mile south of Route 6. (Modal profile)	69MD–8–1–1	0–9		100	99	59	52	38	19	14	[3]	[3]	A–4	ML
	69MD–8–1–3	20–36			100	74	68	62	48	43	55	23	A–7–5	MH
	69MD–8–1–5	55–64			100	40	36	33	27	24	[3]	[3]	A–4	SM

[1] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[2] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is ML–CL.

[3] NP=nonplastic.

[4] 100 percent of this sample passed the 1½-inch sieve.

[5] 100 percent of this sample passed the ⅜-inch sieve.

tailed field investigations and for indicating the kinds of problems that may be expected.

Some of the terms used in this soil survey that have special meaning to soil scientists are not known to all engineers. Many of the terms commonly used in soil science are defined in the Glossary at the back of this survey.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*12*) used by the SCS engineers, Department of Defense, and others, and the AASHO system (*1*) adopted by the American Association of State Highway Officials.

In the Unified system soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GX, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

Estimated engineering properties

Estimates of some of the soil properties that are significant in engineering are shown in table 5. These estimates are based on field observations, test data on the soils of this county and nearby counties and states, and on past experience gained in working with these and other soils.

Permeability refers only to the rate at which water moves downward through the undisturbed and uncompacted soil, but does not include lateral seepage. The estimates of permeability are based on the structure and porosity of the soil.

Available water capacity is the capacity of a soil to hold water in a form available to plants. Reaction refers to the degree of acidity or alkalinity of a soil. It is expressed as a pH value, which applies only to the unlimed soil.

Shrink-swell potential is an indication of the change in volume to be expected with a change in moisture content. A high shrink-swell potential indicates severe hazards to structures built in, on, or with such materials. A moderate shrink-swell potential indicates a significant, but not severe, hazard.

Soils having significant plastic properties are indicated by "H" in the Unified classification symbol (MH or CH).

In table 5, the columns headed "Percentage passing sieve" have figures that represent the ranges in the percentage of the soil, by weight, that is finer than the four specified diameters given in the subheadings.

Depths to bedrock are not shown in this table because all soils of the county are underlain by unconsolidated sediments of great thickness.

Engineering interpretations

The suitability of the soils for pipelines, highways, and various farm facilities are shown in table 6. It also rates each soil according to its suitability as a source of topsoil, sand and gravel, and road fill, and lists the major limitations for winter grading.

Detrimental or undesirable features are emphasized in this table. Important desirable features also are listed. The ratings and other interpretations are based on the estimates of engineering properties given in table 5; on available test data, including those in table 7; and on field experience. Although the information applies only to the depths given in table 5, it can be considered reasonably reliable to depths of about 6 feet for most soils, and to somewhat greater depths for a few soils.

Ratings for topsoil apply only to the depths given, as many subsoils generally are unsuitable. Where depths are not given, the rating applies to all layers of the soil.

Ratings for sand and gravel indicate only the probable presence of deposits, not the quality or quantity of the material.

The ratings for road fill, which is the material used to build road embankments and subgrades, or both, indicate the general performance of soil material moved from borrow areas for this purpose.

Pipeline and highway location are affected chiefly by a high water table and stability. The need for cuts and fills (indicated by slopes and changes in slopes), and the probable severity of frost action are also important for highway location.

Reservoir or pond sites are affected mainly by the loss of water through seepage. This is especially so for impoundments. Dug-out ponds are dependent primarily on the height of the water table, so seepage into and out of the pond is important.

The most significant features of soils used for embankments are stability, ease of compaction, permeability, and resistance to piping.

Dikes and levees are low embankments used to impound or divert water. They are not listed separately in table 6, but the soil features that affect the use of the soils for dams also affect their use for these structures. Dikes and levees generally do not require as much strength and stability as dams for ponds and reservoirs.

The most significant features that affect drainage are the depth to the water table, the kind of water table, and the soil permeability. Stability, the coherence of soil material, the availability of drainage system outlets, and the possible hazard of flooding are also significant.

Sprinkler irrigation is affected by water intake rate of the surface soil, permeability, moisture capacity, and natural drainage. Soils that are not well drained must have

artificial drainage improvement if irrigation water is to be applied.

In planning and designing means of slowing down and diverting runoff water, the stability and erodibility of the soil material are among the most important concerns. Slope and seepage also are important. Sodded waterways (fig. 21) are used to dispose of excess water. Available water capacity and natural fertility are important soil features to be considered in selecting soils for sodded waterways.

Winter grading is affected chiefly by the water table, and the trafficability of the soil surface under winter conditions. It also is affected by subsoil plasticity and, locally, by the hazard of flooding.

Engineering test data

Table 7 lists the results of tests made on certain soils of Charles County to determine their properties.

Besides grain-size distribution, values for plastic properties are given. *Liquid limit* is the moisture content at which the soil material passes from a plastic to a liquid state. *Plastic limit* is the moisture content at which the soil material changes from a semisolid to a plastic state. *Plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil is in a plastic state.

The soils for which test data are given are not necessarily among the more extensive in the county, but they are extensive enough and sufficiently distinctive for testing. The more extensive soils were previously tested in other counties of Maryland and in nearby states.

Use of the Soils for Town and Country Planning

Charles County is largely a rural area, but its population is growing, and nonfarm use of the land is expanding. In recent years there has been a rapid increase in the use of the soils of the county for residential and commercial purposes, especially in the northern part of the county and along a few of the main highways. Accompanying this change in land use is a growing demand for information about soil properties that affect the use of the soils of the area for nonfarm purposes.

Reliable information about soils is needed in planning the use of soils for different kinds of community development so that efficient use of each area can be determined. Generally, the soils that are well suited to farming are also well suited to buildings and other nonfarm uses. Among these soils in Charles County are the nearly level and gently sloping soils of the Chillum, Magnolia, Marr, Matapeake, Ochlockonee, Rumford, Westphalia, Sassafras, and Wickham series. These soils make up about 7 percent of the county. An additional 30 percent is well suited to farming if adequately drained or well protected.

The Evesboro, Galestown, Marr, Ochlockonee, Rumford, Sassafras, Westphalia, and Wickham soils have slopes of less than about 10 percent (table 8), and they have only slight limitations for filter-field disposal of effluent from septic tanks. These soils make up about 11 percent of the county. Some of the soils that have severe limitations for filter-field disposal because of slow permeability or the presence of a high water table have only slight limitations for construction works and for sewage lagoons.

A soil can have severe limitations for a particular use, but under good management the limitations can be modified or removed, so that the soil can be safely used for the intended purpose. For example, a soil that has a high water table has severe limitations to use for streets and parking lots, but if supplemental drainage is provided, this soil can be used for those purposes. Likewise, a soil that has a slowly permeable subsoil has severe limitations for absorbing effluent from septic tanks, but some special means of effluent disposal may be utilized if the effort and expense are justified (fig. 22).

Table 8 gives the degree and kind of limitation of each soil in the county for specified uses, including sewage dis-

Figure 21.—A sodded waterway. Cut and fill land is on the left, and Gravelly land, steep, is on the right.

Figure 22.—Tall vegetation (lower front) over a septic tank filter field that does not function properly because the Beltsville silt loam is too slowly permeable.

TABLE 8.—*Limitations of soils for town and country planning*

[Cut and fill land (Cu) and Gravel and borrow pits (Gp) are too variable for interpretation or are not used for the purpose listed]

