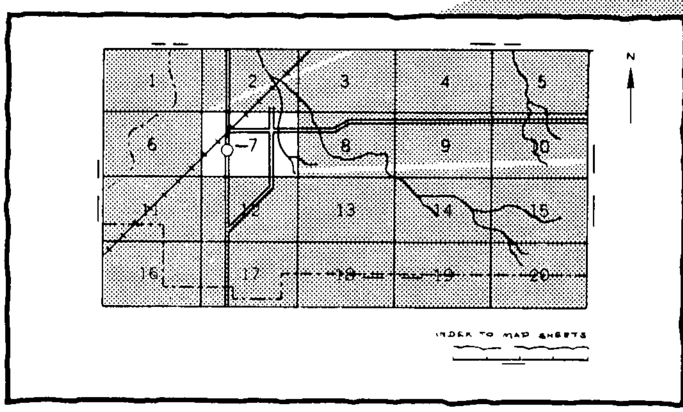
SOIL SURVEY OF

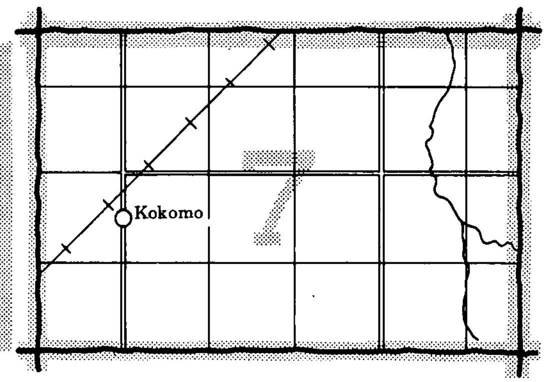
Westmoreland County, Virginia

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Virginia Polytechnic Institute
and State University

HOW TO USE

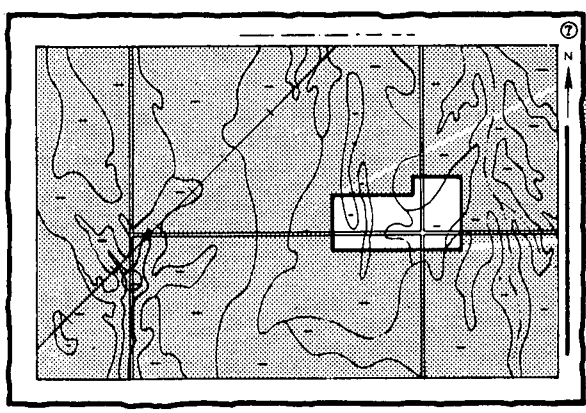
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

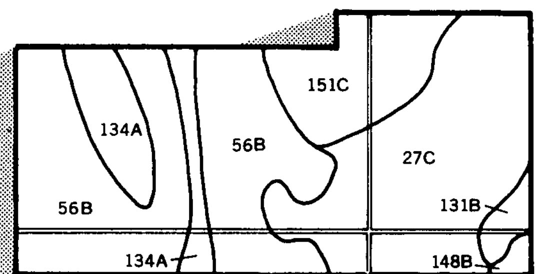




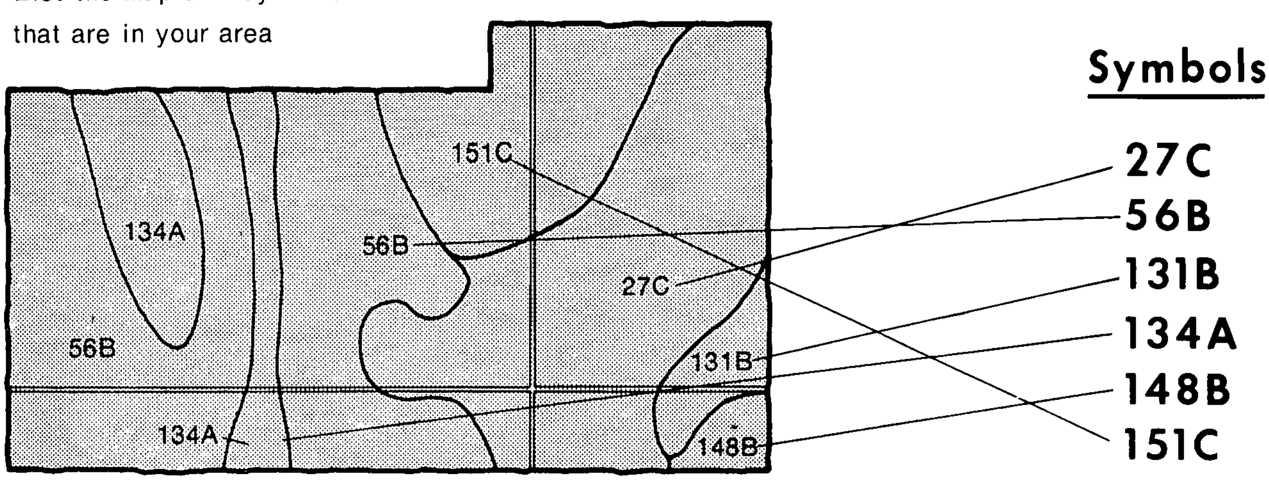
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