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Alluvial land: Ad	Severe: high water table; flood hazard.[1]	Severe: flood hazard.[1]	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Aura:						
AuC2	Severe: moderately slow permeability.	Severe: slope.	Slight	Slight	Severe: slope.	Severe: slope.
AuD2	Severe: moderately slow permeability.	Severe: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: slope.
AuD3	Severe: moderately slow permeability.	Severe: slope.	Slight to moderate: slope.	Slight to moderate: slope.	Severe: slope.	Severe: slope; severely eroded.
Beltsville:						
BlA	Severe: slow permeability; seasonally perched water table.	Slight	Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table.	Moderate: seasonally perched water table.
BlB2	Severe: slow permeability; seasonally perched water table.	Moderate: slope.	Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table; slope.	Moderate: slope; seasonally perched water table.
BlC2, BlC3	Severe: slow permeability; seasonally perched water table.	Severe: slope.	Moderate: seasonally perched water table.	Slight	Severe: slope; seasonally perched water table.	Severe: slope; BlC3 severely eroded.
Bibb: Bo	Severe: high water table; flood hazard.[1]	Severe: flood hazard.[1]	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Bourne:						
BrB2	Severe: slow permeability; seasonally perched water table.	Moderate: slope.	Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table; slope.	Moderate: slope; seasonally perched water table.
BrC2, BuC3	Severe: slow permeability; seasonally perched water table.	Severe: slope.	Moderate: seasonally perched water table.	Slight	Severe: slope.	Severe: slope; BuC3 severely eroded.
Chillum:						
ChB2	Slight to moderate: moderate to moderately slow permeability.	Moderate: moderate to moderately slow permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
ChC2	Slight to moderate: moderate to moderately slow permeability.	Severe: slope; moderate to moderately slow permeability.	Slight to moderate: slope.	Slight to moderate: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Coastal beaches: Co	Severe: high water table: flooding.[1]	Severe: rapidly permeable; tidal flooding.[1]	Severe: loose sand; tidal high water table; flooding.	Severe: loose sand; tidal flooding.	Severe: loose sand; tidal high water table; flooding.	Severe: tidal flooding; salinity; extremely low fertility and available water capacity.
Croom: CrB2	Severe: moderately slow permeability.	Moderate to severe; slope.	Slight	Slight	Moderate to severe; slope.	Moderate: slope; limited rooting depth.
CrC2, CrC3	Severe: moderately slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: slope; CrC3 severely eroded.
Elkton: Ek	Severe: high water table; poor natural drainage; slow permeability.	Slight	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Eroded land, steep: FrE.	Severe: slope [1]	Severe: slope [1]	Severe: slope	Severe: slope	Severe: slope	Severe: slope; severely eroded.
Evesboro: EvB, EwB	Slight [1]	Severe: too rapidly permeable.[1]	Slight	Slight	Slight to moderate: slope.	Severe: low available water capacity and fertility.
EvC, EwC	Moderate: slope.[1]	Severe: too rapidly permeable.[1]	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: low available water capacity and fertility; slope.
Exum: ExC2, EyC3	Severe: moderately high water table; moderately slow permeability.	Severe: slope	Moderate: moderately high water table.	Slight	Severe: slope	Severe: slope; EyC3 severely eroded.
ExD2, EyD3	Severe: moderately slow permeability; moderately high water table.	Severe: slope	Moderate: moderately high water table; slope.	Moderate: slope.	Severe: slope	Severe: slope; EyD3 severely eroded.
Exum-Beltsville: EzB2.	Severe: moderately high or perched water table; moderate to slow permeability.	Moderate: slope.	Moderate: moderately high or perched water table.	Slight	Moderate: moderately high or perched water table; slope.	Moderate: slope; moderately high or perched water table.

See footnote at end of table.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Fallsington: Fs	Severe: high water table; poor natural drainage.	Moderate: moderate permeability.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Galestown: GaB	Slight [1]	Severe: rapidly permeable.[1]	Slight	Slight	Slight to moderate; slope.	Severe: low available water capacity and fertility.
Gravelly land, steep: GvE.	Severe: slope [1]	Severe: slope; extremely gravelly.	Severe: slope	Severe: slope	Severe: slope	Severe: slope; extremely gravelly.
Iuka:						
Ik	Severe: flood hazard.[1]	Severe: flood hazard.[1]	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderately high water table; flood hazard.
Im, In	Moderate: moderately high water table; moderate to moderately slow permeability.	Moderate: moderate to moderately slow permeability.	Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
Keyport:						
KeA, KpA	Severe: slow permeability; moderately high water table.	Slight	Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
KeB2, KpB2	Severe: slow permeability; moderately high water table.	Moderate: slope.	Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.
KpC2, KrC3	Severe: slow permeability; moderately high water table.	Severe: slope	Moderate: moderately high water table; slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; KrC3 severely eroded.
Leonardtown: Le	Severe: high water table; poor natural drainage; slow permeability.	Slight	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Magnolia:						
MgA	Slight	Moderate: moderate permeability.	Slight	Slight	Slight	Slight.
MgB2	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
MgC2, MkC3	Slight	Severe: slope	Slight	Slight	Severe: slope	Severe: slope; MkC3 severely eroded.

See footnote at end of table.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Marr: MlB2	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
Matapeake:						
MmA, MnA	Slight to moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Slight	Slight	Slight.
MmB2, MnB2	Slight to moderate: moderate permeability.	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
MnC2, MnC3	Slight to moderate: moderate permeability.	Severe: slope; moderate permeability.	Slight	Slight	Severe: slope	Severe: slope; MnC3 severely eroded.
Matawan: Ms	Severe: slow permeability.	Slight	Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
Mattapex:						
MtA, MuA	Severe: moderately slow permeability; moderately high water table.	Slight	Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
MtB2, MuB2	Severe: moderately slow permeability; moderately high water table.	Moderate: slope.	Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.
MxC	Severe: moderately slow permeability; moderately high water table.	Severe: slope	Moderate: moderately high water table; slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; in part severely eroded.
Ochlockonee: OcB	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Slight to moderate: slope.	Slight to moderate: slope.
Osier: Or	Severe: high water table; poor natural drainage.[1]	Severe: too rapidly permeable.[1]	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage; very low fertility.
Othello: Os, Ot	Severe: high water table; poor natural drainage; moderately slow permeability.	Slight	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.

See footnote at end of table.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Rumford:						
RdB2, RgB2	Slight	Severe: rapidly permeable.	Slight	Slight	Slight to moderate: slope.	Moderate: moderately droughty.
RdC2, RgC2	Slight	Severe: rapidly permeable; slope.	Slight	Slight	Severe: slope	Severe: slope.
Sandy land, steep: SaE.	Severe: slope [1]	Severe: rapidly permeable; slope.[1]	Severe: slope	Severe: slope	Severe: slope	Severe: slope; droughtiness.
Sassafras:						
ShA	Slight	Moderate: moderate permeability.	Slight	Slight	Slight	Slight.
ShB2	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
ShC2, ShC3	Slight	Severe: slope; moderate permeability.	Slight	Slight	Severe: slope	Severe: slope; ShC3 severely eroded.
ShD2, ShD3	Moderate: slope.	Severe: slope; moderate permeability.	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: slope; ShD3 severely eroded.
Swamp: Sx	Severe: ponding.[1]	Severe: ponding.[1]	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Tidal marsh: Tm	Severe: tidal high water table.[1]	Severe: tidal high water table; instability.[1]	Severe: tidal high water table; instability.	Severe: tidal high water table; instability.	Severe: tidal high water table; instability.	Severe: tidal high water table; salinity.
Westphalia:						
WaB2	Slight	Moderate to severe: moderate to moderately rapid permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
WaC2, WaC3	Slight to moderate: slope.	Severe: slope	Slight to moderate: slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; WaC3 severely eroded.
WaD2, WaD3	Moderate to severe: slope.	Severe: slope	Moderate to severe: slope.	Moderate to severe: slope.	Severe: slope	Severe: slope; WaD3 severely eroded.
Westphalia-Evesboro:						
WeB2	Slight	Moderate to severe: slope; moderate to rapid permeability.	Slight	Slight	Moderate: slope.	Moderate to severe: slope; low available water capacity and fertility in Evesboro.
WeC2, WeC3	Slight to moderate: slope.	Severe: slope; rapid permeability in Evesboro.	Slight to moderate: slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; low available water capacity and fertility in Evesboro.

See footnote at end of table.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Wickham:						
WkB2	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
WkC2, WmC3	Slight	Severe: slope; moderate permeability.	Slight	Slight	Severe: slope	Severe: slope; WmC3 severely eroded.
WkD2, WmD3	Moderate: slope.	Severe: slope; moderate permeability.	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: slope; WmD3 severely eroded.
Woodstown:						
WoA	Moderate: moderately high water table.	Moderate: moderate permeability.	Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
WoB2	Moderate: moderately high water table.	Moderate: moderate permeability; slope.	Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.
WoC2	Moderate: moderately high water table.	Severe: slope; moderate permeability.	Moderate: moderately high water table.	Slight	Severe: slope	Severe: slope.

[1] Strong possibility of polluting nearby springs, wells, ponds, streams, or other surface or underground water resources.

posal systems, homesites, streets and parking lots, and home gardens. This table, along with the soil map and other parts of the survey, will be helpful to planning and zoning boards and to others who are responsible for residential and community planning.

In table 8 soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means that the soil properties generally are favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation and special designs are required.

The degree of limitation refers to the most significant single limitation, but more than one kind of limitation can be listed. For example, a soil can have a moderate limitation for sewage lagoons because of permeability, but a steeper soil of the same series can have a severe limitation because of slope.

Following are the soil properties that affect the uses specified in table 8.

Disposal of sewage effluent in septic tank filter fields: permeability; depth to seasonally high water table; natural drainage; slope; and the hazard of flooding.

Sites for sewage lagoons: permeability, slope, and the hazard of flooding (fig. 23).

Homesites, three stories or less: depth to water table, natural drainage, stability of the subsoil and the substratum, slope, and the hazard of flooding.