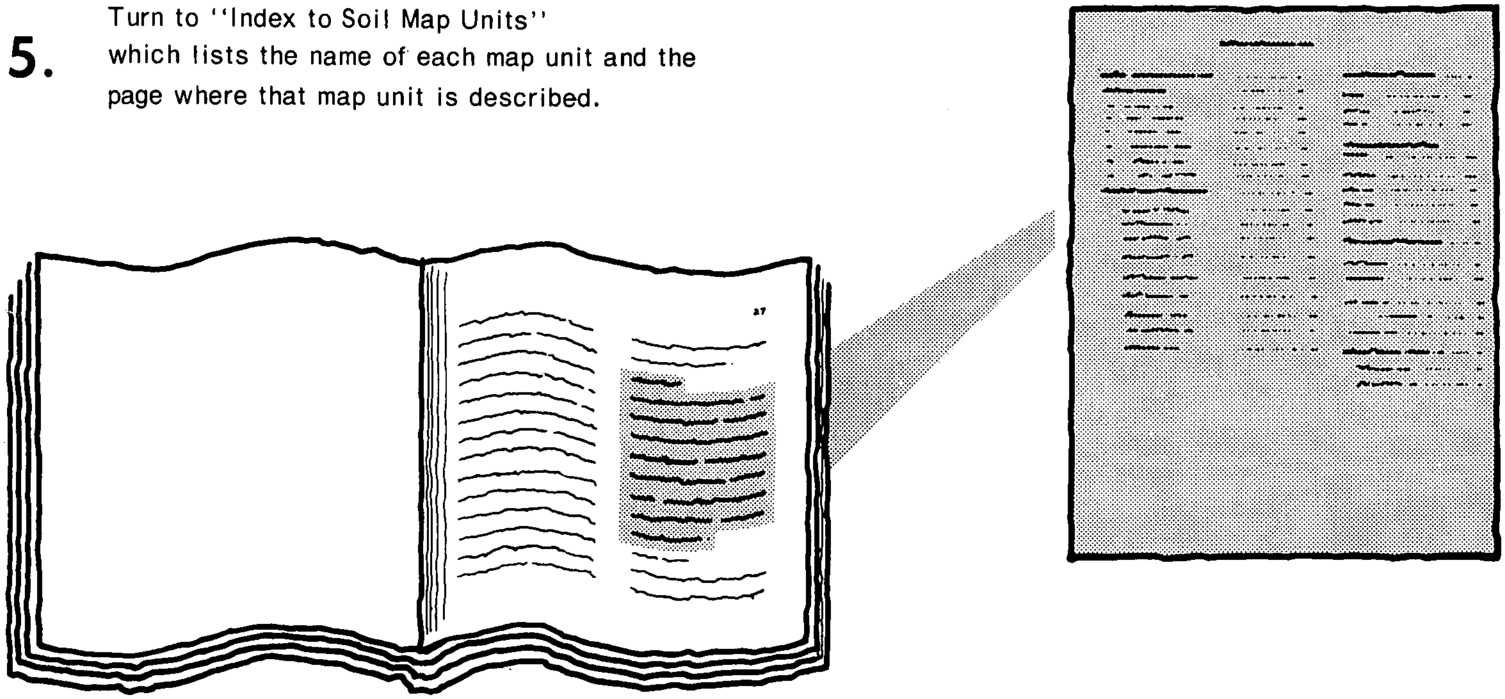


4. List the map unit symbols that are in your area

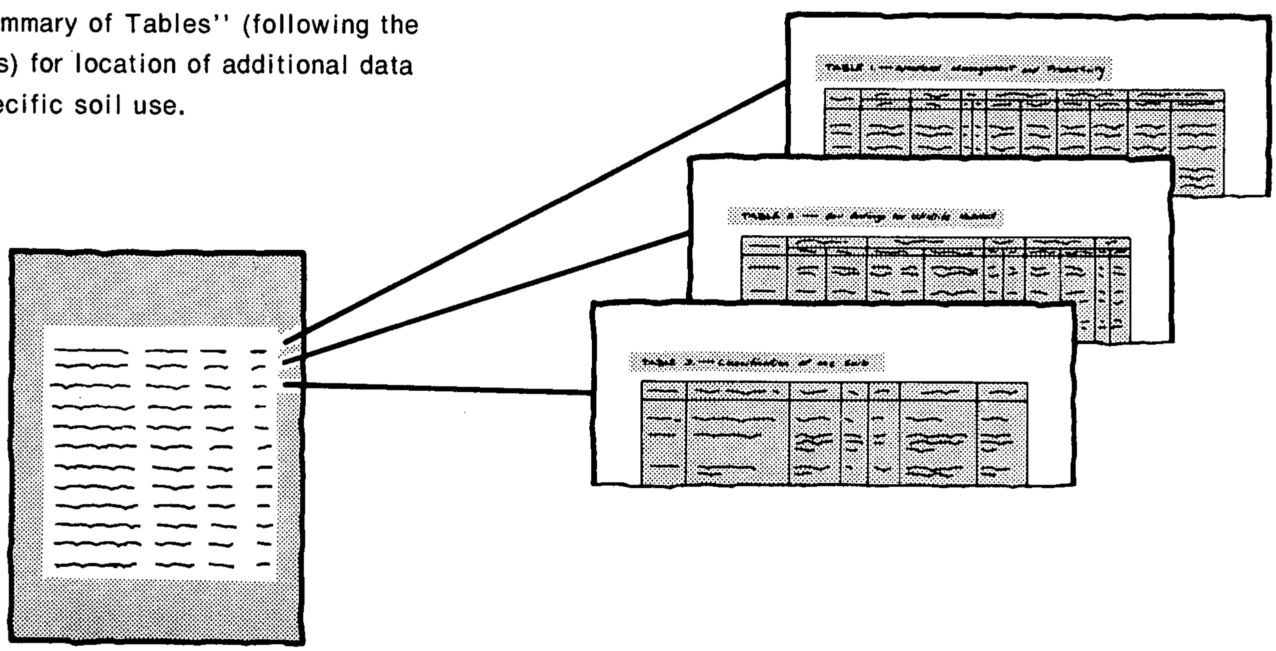


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1973-79. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Virginia Polytechnic Institute and State University. It is part of the technical assistance furnished to the Northern Neck Soil and Water Conservation District.

Cover: Wakefield Mansion, George Washington's birthplace, is on an area of well drained Rumford soils.

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soil series

Issued August 1981

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foreword

This soil survey contains information that can be used in land-planning programs in Westmoreland County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

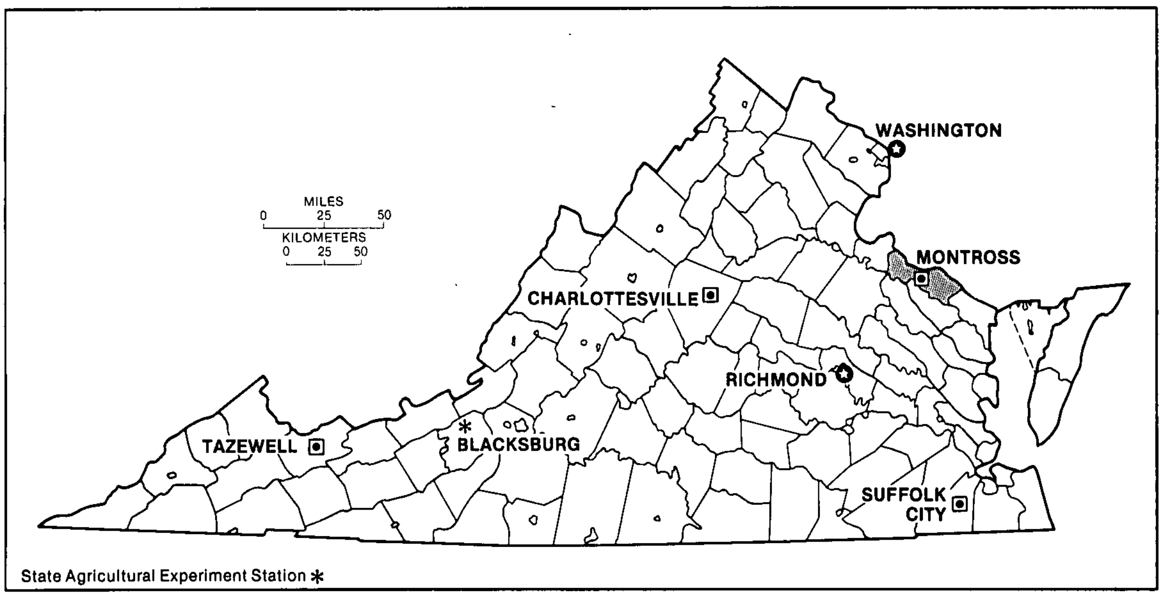
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Manly S. Wilder