Roads, streets, and parking lots: depth to water table, natural drainage, stability, slope, and the hazard of flooding.

Home gardens: depth to water table, natural drainage, texture of the surface soil, available water capacity, natural fertility, slope, the degree of erosion, and the hazard of flooding.

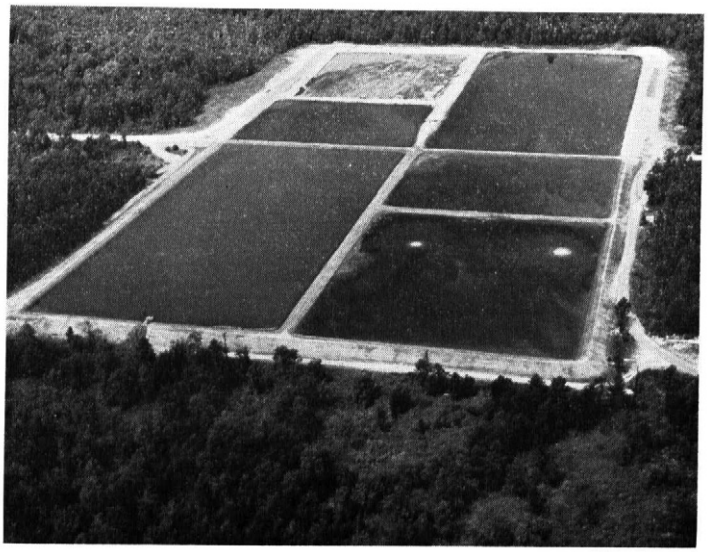

***Figure 23.*—Sewage lagoons in operation near St. Charles. Most areas of the soil are Woodstown sandy loam.**

Use of the Soils for Recreational Facilities

Table 9 rates each soil in the county according to its suitability for specified recreational uses. Soil properties significant to recreational uses are depth to water table, natural drainage, permeability, texture of the surface layer, presence of coarse fragments, soil stability, slope, and the hazard of flooding. No one property limits a soil for all recreational uses or necessarily to the same degree for different uses. A soil that has a slope of more than about 5 percent has severe limitations for athletic fields because a great deal of land leveling is needed. On the other hand, slopes do not severely limit the use of a soil for camp or picnic areas unless the slopes are 15 percent or more.

In table 9 soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means that the soil properties generally are favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable, but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation and special designs are required.

A soil can be severely limited for a specified use and yet can be put to that use. For example, soils severely limited for camping areas can be used for camping if drainage is improved or the surface is leveled or the site is otherwise altered as needed. Such measures usually require costly preparation and maintenance.

Service buildings are needed for use with some recreational facilities. Inasmuch as these buildings generally are not large and do not have basements, the limitations of the soils for this purpose are approximately the same as those for homesites without basements (table 8).

TABLE 9.—*Estimated degree and kind of limitation for specified recreational uses*

[Cut and fill land (Cu) and Gravel and borrow pits (Gp) are not rated because they are too variable or not used for the purposes listed]

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Alluvial land: Ad	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.
Aura:				
AuC2	Severe: coarse fragments on surface; slope.	Moderate: coarse fragments on surface; moderately slow permeability.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
AuD2, AuD3	Severe: coarse fragments on surface; slope.	Moderate: coarse fragments on surface; moderately slow permeability; slope.	Moderate: coarse fragments on surface; slope.	Moderate: coarse fragments on surface.
Beltsville:				
BlA	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table.	Slight.
BlB2	Moderate: seasonally perched water table;[1] slow permeability; slope.	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table.	Slight.
BlC2, BlC3	Severe: slope; seasonally perched water table.	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table.	Slight.
Bibb: Bo	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.
Bourne:				
BrB2	Moderate: seasonally perched water table;[1] slow permeability; slope.	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table.	Slight.
BrC2	Severe: slope; seasonally perched water table.	Moderate: seasonally perched water table;[1] slow permeability.	Moderate: seasonally perched water table.	Slight.
BuC3	Severe: slope; seasonally perched water table.	Moderate: seasonally perched water table;[1] slow permeability; sticky surface.	Moderate: seasonally perched water table; sticky surface.	Moderate: sticky surface.

See footnote at end of table.

TABLE 9.—*Estimated degree and kind of limitation for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Chillum:				
ChB2	Moderate: slope	Slight	Slight	Slight.
ChC2	Severe: slope	Slight	Slight	Slight.
Coastal beaches: Co	Severe: loose sand; subject to soil blowing.	Severe: loose sand; subject to soil blowing.	Severe: loose sand; subject to soil blowing.	Severe: loose sand.
Croom:				
CrB2	Severe: coarse fragments on surface.	Moderate: coarse fragments on surface; moderately slow permeability.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
CrC2, CrC3	Severe: coarse fragments on surface; slope.	Moderate: coarse fragments on surface; moderately slow permeability.	Moderate: coarse fragments on surface; slope.	Moderate: coarse fragments on surface.
Elkton: Ek	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Eroded land, steep: ErE.	Severe: slope	Severe: slope	Severe: slope	Moderate to severe: sticky surface; slope.
Evesboro:				
EvB, EwB	Severe: loamy sand; subject to soil blowing.	Moderate: loamy sand surface layer, gravelly in EwB.	Moderate: loamy sand surface layer, gravelly in EwB.	Moderate: loamy sand surface layer, gravelly in EwB.
EvC, EwC	Severe: loamy sand; subject to soil blowing; slope.	Moderate: loamy sand surface layer, gravelly in EwC; slope.	Moderate: loamy sand surface layer, gravelly in EwC; slope.	Moderate: loamy sand surface layer, gravelly in EwC; slope.
Exum:				
ExC2	Severe: slope; moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
ExD2	Severe: slope; moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability; slope.	Moderate: moderately high water table; slope.	Slight.
EyC3	Severe: slope; moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability; sticky surface layer.	Moderate: moderately high water table; sticky surface layer.	Moderate: sticky surface layer.
EyD3	Severe: slope; moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability; sticky surface layer; slope.	Moderate: moderately high water table; sticky surface layer; slope.	Moderate: sticky surface layer.
Exum-Beltsville: EzB2	Moderate: moderately high water table;[1] moderately slow to slow permeability; slope.	Moderate: moderately high water table;[1] moderately slow to slow permeability; slope.	Moderate: moderately high water table.	Slight.
Fallsington: Fs	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Galestown: GaB	Severe: loamy sand; subject to soil blowing.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.
Gravelly land, steep: GvE.	Severe: coarse fragments on surface; slope.	Severe: slope	Severe: slope	Moderate to severe: coarse fragments on surface; slope.

See footnote at end of table.

TABLE 9.—*Estimated degree and kind of limitation for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Iuka:				
Ik	Moderate: moderately high water table; moderate to moderately slow permeability; flood hazard.	Severe: flood hazard	Moderate: moderately high water table; flood hazard.	Moderate: flood hazard.
Im, In	Moderate: moderately high water table; moderate to moderately slow permeability.	Moderate: moderately high water table; moderate to moderately slow permeability.	Moderate: moderately high water table.	Slight.
Keyport:				
KeA, KpA	Moderate: moderately high water table;[1] slow permeability.	Moderate: moderately high water table;[1] slow permeability.	Moderate: moderately high water table.	Slight.
KeB2, KpB2	Moderate: moderately high water table;[1] slow permeability; slope.	Moderate: moderately high water table; slow permeability.	Moderate: moderately high water table.	Slight.
KpC2	Severe: slope; moderately high water table; slow permeability.	Moderate: moderately high water table; slow permeability; slope.	Moderate: moderately high water table; slope.	Slight.
KrC3	Severe: slope; moderately high water table; slow permeability.	Moderate: moderately high water table; slow permeability; sticky surface layer; slope.	Moderate: moderately high water table; sticky surface layer; slope.	Moderate: sticky surface layer.
Leonardtown: Le	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Magnolia:				
MgA	Slight	Slight	Slight	Slight.
MgB2	Moderate: slope	Slight	Slight	Slight.
MgC2	Severe: slope	Slight	Slight	Slight.
MkC3	Severe: slope	Moderate: sticky surface layer.	Moderate: sticky surface layer.	Moderate: sticky surface layer.
Marr: MlB2	Moderate: slope	Slight	Slight	Slight.
Matapeake:				
MmA, MnA	Slight	Slight	Slight	Slight.
MmB2, MnB2	Moderate: slope	Slight	Slight	Slight.
MnC2, MnC3	Severe: slope	Slight	Slight	Slight.
Matawan: Ms	Moderate: moderately high water table; slow permeability;[1] loamy sand surface layer.	Moderate: moderately high water table; slow permeability;[1] loamy sand surface layer.	Moderate: moderately high water table; loamy sand surface layer.	Moderate: loamy sand surface layer.
Mattapex:				
MtA, MuA	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
MtB2, MuB2	Moderate: moderately high water table; moderately slow permeability; slope.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
MxC	Severe: slope	Moderate: moderately high water table; moderately slow permeability; slope.	Moderate: moderately high water table; slope.	Slight.
Ochlockonee: OcB	Slight to moderate: slope.	Slight	Slight	Slight.