Manly S. Wilder
State Conservationist
Soil Conservation Service



Location of Westmoreland County in Virginia.

soil survey of
Westmoreland County, Virginia

By John C. Nicholson, Soil Conservation Service

Fieldwork by John C. Nicholson, Kenneth C. Harward, Cecil F. Bullard, and Dan Isgrig
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service

in cooperation with
the Virginia Polytechnic Institute and State University

WESTMORELAND COUNTY is in the Northern Neck of Virginia, a narrow peninsula between the Rappahannock and Potomac Rivers. The county is 151,040 land acres, or about 236 square miles. The Potomac River separates Westmoreland County from Maryland to the north and is navigable by ocean-going vessels as far north as Washington, D.C. The county is about 60 percent woodland and 40 percent farmland. The topography is generally level and is cut by wide tidal creeks and bays.

The county has two incorporated towns, Colonial Beach and Montross, which is the county seat. The population of the county in 1973 was about 12,900.

The main highway in Westmoreland County is State Route 3, which runs east-west and intersects U.S. Routes 301 and 360. The nearest airports offering commercial service are National Airport in Washington, D.C. and Richard E. Byrd International Airport in Richmond. Each is about 80 miles from Colonial Beach.

general nature of the survey area

This section provides general information about Westmoreland County. A brief history of the county is given, and the physiography, relief, and drainage; water supply; and climate are described.

history

Westmoreland County was established in 1653 by the colonial government at Jamestown, Virginia (*5*). The county was formed from a portion of Northumberland County, Virginia, and was named for the county of Westmorland in England.

Many of Westmoreland County's early settlers came from St. Marys County, Maryland. Some of the other early settlers were from Jamestown and other sections south of the Rappahannock River.

Several sites in the county are of national historical significance. Pope's Creek Plantation was the birthplace of George Washington, and Stratford Hall was the home of the Lee family, ancestors of Richard Henry Lee, Francis Lightfoot Lee, and Robert E. Lee. Leedstown was a busy colonial port where the Leedstown Resolves were drafted in 1766 and signed by 115 citizens. The Resolves were later incorporated into the Declaration of Independence.

physiography, relief, and drainage

Westmoreland County is entirely within the northern Coastal Plain. The county has three general types of topography: neckland, upland, and cliffs.

The neckland is nearly level and ranges in elevation from less than 10 feet to about 50 feet above sea level. It borders most of the waterways and extends into the lower portions of the upland. The dividing line between neckland and upland is mainly marked by a distinct slope or scarp that starts at an elevation of about 50 feet and rises to about 100 feet. The upland is a gently rolling plateau dissected by numerous small gullies or drainageways and a few large ones. The plateau is highest in the north, 193 feet, which is the maximum elevation in the county. The uplands nearest to the Potomac and Rappahannock estuaries and upper portions of Nomini Creek have been eroded into numerous small hills and narrow ridges. Along these river fronts are the new cliffs in the county. On the Rappahannock side, the cliffs are 140 feet high. The cliffs on the Potomac side, preserved in Westmoreland State Park, are more extensive and slightly steeper than those on the Rappahannock side (*6*).

water supply

The municipally owned system of Colonial Beach is supplied from wells. The yield from these wells is estimated to be 520 gallons per minute. Storage facilities consist of two concrete ground-storage reservoirs and an elevated storage tank, giving a combined capacity of 423,000 gallons. Hardness of the water is about 0.9 grain per gallon.

The town of Montross obtains water from two drilled wells to supply the municipally owned system. Well no. 1 yields 35 gallons per minute; well no. 2, 135 gallons per minute. Storage is provided by a 100,000-gallon elevated tank. Hardness is approximately 1.7 grains per gallon.

Two communities in the county are served by privately owned water systems which do not provide treatment of the water. Fifteen privately owned water systems serve subdivisions in the area. The water is obtained from deep wells.

A State-owned system supplies Westmoreland State Park with water from drilled wells.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Colonial Beach, Virginia, in the period 1963 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 38 degrees F, and the average daily minimum temperature is 28 degrees. The lowest temperature on record, which occurred at Colonial Beach on January 18, 1977, is 0 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at Colonial Beach on July 3, 1966, is 100 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 40 inches. Of this, 22 inches, or 55 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 6.66 inches at Colonial Beach on June 22, 1972. Thunderstorms occur on about 40 days each year, and most occur in summer.