See footnote at end of table.

TABLE 9.—*Estimated degree and kind of limitation for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Osier: Or	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Othello: Os, Ot	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Rumford:				
RdB2	Moderate: loamy sand surface layer; slope.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.
RdC2	Severe: slope	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.
RgB2	Severe: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
RgC2	Severe: coarse fragments on surface; slope.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
Sandy land, steep: SaE	Severe: sandy, subject to soil blowing; slope.	Severe: slope	Severe: slope	Moderate to severe: sandy; slope.
Sassafras:				
ShA	Slight	Slight	Slight	Slight.
ShB2	Moderate: slope	Slight	Slight	Slight.
ShC2, ShC3	Severe: slope	Slight	Slight	Slight.
ShD2, ShD3	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Swamp: Sx	Severe: ponded for long periods.	Severe: ponded for long period.	Severe: ponded for long periods.	Severe: ponded for long periods.
Tidal marsh: Tm	Severe: tidal high water table; no trafficability.	Severe: tidal high water table; no trafficability.	Severe: tidal high water table; no trafficability.	Severe: tidal high water table; no trafficability.
Westphalia:				
WaB2	Moderate: slope	Slight	Slight	Slight.
WaC2, WaC3	Severe: slope	Slight to moderate: slope.	Slight to moderate: slope.	Slight.
WaD2, WaD3	Severe: slope	Moderate to severe: slope.	Moderate to severe: slope.	Slight to moderate: slope.
Westphalia-Evesboro:				
WeB2	Moderate to severe: slope; loamy sand surface layer in Evesboro part subject to soil blowing.	Slight to moderate: loamy sand surface layer in Evesboro part.	Slight to moderate: loam sand surface layer in Evesboro part.	Slight to moderate: loamy sand surface layer in Evesboro part.
WeC2, WeC3	Severe: slope; loamy sand surface layer in Evesboro part subject to soil blowing.	Slight to moderate: slope; loamy sand surface layer in Evesboro part.	Slight to moderate: slope; loamy sand surface layer in Evesboro part.	Slight to moderate: loamy sand surface layer in Evesboro part.
Wickham:				
WkB2	Moderate: slope	Slight	Slight	Slight.
WkC2	Severe: slope	Slight	Slight	Slight.
WkD2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
WmC3	Severe: slope	Moderate: sticky surface layer.	Moderate: sticky surface layer.	Moderate: sticky surface layer.
WmD3	Severe: slope	Moderate: sticky surface layer; slope.	Moderate: sticky surface layer; slope.	Moderate: sticky surface layer.
Woodstown:				
WoA	Moderate: moderately high water table.	Moderate: moderately high water table.	Moderate: moderately high water table.	Slight.
WoB2	Moderate: moderately high water table; slope.	Moderate: moderately high water table.	Moderate: moderately high water table.	Slight.
WoC2	Severe: slope	Moderate: moderately high water table.	Moderate: moderately high water table.	Slight.

[1] Although soils of the Beltsville, Bourne, Keyport, and Matawan series are slowly permeable, they generally are dry enough for long periods during the seasons of most use, so they are rated as only moderately limited for playgrounds and camp areas because of permeability.

The soils that have slight, if any, limitations for use as athletic fields or other intensive play areas are of the Matapeake, Ochlockonee, and Sassafras series. These soils have slopes of no more than 2 percent. A few are moderately limited locally because of moderately slow permeability, which delays drying of the soils after rains. These soils occupy about 2 percent of the county, but they do not occur in many communities.

Many soils of the county have only moderate limitations for use as playgrounds. Some of these soils are seasonally wet or are slow to dry. Others have a somewhat loose sandy surface layer, and many have slopes of about 2 to 6 percent. Such soils make up about 36 percent of the county area.

Most of the well-drained soils that have slopes of 10 percent or less have only slight limitations for camp areas, general recreational areas, and picnic areas. Most well drained and moderately well drained soils that have slopes of 15 percent or less have only slight limitations for paths and trails. The only soils that are severely limited for these uses are those that have slopes of more than 15 percent, a very high water table, and poor natural drainage. In addition, such soils generally are very loose and sandy and are subject to flooding.

Artificial ponds and small lakes are desirable for recreational uses and for their esthetic value. Soils of the Elkton, Fallsington (fig. 24), Leonardtown, Osier, and Othello series generally are suitable for excavated ponds.

Soils of the Bibb, Exum, Iuka, Keyport, Matawan, Mattapex, and Woodstown series and Alluvial land generally are suitable for excavated ponds and impoundments. Soils of the Aura, Beltsville, Bourne, Chillum, Croom, Evesboro, Galestown, Magnolia, Marr, Matapeake, Ochlockonee, Rumford, Sassafras, Westphalia, and Wickham series generally are suitable only for impoundments. In impoundments, both the dam and the floor of the pond must have soil material that does not permit excessive seepage. Chemical or other special treatment is needed to seal off the material and to prevent excessive seepage, especially in the Evesboro, Galestown, and Rumford soils.

Onsite investigation is needed before constructing ponds on the soils in this survey area. In table 6 are provided the features that affect the use of each soil for this purpose.

Figure 24.—Community pond and picnic area at Hughesville. Soil is Fallsington sandy loam. Water level in excavated pond is maintained chiefly by subsurface recharge.

Genesis, Morphology, and Classification of Soils

Genesis and Morphology [4]

Soil is the product of several processes acting simultaneously upon the earth's surface. Using an analogy, soil is the "rust" or "weathering rind" on the earth's skin. The morphological characteristics of the 27 soil series mapped in Charles County have developed through a unique set of processes acting upon geologic materials. Simonson (*6*) outlined four basic changes in the soil system during pedogenesis (soil formation). These changes are the result of additions, removals, transfers, and transformations. For example, organic matter, fertilizer, dust, and other materials are added to soils, while soluble salts and basic ions released in the weathering of certain minerals are removed to varying degrees. Clay particles and iron are transferred within the soil profile. Soil minerals such as feldspars and mica are transformed to clay minerals.

The intensity and magnitude of changes are directed by five factors of soil formation. These soil-forming factors—parent material, climate, living organisms, relief, and time—are important in determining the nature and properties of soils. They do not act independently but overlap, and each factor modifies the effects of the other. Climate and living organisms are the active forces in soil formation. Their effect on the parent material is modified by topography and time. Each of these soil-forming factors, as it applies to the distribution and morphology of soils in Charles County, is discussed in the following paragraphs.

Parent material

Soils inherit some of their characteristics from the parent material. The various types of geologic sediment are altered by physical and chemical processes. The unconsolidated residue that results from this action is the parent material from which soils form by weathering and subsequent modification by the other factors of soil formation.

Parent material provides the mineral skeleton of the soils and influences the texture and mineralogy of the resulting soil profile. Studies by Fanning (*4*) have shown that most soils of the Coastal Plain are fairly uniform in clay mineralogy. The clay fraction of the soil contains about equal amounts of the minerals chlorite, mica, and kaolinite or intergradient chlorite. This reflects the importance of parent material in clay mineralogy. Soils that formed in Coastal Plain sediment containing mostly quartz and kaolinite clay will most likely contain a predominance of these minerals. Likewise, soils formed from sandy or gravelly sediment will probably retain this characteristic throughout their genesis. Soils that formed from clayey sediment tend to be fine textured. These inherited charac-

[4] By Drs. F. P. Miller and J. E. Foss, Department of Agronomy, University of Maryland.

teristics, however, are frequently modified and sometimes masked by the influence of other factors.

The parent material of all soils in Charles County is unconsolidated sediment of the Coastal Plain. The texture of this material varies greatly, and the geologic age ranges from early Cretaceous to Holocene (Recent). The older sediment is dominantly sandy or gravelly. The Aura, Croom, Evesboro, Marr, Sassafras, Westphalia, and Woodstown soils commonly developed in this sediment. Where the older sediment has a silty deposit over it, the Beltsville, Chillum, Leonardtown, and some of the Matapeake, Mattapex, and Othello soils developed.

In places soils that formed in old sediment are very deeply developed, commonly to depths of 10 to 15 feet. These are called paleosols and are best represented by soils of the Exum series.

In later sediment of various textures, mostly on old alluvial terraces above major streams, the soils are chiefly of the Elkton, Fallsington, Keyport, Galestown, Osier, and Wickham series. Some of the Matapeake, Mattapex, and Othello soils are also on these terraces.