Average seasonal snowfall is 4 inches. The greatest snow depth at any one time during the period of record was 5 inches.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; and the kinds of native plants or crops. They dug many holes to study 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, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or association, on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The boundary on the general soil map of this survey area does not, in all instances, match the boundary for the adjacent general soil map of King George County, published in 1974. The differences are the result of changes in the system of classifying and naming soils since the publication of the map of King George County.

descriptions of map units

1. Lumbee-Leaf-Lenoir association

Poorly drained and somewhat poorly drained, level to nearly level, loamy soils on the low marine terrace

This association consists of broad flats bordered on the north and east by the Potomac River and its tidal estuaries, and on the south and west by slightly higher, nearly level, better drained soils. Seasonal wetness is common in this association. Slopes range from 0 to 2 percent.

This association makes up about 15 percent of Westmoreland County. The association is about 40 percent Lumbee soils, 25 percent Leaf soils, 10 percent Lenoir soils, and 25 percent soils of minor extent.

The Lumbee soils are poorly drained. They have a surface layer of dark grayish brown loam and a subsoil of mottled, light brownish gray clay loam and loam.

The Leaf soils are also poorly drained. They have a surface layer of dark gray silt loam and a subsoil of mottled, dark gray clay and silty clay.

The Lenoir soils are somewhat poorly drained. They have a surface layer of grayish brown silt loam and a subsoil of mottled, light olive brown silty clay loam and gray clay.

The minor soils consist of Bohicket soils in tidal marshes; poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters; moderately well drained Nansemond soils on broad, low-lying flats and moderately well drained Tetotum soils on broad, low-lying flats and on narrow side slopes along tidal waters or drainageways and ridgetops; well drained State soils on broad areas or narrow ridges between more poorly drained soils; and well drained Rumford soils in short, sloping and steep areas above and at the heads of drainageways.

About a third of the acreage of this unit has been cleared and is mostly used for cultivated crops. The uncleared acreage consists of wet, flat areas and steep areas around drainageways that are generally in mixed softwoods and hardwoods.

Seasonal wetness is the main limitation for farming in this association. The better drained soils and the soils that have been artificially drained are suitable for cultivated crops, mainly corn and soybeans. Increasing organic matter content and using lime and fertilizer to offset acidity and low natural fertility are main management needs.

The soils in this association are well suited to trees. The soils are managed for pines and hardwoods. Productivity is high, but the rate of seedling mortality is moderate to severe. The use of logging equipment is limited by prolonged periods of wetness.

Seasonal wetness is the main limitation of this association for waste disposal facilities and building sites. The soils are poor as roadfill material.

2. Nansemond-Tetotum-State association

Moderately well drained and well drained, level to nearly level, loamy soils on the low marine terrace

This association consists of two main areas, one in the northeastern part of the county and one in the northwestern part. Both areas are bordered by the Potomac River and its tidal estuaries. Most of the acreage has a seasonal high water table. Slopes range from 0 to 6 percent.

This association makes up about 11 percent of Westmoreland County. The association is about 30 percent Nansemond soils, 30 percent Tetotum soils, 25 percent State soils, and 15 percent soils of minor extent.

The Nansemond soils are moderately well drained. They are on broad, low-lying flats. The soils have a surface layer of brown fine sandy loam and a subsoil of light olive brown, mottled fine sandy loam and loamy fine sand.

The Tetotum soils are moderately well drained. They are on broad, low-lying flats, on narrow side slopes along tidal waters or drainageways, and on ridgetops. The soils have a surface layer of grayish brown loam and a subsoil of yellowish brown, mottled sandy clay loam and loam.

The State soils are well drained. They are on broad areas, on elongated areas around the heads of drainageways, and on irregularly shaped, low ridges between more poorly drained soils. The soils have a surface layer of dark brown fine sandy loam and a subsoil of strong brown and brown sandy clay loam and clay loam.

The minor soils consist of very poorly drained Bohicket soils in tidal marshes; poorly drained Leaf and Lumbee soils on broad low-lying flats; poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters; somewhat poorly drained Lenoir soils on broad, level to slightly convex, low-lying flats; well drained Rumford soils on broad low-lying flats; somewhat excessively drained Catpoint soils on broad fluvial terraces near streams; and well drained Rumford soils on short, sloping and steep areas above and at the heads of drainageways.

Slightly less than half of the acreage of this association has been cleared and is mostly used for cultivated crops. The uncleared acreage consists of moderately wet, flat areas and steep areas around drainageways that are generally in mixed softwoods and hardwoods.

The soils in this association are well suited to cultivated crops and to pasture and hay. The major limitation is the seasonal high water table late in winter and early in spring. Increasing the organic matter content and using lime and fertilizer to offset acidity and low natural fertility are main management needs.

The soils are also well suited to trees. The soils are managed mostly for softwoods, and productivity is moderately high to high. The use of logging equipment is limited by seasonal wetness.