The parent material of the youngest soils in the county consists of recent alluvium transported by streams and deposited on flood plains. These soils are of the Bibb, Iuka, and Ochlockonee series.

Climate

Climate strongly influences the weathering process and the vegetation which in turn further modifies the soil-forming process. Under the humid climate typical of the mid-Atlantic region, the soils of Charles County reflect the impact of the weathering process as evidenced by the well-developed soil profiles. Climatic data for the county are recorded in the section "General Nature of the County."

Rainfall influences soil formation through erosion solution losses caused by leaching, and chemical reaction (where water is a necessary component). The effects of erosion are particularly noticeable on soils that have steep slopes. Many of these soils are thin and have weakly developed profiles, in contrast to their more level counterparts in areas where geological erosion is in equilibrium with the soil-forming processes. Accelerated erosion resulting from man's influence also contributes to the loss of horizons at the surface in soils on sloping landscapes.

Many constituents are removed from the soils by leaching. For example, the soluble salts and basic ions (Ca^{++}, Mg^{++}, K^{+}, and Na^{+}) released in weathering of certain minerals are removed in varying degrees. Water percolating through soils may remove, in the course of one year via solution, several tons of minerals per square mile. As a result of this leaching, the soils of Charles County are naturally acid to extremely acid. The exchange sites on clay and organic matter are dominated by hydrogen or aluminum ions rather than by basic ions. Variations in percentage of bases on the exchange sites are dependent on the amount of basic elements in the parent material, the duration and intensity of weathering, or on possible additions of basic ions. The low content of bases in the parent materials of soils of Charles County accounts for much of the natural acidity in these soils. The addition of lime or limestone during farming operations has decreased the acidity of some soils, particularly in the Ap horizon, or plow layer.

One of the results of weathering is the formation of an argillic (Bt) subsoil horizon in many soils. The weathering of coarser mineral particles to clay and movement of the clay downward from the surface horizons account for the formation of the Bt horizon. Increased clay content of the Bt horizon and evidence of movement of clay are indicated by the thin coatings or clay films on the surfaces of the natural soil structural units (peds) and the presence of similar coatings or films in pores and old root channels. This Bt horizon influences many properties of soils including drainage, aeration, available moisture capacity, shrink-swell potential, and permeability.

The Bt or argillic horizon is very weakly expressed in some soils, such as those of the Galestown series. It is very strongly expressed in other soils, such as those of the Keyport and Magnolia series. The Bibb, Evesboro, Iuka, Ochlockonee, and Osier soils do not have a Bt horizon. This is the result of the parent material containing practically no clay (Evesboro and Osier) or the soil being too immature to have developed a Bt horizon (Bibb, Iuka, and Ochlockonee.) In the latter example, the soil-forming factor "time" has not expressed itself.

Translocation of iron from the A horizon to the B horizon occurs in many soils. In Charles County this is most evident in the Magnolia soils, which have a brown A horizon from which iron has been removed and a red B horizon in which iron has accumulated and oxidized.

Charles County is at a latitude a little south of the midpoint between the North Pole and the Equator. The degree of soil expression, therefore, is intermediate between that which would be normal for polar and equatorial climatic conditions. The soils are more deeply weathered and thickly formed than in polar regions, yet they are not so highly weathered and deep as most soils in tropical latitudes where climate commonly completely masks the influence of different parent materials. This comparison emphasizes the active role that climate plays in soil formation.

In Charles County, soil properties related to parent material are evident enough to serve as a useful criterion in distinguishing soil series, but climatic factors modify this evidence in a number of ways: precipitation in excess of evapotranspiration results in leaching and translocation; wetting and drying results in expansion and contraction, which subsequently forms soil structure; and the continuous process of mineral weathering eventually produces a soil in dynamic equilibrium with its environment. The soils in Charles County are thus directly related to the climate in which they formed and in which they exist today.

Plant and animal life

One of the features that distinguishes soil from its parent material (purely mineral) is the organic constituent of living plants and animals and their decayed or decaying remains. When climate begins to act on parent material, soil begins to develop. Plant and animal life soon follow and hasten the weathering process. The resulting soil is a product of these inorganic and living factors as modified by climate, relief, and time.

Early in the formation of soil, such primitive forms of life as bacteria, fungi, and other simple living organisms

influence the weathering process. As time progresses these simple life forms are supplemented through the development of a more complex system of plant and animal life. In Charles County a stage was reached where trees were the dominant vegetation, and worms, insects, and more advanced types of animal life inhabited the soil. Before this climax vegetation was cleared, the soils of Charles County had a cover consisting mainly of deciduous hardwood trees and some conifers. At present the cover consists largely of second-growth oaks and some poplar, hickory, maple, ash, elm, birch, and sycamore. Conifers, especially Virginia pine, are now more common than before.

Although vegetation is the most common type of living organism, many other life forms greatly influence soil formation. Besides man, these are the micro-organisms, earthworms, larvae, insects, burrowing rodents, and other forms of life. All of these are important in the cycle of decay and regeneration of vegetation. They also play a role in nutrient and gas cycles. The continuing cycle produces large amounts of nutrients and organic matter. Nutrients absorbed by plants are eventually returned to the soil through leaf fall and the final decomposition of the entire plant itself. In the process organic matter is produced and incorporated into the upper layers of the soil by earthworms, rodents, and decaying roots. Other processes, including windthrow of trees and various activities of man, also hasten decomposition.

Wright [5] found that the Ap horizon of the Coastal Plain soils of Maryland is on an average about 1.6 percent organic matter. The organic-matter content of the B horizon of these soils is less than 0.4 percent.

Clearing, cultivation, acceleration of erosion, introduction of new plants, addition of lime and fertilizers, improving natural drainage, and grading or otherwise changing the landform are several of the ways in which man has modified the environment. This may initiate the formation of new soil characteristics and, in turn, produce a shift in equilibrium of soils with their environment. Such a shift will be a very slow process in most cases. Soils that have been cultivated for centuries in Europe, however, are easily distinguishd in morphology and other properties from their virgin associates. This emphasizes the concept that man must be considered significant in the soil-forming processes.

Relief

The shape of the landscape, as well as its elevation, orientation, and gradient influences soil formation. Even in places where parent materials are uniform, soils formed on steeper gradients generally are thinner and not so well expressed as soils formed on more nearly level parts of the landscape. Also, the more level the area the more likely it is to have poor natural drainage and a high water table. This condition is strongly reflected in the profiles of some soils of Charles County.

The Coastal Plain consists of nearly horizontal beds of loose sediment. These have eroded through geologic time, leaving some very old sediment exposed at rather higher elevations. At some of the higher elevations there have been later depositions of silty material (presumably loessial). In these positions there is little local relief, and consequently drainage patterns are poorly developed. Extensive areas of Beltsville and Leonardtown soils are in these interfluvial landscape positions.

In contrast to these older uplands are the level to gently or moderately sloping alluvial or late marine terraces that border the major rivers. On these terraces the soils are presumably younger than those on the higher uplands. Many of these soils have well-developed profiles.

Relief influences the drainage condition of soils. Poorly drained soils occupy positions in the landscape that are flat or concave. Moderately well drained and somewhat poorly drained soils are in nearly level to moderately sloping landscape positions. Well-drained soils are generally in areas where slopes are steeper, but they also occupy nearly level landscape positions where natural drainage and permeability are rapid enough to prevent long periods of saturation.

Time

The degree of profile expression results not only from the intensity of the soil-forming processes but also from the duration of these processes. For this reason the degree of soil development or the expression of a particular soil property is not necessarily related to the age of the underlying rock or the geomorphic surface.

For example, the Evesboro soils are on some of the oldest sediment and land surfaces in the county, but their typical profile is not well developed. This is because the parent material is almost entirely quartz sand that is highly resistant to weathering. The profiles of many "younger" soils are fairly well developed, because the parent material was more susceptible to weathering over a shorter period. Examples of soils that have well-developed profiles, yet are no older or are younger than Evesboro soils, are the very silty Matapeake, Mattapex, and Othello soils.

A few soils of the county show only weak profile development. These soils are in the Bibb, Iuka, and Ochlockonee series. Their parent materials, which are on flood plains, have not been in place long enough for profiles to be significantly differentiated and expressed. Some features associated with wetness or natural drainage, however, can be observed. The Exum and Magnolia soils, on the other hand, have very well developed profiles. This indicates that their landscapes have been rather stable and have been exposed to soil-forming processes for a considerable length of time.