The seasonal high water table in the Nansemond and Tetotum soils is the main limitation of the association for nonfarm use, especially for waste disposal facilities and building sites. Most of the soils in the association are poor as roadfill material.

3. Rumford-Kempsville-Emporia association

Well drained, steep to nearly level, loamy and sandy soils on the high marine terrace

This association consists of narrow to broad ridges and dissecting drainageways. The elevation of the unit ranges from about 100 feet to 170 feet above sea level. The association is in the central part of Westmoreland County between the Potomac River on the north and Richmond County on the south. The permeability of the soil ranges mostly from rapid to moderately slow. Slopes range from 0 to 50 percent.

This association makes up about 34 percent of Westmoreland County. The association is about 50 percent Rumford soils, 20 percent Kempsville soils, 10 percent Emporia soils, and 20 percent soils of minor extent.

The Rumford soils are sloping and steep. They are on side slopes above and at the heads of drainageways. The soils have a surface layer of dark brown fine sandy loam and a subsoil of yellowish brown fine sandy loam.

The Kempsville soils are nearly level to gently sloping. They are on narrow ridgetops. The soils have a surface layer of dark brown, mottled loam and a subsoil of strong brown and yellowish red loam and sandy loam.

The Emporia soils are gently sloping. They are on broad to narrow ridgetops. The soils have a surface layer of pale brown loam and a subsoil of yellowish brown to strong brown loam, silt loam, clay loam, or clay.

The minor soils are well drained Suffolk soils on broad to narrow ridgetops and moderately well drained Montross and Savannah soils on broad ridgetops and narrow ridge ends.

About a third of the acreage of this association has been cleared and is used for cultivated crops. Most of the uncleared acreage consists of steep areas around drainageways that are generally in mixed softwoods and hardwoods.

The nearly level soils in the association are well suited to cultivated crops, mainly soybeans, corn, and small grains, and to pasture and hay. The hazard of erosion is a major management concern. Increasing the organic matter of the soils and using lime and fertilizer to offset the acidity and low natural fertility are main management needs.

The soils are suitable for trees. The soils are managed for pines and hardwoods, and productivity is moderate to moderately high. Steep slopes and the hazard of erosion are the major management concerns.

Most of the acreage is poorly suited to use for waste disposal facilities and building sites. Slope and the permeability are the main limitations. The nearly level, well drained Kempsville soils are suitable for some nonfarm uses. Most of the soils are poor as roadfill material.

4. Montross-Ackwater association

Moderately well drained, level to gently sloping, loamy soils on the intermediate fluvial terrace

This association is in the western part of the county. It consists of broad to narrow ridgetops and narrow side slopes. It is bordered on the north by lower, more poorly drained soils, on the east and south by higher, better drained soils, and on the west by King George County. The elevation ranges from about 50 feet to 100 feet above sea level. A seasonal high water table and moderately slow to slow permeability are dominant in these soils. Slopes range from 0 to 6 percent.

This association makes up 6 percent of Westmoreland County. The association is about 55 percent Montross soils, 10 percent Ackwater soils, and 35 percent soils of minor extent.

The Montross soils have surface layer of grayish brown and light yellowish brown silt loam and a subsoil of mostly yellowish brown and red, mottled silt loam, silty clay loam, and clay.

The Ackwater soils have a surface layer of dark yellowish brown and light yellowish brown silt loam and a subsoil of yellowish brown, mottled silty clay loam and silty clay.

The minor soils consist of poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters; and well drained, sloping and steep Rumford soils on short side slopes above and at the heads of drainageways.

About a third of the acreage of this association has been cleared and is used for cultivated crops. Most of the uncleared acreage is in mixed softwoods and hardwoods.

The soils in this association are suited to cultivated crops, mainly soybeans, corn, and small grains, and to pasture and hay. Seasonal wetness is the major management concern. Increasing the organic matter content of the soils and using lime and fertilizer to offset the acidity and low natural fertility are main management needs.

The soils are suited to trees. The soils are managed mostly for pine, and production is moderately high. The use of logging equipment is limited by seasonal wetness.

The soils are poorly suited to use for waste disposal facilities and building sites. The seasonal high water table and moderately slow to slow permeability are the main limitations. Most of the soils are poor as roadfill material.

5. Suffolk-Rumford association

Well drained, nearly level to steep, sandy and loamy soils on the high marine terrace

This association consists of narrow to broad ridges and dissecting drainageways. The elevation ranges from about 100 to 140 feet above sea level. The association is in the southwestern part of Westmoreland County. It is bordered on the south by Richmond County and on the east by Northumberland County. On the north are lower, level, more poorly drained soils, and on the west are soils that are not as well drained as these Suffolk and Rumford soils. Slopes range from 0 to 50 percent.

The association makes up about 23 percent of Westmoreland County. The association is about 45 percent Suffolk soils, 25 percent Rumford soils, and 30 percent soils of minor extent.

The Rumford soils are sloping and steep. They are on side slopes above and at the heads of drainageways. The soils have a surface layer of dark brown loamy sand and a subsoil of yellowish brown fine sandy loam.

The Suffolk soils are nearly level to gently sloping. They are on broad to narrow ridgetops. The soils have a surface layer of brown sandy loam and a subsoil of strong brown sandy loam, sandy clay loam, and loam.

The minor soils consist of moderately well drained Montross and Savannah soils on broad ridgetops; well drained Emporia soils on broad ridgetops; and poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters.

About half of the acreage of this unit has been cleared and is used for cultivated crops. Most of the uncleared acreage consists of steep areas around drainageways that are generally in mixed softwoods and hardwoods.

The nearly level soils in this association are suited to cultivated crops, mainly soybeans, corn, and small grains, and to pasture and hay. The hazard of erosion by wind and water is a major management concern. Increasing the organic matter content of the soils and using lime and fertilizer to offset acidity and low natural fertility are main management needs.

The soils are suited to trees. The soils are managed for pines and hardwoods, and productivity is moderately high. Slope and the hazard of erosion are the major management concerns.

Most of the acreage is well suited to use for waste disposal facilities and building sites. Slope and permeability are the main limitations for the unsuited areas. Most of the soils are poor as roadfill material.

6. Rumford-Kempsville-Turbeville association

Well drained, nearly level to steep, loamy and sandy soils on the high fluviomarine terrace

This association consists of broad to narrow ridgetops and dissecting drainageways. The elevation ranges from about 50 feet to 190 feet above sea level. The association is bordered on the south by lower, nearly level, more poorly drained soils; on the west by the Rappahannock River; and on the north and east by the Montross-Ackwater association and the Rumford-Kempsville-Emporia association. Slopes range from 0 to 50 percent.

This association makes up about 7 percent of Westmoreland County. The association is about 30 percent Rumford soils, 30 percent Kempsville soils, 10 percent Turbeville soils, and 30 percent soils of minor extent.

The Rumford soils are sloping and steep. They are on short side slopes above and at the heads of drainageways. The soils have a surface layer of dark brown loamy sand and a subsoil of yellowish brown fine sandy loam.

The Kempsville soils are nearly level to gently sloping. They are on broad to narrow ridgetops. The soils have a surface layer of brown, mottled loam and a subsoil of strong brown and yellowish red sandy loam.

The Turbeville soils are gently sloping. They are on broad to narrow ridgetops, on the sides of narrow ridges, and around the heads of drainageways. The soils have a surface layer of dark yellowish brown loam and a subsoil of yellowish red and red clay loam.

The minor soils consist of moderately well drained Montross soils on broad ridgetops; well drained Emporia soils on broad, dissected ridgetops; and poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters.

About half of the acreage of this association has been cleared and is used for cultivated crops, pasture and hay, and horticultural crops. Most of the uncleared acreage consists of steep areas around drainageways that are generally in mixed softwoods and hardwoods.

Most of the soils in this unit are well suited to cultivated crops, mainly soybeans, corn, and small grains, and to pasture and hay. The hazard of erosion is a major management concern. Increasing the organic matter content of the soils and using lime and fertilizer to offset acidity and low natural fertility are main management needs.

These soils are suited to trees. The soils are managed for pines and hardwoods, and productivity is moderately high. Slope and the hazard of erosion are the major management concerns.

Most of the acreage is suitable for waste disposal facilities and building sites. Slope and permeability are the main limitations for the unsuited areas. Most of the soils are fair as roadfill material.

7. Tetotum-Bojac-Pamunkey association

Well drained and moderately well drained, level or nearly level, loamy and sandy soils on low fluvial terraces

This association consists of low areas in the southwestern section of Westmoreland County bordering the Rappahannock River. To the north are more poorly drained soils at slightly higher elevations and soils made up of marine sediments at much higher elevations. Most areas of this association have a seasonal high water table. Slopes range from 0 to 6 percent.

This association makes up about 4 percent of Westmoreland County. The association is about 40 percent Tetotum soils, 15 percent Bojac soils, 10 percent Pamunkey soils, and 35 percent soils of minor extent.

The Tetotum soils are moderately well drained. They are on broad terraces along the Rappahannock River. The soils have a surface layer of grayish brown loam and a subsoil of yellowish brown, mottled sandy clay loam.