Classification of Soils [6]

Soils are classified to show their relationships to one another. They are classified by many different systems. For example, a system could be devised to classify soils according to a single criterion, such as their suitability for growing cotton or their trafficability by oxcarts. Neither system is suitable for Charles County. Cotton is not climatically adapted and oxcarts are obsolete. The system would be of little or no use for other purposes.

The classification system employed in the United States (*2, 7, 9*) is based on many soil properties, and it has several levels of classes or categories. This allows interpretations

[5] WRIGHT, W. R., Contributions of Clay and Organic Matter to the Cation-exchange Capacity of Maryland Soils, University of Maryland, M.S. Thesis, 1969.

[6] By DR. D. S. FANNING, associate professor of soil classification and mineralogy, University of Maryland.

based on the classification, plus soil maps, to be made for most presently conceivable purposes.

Six levels of classifications or categories are employed in table 10. The classification units within each level are based on many carefully defined soil characteristics (*11*). In mapping, each of the soil series (the class at the lowest level of classification) is subdivided into phases.

The phase separations are based on the slope of the land, the degree of erosion, surface texture, content of coarse fragments, etc.

A systematic nomenclature system is used for the classes of the four highest categories (orders, suborders, great groups, and subgroups; see tables 10 and 11).

Table 11 is provided to help users of this survey to understand the origin and connotation of each of the nomenclature stems that are used to indicate the classes of soils recognized in Charles County.

The classification system (*11*) places all known soils into 10 orders. The two orders recognized in Charles County, Entisols and Ultisols, are defined in table 11.

There are five soil series in the order Entisols. These soils have no genetic or pedogenic horizons because the Bibb, Iuka, and Ochlockonee soils are too recent. These horizons are also lacking because the mineral portion of the Evesboro and Osier soils is almost pure quartz and is highly resistant to weathering.

All of the other soil series are in the order Ultisols. They have Bt horizons of clay, and are low in natural base supply (less than 35 percent base saturation of the exchange capacity).

Five suborders are recognized in Charles County (table 10). The distinctions and similarities between them may be understood in terms of the four stem names used to designate them within the orders (table 11). Nine great groups are recognized in the county (table 10), and as with the suborders, the name stems used to designate them (table 11) are keys to the main characteristics used to separate them within the suborders.

Fourteen subgroups are recognized in Charles County (table 10). Subgroups are defined in terms of how well they represent the central concept of the respective great group. Typic (central concept of the great group) subgroups were found in Charles County for all great groups except Paleudults. The various terms used to designate these subgroups are given in table 11.

Twenty-four soil families are recognized in Charles County. Families are defined within subgroups chiefly by soil texture, mineralogy, and temperature. For some families, other factors are used for differentiation; for example, reaction and whether or not sand grains are coated (table 10).

The textural classes are based on the texture of a subsurface control section that is important in the soil. The broad textural groups are skeletal, sandy, loamy, silty, and clayey.

TABLE 10.—*Soil series classified according to the current system of classification*

Series	Family	Order	Suborder	Great Group	Subgroup
Aura	Fine-loamy, mixed, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Beltsville	Fine-loamy, mixed, mesic	Ultisols	Udults	Fragiudults	Typic Fragiudults.
Bibb	Coarse-loamy, siliceous, acid, thermic	Entisols	Aquents	Haplaquents	Typic Haplaquents.
Bourne	Fine-loamy, mixed, thermic	Ultisols	Udults	Fragiudults	Typic Fragiudults.
Chillum	Fine-silty, mixed, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Croom	Loamy-skeletal, mixed, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Elkton	Clayey, mixed, mesic	Ultisols	Udults	Ochraquults	Typic Ochraquults.
Evesboro [1]	Mesic, coated	Entisols	Psamments	Quartzipsamments.	Typic Quartzipsamments.
Exum	Fine-silty, siliceous, thermic	Ultisols	Udults	Paleudults	Aquic Paleudults.
Fallsington	Fine-loamy, siliceous, mesic	Ultisols	Aquents	Ochraquults	Typic Ochraquults.
Galestown	Sandy, siliceous, mesic	Ultisols	Udults	Hapludults	Psammentic Hapludults.
Iuka	Coarse loamy, siliceous, acid, thermic	Entisols	Fluvents	Udifluvents	Aquic Udifluvents.
Keyport	Clayey, mixed, mesic	Ultisols	Udults	Hapludults	Aquic Hapludults.
Leonardtown	Fine-silty, mixed, mesic	Ultisols	Aquults	Fragiaquults	Typic Fragiaquults
Magnolia [2]	Clayey, kaolinitic, thermic	Ultisols	Udults	Paleudults	Rhodic Paleudults.
Marr	Fine-loamy, siliceous, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Matapeake	Fine-silty, mixed, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Matawan	Fine-loamy, siliceous, mesic	Ultisols	Udults	Hapludults	Aquic Hapludults.
Mattapex	Fine-silty, mixed, mesic	Ultisols	Udults	Hapludults	Aquic Hapludults.
Ochlockonee	Coarse-loamy, siliceous, acid, thermic	Entisols	Fluvents	Udifluvents	Typic Udifluvents.
Osier	Siliceous, thermic	Entisols	Aquents	Psammaquents.	Typic Psammaquents.
Othello	Fine-silty, mixed, mesic	Ultisols	Aquults	Ochraquults	Typic Ochraquults.
Rumford [1]	Coarse-loamy, siliceous, thermic	Ultisols	Udults	Hapludults	Typic Hapludults.
Sassafras	Fine-loamy, siliceous, mesic	Ultisols	Udults	Hapludults	Typic Hapludults.
Westphalia	Coarse-loamy, siliceous, mesic	Ultisols	Udults	Hapludults	Ochreptic Hapludults.
Wickham	Fine-loamy, mixed, thermic	Ultisols	Udults	Hapludults	Typic Hapludults.
Woodstown	Fine-loamy, siliceous, mesic	Ultisols	Udults	Hapludults	Aquic Hapludults.

[1] Gravelly phases in Charles County are taxadjuncts to the series because of content of fragments greater than 2 millimeters in diameter.

[2] Magnolia soils in Charles County are taxadjuncts to the series because they have a lower clay content and a higher silt content in the textural control section than modal Magnolia soils, and because the argillic (Bt) horizon is not uniformly as dark red in color as is listed in the official series description.

TABLE 11.—*Terminology used in naming major taxonomic categories of the soils of Charles County* [1]

ORDER NAMES

Names of soil orders end in "sol" (solum,[2] soil) and contain a formative element used in the final syllable in the names of the suborder, great group, and subgroup classes.

Entisols	Soils that have no pedogenic horizons. Formative element: ent, which has the connotation of "recent."
Ultisols	Soils with horizons of clay accumulation and low base supply. Formative element ult, which has the connotation of "last."

STEMS USED IN SUBORDER NAMES

These stems are placed before the formative element of the order names to form suborder names.

Fluv	Fluvius,[2] river; soils formed in alluvium.
Aqu	Aqua,[2] water; soils that are wet for long periods.
Ud	Udus,[2] humid; of humid climates.
Psam	Psammos,[3] sand; excessively sandy.

STEMS USED IN GREAT GROUP NAMES

Ud	Udus,[2] humid; of humid climates.
Hapl	Haplous,[3] simple; the least advanced horizons, generally typifies the suborder.
Fluv	Fluvius,[2] river; soils formed in alluvium.
Ochr	Base of ochros,[3] pale; soils with little organic matter.
Quartzi	Quarz, quartz;[4] dominated by the mineral quartz.
Fragi	Modified from fragilis,[2] brittle; a dense brittle horizon.
Pale	Paleos,[3] old; old soils of advanced degree of development.

SUBGROUP TERMINOLOGY

Typic	Typus [2] and typos,[3] type; this subgroup typifies the central concept of the great group.
Aquic	Aqua,[2] water; the soil has some characteristics of poor natural drainage though not sufficient for its placement in an Aqu suborder.
Ochreptic	Base of ochros,[3] pale; Hapludults with a very thin argillic horizon, thus with a solum dominantly pale in color.
Psammentic	Psammos,[3] sand; intergrading toward Psamments, which are a suborder of sandy Entisols.
Rhodic	Rhodon,[3] rose; soils that are unusually dark-red in color.

[1] Terminology in this table follows, and the explanations have been adapted from the USDA comprehensive system of soil classification (*11*).
[2] From the Latin.
[3] From the Greek.
[4] From the German.

Skeletal soils have a control section with more than 35 percent, by volume, of coarse fragments greater than 2 millimeters thick. Loamy soils are divided into coarse-loamy (less than 18 percent clay) and fine-loamy (18 to 35 percent clay), and more than 15 percent is coarser than very fine sand. On the same basis of clay content, silty soils are divided into coarse-silty and fine-silty, but less than 15 percent is coarser than very fine sand. Clayey soils have a control section containing more than 35 percent clay.

Mineralogy classes are based on the dominant minerals in the control section. For clayey families, this means the dominant clay mineral. For others it means the dominant minerals in the silt and sand. Most of the soils of Charles County are either siliceous (dominated by silica or quartz) or of mixed mineralogy (no dominant single mineral). One series (Magnolia) is dominated by kaolinitic clay. Mineralogy does not appear in the family name of the Evesboro series, because quartz, which is silicon dioxide, appears in the names used to designate both the great group and subgroup to which this series belongs.

Soil families are also separated on the basis of temperature. *Mesic* families have an average annual temperature at a depth of 20 inches between 47° and 59° F., with a difference of at least 9° F. between the average summer and winter temperatures. *Thermic* families have an average annual temperature that is greater than 59° at a depth of 20 inches.

The soil isotherm of 59° F. passes through Charles County. This line is fairly broad and indefinite. The soils of this county are classified as thermic families if they most commonly occur southward in the warmer regions. They are classified as mesic families if they most commonly occur northward in the cooler regions. It must be emphasized that the 59° isotherm is not only broad and indefinite but also quite irregular. Limited information on exact soil temperatures makes it impossible to trace this isotherm on any map of the landscape.

It will be noted in table 10 that most soil families have only one representative. Most of these families have other members that are elsewhere in Maryland or in adjacent states. Three families listed in table 10 have two members in the county. Differences between the Marr and Sassafras series, between Chillum and Matapeake series (see fig. 15), and between Matawan and Woodstown series, are based on color, thickness of solum or major horizons, or other factors, and are pointed out in the section "Descriptions of the Soils."

General Nature of the County

This section gives background information about the history, population, and climate of the county. It also gives some facts about transportation and markets, farming, surface features, and water supply.

Charles County is the fifth county in Maryland and was founded by the Governor and his Council on May 10, 1658. It was named in honor of Charles Calvert, the third Lord Baltimore. Port Tobacco, then called Chandler's Town, was designated the county seat. Previously it was a village called "Potobac" that was occupied by the Indians when Captain John Smith visited the area in 1608. Port Tobacco soon became the center of activity, shipping tobacco and other products of Southern Maryland to European ports. It was on the stagecoach and Potomac Ferry route from Philadelphia to the south.

La Plata, the present county seat, was founded as a town about 1870, on the newly built Popes Creek Railroad. By 1895, Port Tobacco had lost much of its importance because soil debris from eroded farms in the watershed

blocked the river below the port and prevented access by larger ships. In 1895 the courthouse burned, and the county seat moved to La Plata.

Benedict, the second oldest town in the county, is on the Patuxent River. Benedict was the landing site of the British Army that burned Washington, D.C., during the War of 1812. Indian Head, Waldorf, and Hughesville were founded during the 19th century. Most of the smaller communities in the county date from colonial times.

The early settlers of Charles County were English, or of English descent. Many of the settlers did not come directly from England, but from other colonial settlements. Growth of the county was slow until about 1940. It was semi-isolated until the bridge over the Potomac River at Morgantown was constructed, making possible north-south traffic on U.S. Highway 301.

In 1950 the population of Charles County was 23,415, and by 1970, it was 47,678. The highest density of population is in the Pomonkey-Indian Head area, and the second highest is in the Waldorf area.

Transportation for the earliest settlers in the county was mainly by water. Several towns, including the county seat, were established at points served by ocean-going ships. The Potomac River, which borders the county for about 75 miles, with its tributaries served the families who lived far from the towns.

The building of good roads was accelerated just before World War I, when automobiles became the common mode of transportation. U.S. Highway 301 runs through the center of the county and is the principal north-south highway.

The Popes Creek Railroad was completed around 1868 to provide rail transportation.

Today, rail service is supplied by the Pennsylvania Central Railroad. Air service is supplied by National Airport in Washington, D.C., and by Friendship International Airport near Baltimore, Maryland. Motor freight service is from terminals in Washington, Baltimore, and Richmond and Norfolk, Virginia.

Markets are easily available. Within overnight trucking distance from La Plata is 28 percent of the U.S. population and 29 percent of the Nation's effective buying power.

Climate [7]

Charles County's position in the middle latitudes, where the general atmospheric flow is from west to east, favors a continental type of climate with its well-defined seasons. However, the Chesapeake Bay and the Potomac River have a modifying influence on the climate, especially in moderating extreme temperatures of the areas nearby.

Data in table 12 are based on the climatic record of the National Weather Service cooperative station in La Plata, in the central part of the county. Those climatic data are representative of those for the county, except in areas bordering the Potomac River and the lower parts of its tributaries.

The warmest period of the year is the last half of July, when the afternoon maximum temperature averages 89° F. Temperatures of 90° or higher occur about 34 days per

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

TABLE 12.—*Temperature and precipitation data*

[All data from La Plata, Maryland, for the period 1931–60]

Month	Temperature				Precipitation [1]				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with [1]—		Average monthly precipitation	One year in 10 will have—		Days with snow cover 1 inch or more	Average depth of snow on days with snow cover 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	Number
January	46.7	27.0	62	9	3.89	1.7	6.6	3	3
February	48.6	27.1	66	11	3.01	1.4	4.9	4	3
March	56.5	33.5	75	20	3.78	1.6	6.1	2	4
April	67.7	42.4	82	29	3.58	1.8	6.3	----------	----------
May	76.6	52.5	89	40	4.21	1.6	7.2	----------	----------
June	84.0	61.1	94	51	3.99	1.9	6.9	----------	----------
July	87.6	65.5	94	57	5.20	2.3	8.4	----------	----------
August	85.9	64.1	95	54	5.07	1.8	10.6	----------	----------
September	80.0	57.5	90	44	4.27	1.3	10.6	----------	----------
October	70.3	46.3	83	32	3.72	1.0	7.5	----------	----------
November	59.0	35.6	74	21	3.01	1.0	5.7	(2)	3
December	47.6	27.4	62	13	3.24	1.6	6.1	3	3
Year	67.5	45.0	[3] 99	[4] 4	46.97	35.1	56.1	12	3

[1] Record, 1933–47.
[2] Less than 0.5 day.
[3] Average annual maximum temperature.
[4] Average annual minimum temperature.

TABLE 13.—*Probabilities of last freezing temperatures in spring and first in fall*

[Data based on observations at La Plata, Charles County, Maryland, during the 30-year period, 1926-55]

Probability	Dates for given probability and temperature		
	32° F. or lower	24° F. or lower	16° F. or lower
Spring:			
9 years in 10 later than	Apr. 4	Feb. 28	Feb. 4
3 years in 4 later than	Apr. 11	Mar. 8	Feb. 13
2 years in 3 later than	Apr. 13	Mar. 11	Feb. 17
1 year in 2 later than	Apr. 18	Mar. 17	Feb. 24
1 year in 3 later than	Apr. 23	Mar. 23	Mar. 3
1 year in 4 later than	Apr. 25	Mar. 26	Mar. 7
1 year in 10 later than	May 2	Apr. 3	Mar. 16
Fall:			
1 year in 10 earlier than	Oct. 9	Nov. 2	Nov. 23
1 year in 4 earlier than	Oct. 15	Nov. 9	Nov. 30
1 year in 3 earlier than	Oct. 18	Nov. 12	Dec. 3
1 year in 2 earlier than	Oct. 22	Nov. 17	Dec. 8
2 years in 3 earlier than	Oct. 26	Nov. 22	Dec. 13
3 years in 4 earlier than	Oct. 29	Nov. 25	Dec. 16
9 years in 10 earlier than	Nov. 4	Dec. 2	Dec. 23

year. The coldest period is the last part of January and the beginning of February, when the early morning average minimum temperature is about 21°. The average number of days when the daily minimum temperature is 32° or lower is 100.

Freeze data, giving the average dates of the last spring and first fall occurrences of minimum temperatures that are equal to or below a specified threshold value, are given in table 13 for La Plata. The period between the last frost, or 32° F., temperature in spring and the first in fall, often defined as the growing season, is about 187 days.

The average annual precipitation is 47 inches. The monthly distribution is fairly uniform throughout the year. July and August are the wettest months, and February and November are the driest. Precipitation in the colder half of the year mainly is the result of low-pressure systems moving north or northeast along the coast. In summer precipitation occurs in the form of showers and thunderstorms.

The average annual snowfall is 18 inches, but it varies from year to year. For example, the total was 49.3 inches in 1939–40 and 4.0 inches in 1951–52. The maximum depth of snow was 24 inches, on January 28, 1922.

Drought occurs at any time, but it is more serious in summer. Generally, rainfall and stored soil moisture are adequate for good crop yields. However, the unequal distribution of summer showers and occasional dry periods at critical stages in crop development makes irrigation necessary for maximum crop yields in some years.

Thunderstorms occur on the average of 35 days per year. They occur in any month, but about 70 percent of them are during the period of May through August. Tornadoes hurricanes, and blizzards are rare. Prevailing winds are from northwest to west-northwest, except during summer, when they are more southerly. The average wind velocity is about 9 miles per hour. In places, winds reach 50 to 60 miles per hour and higher during severe thunderstorms, hurricanes, or intense winter storms.

Farming [8]

The first settlers of Charles County had to clear the land they farmed. The land was covered mostly by hardwoods, including oaks, chestnut, sweetgum, yellow-poplar, and beech. The first crops grown were corn, tobacco, small grains, and hay. Tobacco soon became the principal cash crop and a medium of exchange.

Early farm practices were wasteful. The land was cleared, cropped until yields were no longer profitable, and then abandoned. Level fields naturally regenerated without permanent injury, but erosion was moderate to severe on sloping areas before a plant cover was reestablished.

In 1919 the major crops were the same as those grown by the first settlers (*8*). Of the total acreage farmed, about 42 percent was in corn, 20 percent in wheat, and 10 percent in tobacco. Practically all of the harvested tobacco was exported to Europe. Hay ranked fourth in importance.

There was a decrease in acres cropped between 1879 and 1919.

Farms in the county have decreased in number, but they have increased in size. The average farm size was 118 acres in 1919 (*8*) and 126 acres in 1964 (*5*). There was about a 35 percent increase in the number of part-time farms between 1950 and 1960. Over half of the farm operators reported off-farm employment in 1959 (*3*). The value of farms and farm buildings increased by about 50 percent between 1958 and 1964.

Of the 1,009 farms reported in 1964, 141 were less than 10 acres in size; 265 farms were 10 to 49 acres; 163 were 50 to 99 acres; 257 were 100 to 219 acres; 151 were 220 to 499 acres; and 32 were 500 acres or larger (*3*). In 1964, 605 of the 714 commercial farms in the county were classified as tobacco farms.

In 1964, 8,800 acres were in corn, 5,500 acres in small grains, 2,000 acres in soybeans, and 5,200 acres in hay (*3*). Nursery and greenhouse products were also extensive. 9,002 acres of tobacco was planted in 1900 (*8*), 8,735 acres in 1959 (*3*), and 6,000 acres in 1968 (*5*). The tobacco harvest in 1968 was 7.1 million pounds, an average of 1,188 pounds per acre (*5*). In 1969 there were 6,300 acres of tobacco in the county. During 1960–70 about 75 percent of farm income was derived from tobacco.

The major tobacco-producing areas in Charles County are east of Route 301. The most important tobacco-producing soils are of the Westphalia, Sassafras, Rumford, and Evesboro series. These soils are moderately coarse to coarse in texture and are well drained to excessively drained. Yields generally are high, but they are only moderate on Evesboro soils.

Tobacco responds well to high-range applications of fertilizer. The results of a fertilizer-rate test conducted over a 3-year period showed that yield, value per acre, and average auction price increased with each increment of fertilizer. This test was conducted on Beltsville silt loam, one of the siltier soils used for tobacco. It is not so well

[8] CLAUDE G. MCKEE, extension tobacco specialist, Department of Agronomy, University of Maryland, and H. TRAVIS MCPHERSON, tobacco extension agent in Charles County, assisted in the preparation of this section.

drained or so well aerated as the soils on which tobacco generally is produced.

Tobacco varieties commonly grown in Charles County are Catterton, Maryland 10, Maryland 59, Maryland 64, and Maryland 609. In 1970 about half the total acreage planted to tobacco was in Maryland 609. This variety grows better on heavier textured soils than others. The results of the tobacco variety test conducted on Beltsville silt loam in Charles County showed that Maryland 609 had both the highest average price per pound and dollar return per acre of the varieties tested.

Charles County is not self-sufficient in livestock products. There has been a constant decrease in this area in recent years (*3*). Most livestock farms in the county are operated by owners or part owners, but in 1964 about 25 percent were operated by tenants. Most of the tenants operate on a share basis rather than paying rent.

Surface Features [9]

Charles County lies entirely within the province of the Atlantic Coastal Plain. The western boundary is 6 to 8 miles east of the edge of the Piedmont province in Virginia. A plateau fairly uniform in altitude forms a rough triangle in the north-central part, centered in the area along U.S. Route 301 between White Plains and Waldorf. This upland plateau is not deeply entrenched by stream valleys, but the land gently slopes west, south, and east and is cut by the major streams of the county, the larger of which flows south.

About two-thirds of the county lies within an altitude of 100 feet or more. The maximum elevation, about 240 feet, is near Waldorf. Along some parts of the shorelines of the Potomac and Wicomico Rivers, there is terracing, with a fairly abrupt slope change at the 40-foot contour line. Uniformly elevated terraces below the 40-foot contour are in the Marshall Hall, Stump Neck, and Moss Point areas, and at Maryland Point extending to the northwest along the Wicomico River shoreline. These broad flat areas are 25 to 40 feet in altitude and may be part of the Talbot terrace of late Pleistocene age.

With the exception of Swanson and Indian Creeks, which flow eastward into the Patuxent River, all drainage is into the Potomac River. The eastern half of the county is drained by the Zekiah Swamp Run and its tributaries and the Gilbert Swamp Run, the northern part by Mattawoman Creek, the central part by the Port Tobacco River, and the western part by Reeder Run, Nanjemoy Creek, Wards Run, and Mill Run.

Water Supply

Ground water is available nearly everywhere in Charles County. In a few places it is available from springs, but in most places it is obtained from drilled or dug wells. Several water-bearing formations are below the surface, and they can be tapped by wells ranging in depth from 10 feet or less to drilled wells greater than 1,000 feet in depth. Large amounts of water are stored in the Coastal Plain sediment beneath the area. Much of this water is not available because it is in strata that are too fine grained to yield water at significant rates to springs or wells.

Between 30 and 40 percent of the yearly precipitation infiltrates the ground-water reservoirs. The county receives about 800 million gallons of water per year for each square mile. The fairly low infiltration rate is due to topography and to the fine texture of many of the soils.

The major aquifers in Charles County are in the Patuxent, Patapsco, Raritan, and Magothy formations of the Cretaceous system, the Aquia Greensand of the Eocene series, and Pleistocene deposits.

Major aquifers beneath Pleistocene deposits are penetrated only by drilled wells. Upland deposits, mostly of Pleistocene age, are tapped by dug or bored wells that are seldom deeper than 40 feet. These shallow wells are at 50 to 200 feet above sea level. Most of them furnish only domestic water supplies. The sediment at these sites is saturated at depths of less than 40 feet.

The water source for these wells is absorbed precipitation which is released slowly to the underlying deposits. Commonly, streams have cut downward through these deposits, permitting them to drain. The shallow wells below an elevation of about 50 feet yield limited quantities of water to large-diameter wells, but they are locally subject to encroachment by salt water.

Water in the deeper formations is replenished from precipitation that filters through the soil zone in their outcrop areas, most of which are not in Charles County. These aquifers are recharged principally west of the Potomac River in Fairfax, Prince William, and Stafford Counties, Virginia. Ground water moves slowly through these aquifers toward the south and east, and water in upland deposits moves from the central upland of the county to the low-lying areas along major stream valleys. Ground water emerges in low places as seeps, swamps, and springs and maintains the flow of streams during periods of no runoff.

[9] This section is derived from "Availability of Ground Water in Charles County," Bul. 30, Maryland Geological Survey, by TURBIT H. SLAUGHTER and E. G. OTTON, 1968 (pages 5 and 6).

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Glossary

Acidity. (see Reaction, soil.)

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available 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.

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.

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.

Cropland. Land regularly used for crops, except forest crops and permanent pasture. It includes rotation pasture, cultivated summer fallow, orchards, and other land ordinarily used for crops but temporarily idle.

Diversion, 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 class (natural). 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 the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

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.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The base of a slope, where there is a significant change in the grade or angle toward more nearly level land.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content 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.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gravelly soil material. From 15 to 50 percent of material by volume consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer or 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, sesquioxides, 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.

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 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 materials from soils or other material by percolating water.

Loam. Soil having equal amounts of sand, silt, and clay.

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.

Mottling, soil. 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.

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. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. 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 acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Productivity of soil. The present capability of a soil for producing a specified plant or sequence of plants under a specified system of management. It is measured in terms of output, or harvest, in relation to input of production for the specific kind of soil under a specified system of management.

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.

Runoff. The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter 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 either *single grain* (each grain by itself, as in dune sand) or *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.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, 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."

Topography, or relief. Elevations or inequalities of the land surface, considered collectively.

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 (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

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