The Bojac soils are well drained. They are on broad terraces adjacent to the Rappahannock River. The soils have a surface layer of dark brown loamy sand and a subsoil of reddish brown sandy loam.

The Pamunkey soils are well drained. They are on broad terraces along the Rappahannock River. The soils have a surface layer of brown fine sandy loam and a subsoil of reddish brown sandy clay loam and sandy loam.

The minor soils consist of very poorly drained Rappahannock soils in tidal marshes; poorly drained Bibb soils and very poorly drained Levy soils along drainageways and adjacent to or near tidal waters; poorly drained Lumbee soils on broad, low-lying flats; excessively drained Catpoint soils on broad fluvial terraces adjacent to streams; and well drained, sloping and steep Rumford soils on short side slopes above and at the heads of drainageways.

Most of the acreage of this association has been cleared and is used for cultivated crops. The uncleared acreage consists of wet, flat areas and steep areas around drainageways that are generally in mixed softwoods and hardwoods.

The soils in this association are well suited to cultivated crops and to pasture and hay. The seasonal high water table is the main management concern. Increasing the organic matter content of the soils and using lime and fertilizer to offset acidity and low natural fertility are main management needs.

The soils are suitable for trees. The soils are managed for pines and hardwoods, and production is moderately high to high. The use of logging equipment is limited by seasonal wetness.

The seasonal high water table limits all but the Bojac soils for nonfarm use. Most of the soils are fair as roadfill material.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, *Suffolk sandy loam, 0 to 2 percent slopes,* is one of several phases in the *Suffolk* series.

Some map units are made up of two or more major soils. These map units are called undifferentiated groups.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. *Bibb and Levy soils* is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. *Pits, sand and gravel,* is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1A—Ackwater silt loam, 0 to 2 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on broad ridgetops between elevations of 50 and 100 feet. The areas are elongated or irregularly oval and range from 5 to 100 acres.

Typically, the surface and subsurface layers are dark yellowish brown and light yellowish brown silt loam and have a combined thickness of 7 inches. The subsoil extends to a depth of 60 inches or more. The upper 9 inches of the subsoil is light yellowish brown and yellowish brown silt loam and silty clay loam. The middle 30 inches is light yellowish brown and yellowish brown silty clay mottled with light gray. The lower 14 inches are light gray clay mottled with brownish yellow and strong brown.

Included with this soil in mapping are areas, generally less than 3 acres in size, of well drained Emporia soils and moderately well drained Savannah soils at slightly higher positions on the landscape than this Ackwater soil. Also included are moderately well drained Montross soils that are in the same position as this Ackwater soil. Included soils make up as much as 15 percent of the unit.

The permeability of this Ackwater soil is very slow, and the available water capacity is high. Surface runoff is slow. The surface layer is friable and easily tilled, and the subsoil has a high shrink-swell potential. The root zone commonly extends to a depth of 50 inches or more. Reaction is very strongly acid or strongly acid unless the soil is limed. The depth to the seasonal high water table ranges from 1.5 to 3 feet during wet periods.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture.

This soil is suited to cultivated crops and hay. The hazard of erosion is not a major management concern, but increasing organic matter content, using lime and fertilizer, and providing surface drainage are management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff and control erosion in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and liming and fertilizing are the major pasture management practices. If the pasture is overgrazed, runoff and erosion increase. Grazing during periods of seasonal wetness often cuts and compacts the surface layer, which increases erosion.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal water table, high shrink-swell potential, and very slow permeability are the main limitations of the soil for nonfarm use. They especially limit the soil as a site for buildings, sanitary landfills, or septic tank absorption fields and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIw.

1B—Ackwater silt loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on slightly convex ridgetops and side slopes between elevations of 50 and 100 feet. The areas of this soil are elongated, irregularly rectangular, or irregularly oval and range from 5 to 50 acres.

Typically, the surface and subsurface layers are dark yellowish brown and light yellowish brown silt loam and have a combined thickness of 7 inches. The subsoil extends to a depth of 60 inches or more. The upper 9 inches of the subsoil is light yellowish brown and yellowish brown silt loam and silty clay loam. The middle 30 inches is light yellowish brown and yellowish brown silty clay mottled with light gray. The lower 14 inches is light gray clay mottled with brownish yellow and strong brown.

Included with this soil in mapping are small areas, generally less than 3 acres in size, of well drained Emporia soils and moderately well drained Savannah soils at a slightly higher landscape position than this Ackwater soil. Also included are moderately well drained Montross soils at the same position as this Ackwater soil. Included soils make up as much as 15 percent of the unit.

The permeability of this Ackwater soil is very slow, and the available water capacity is high. Surface runoff is slow. The surface layer is friable and easily tilled, and the subsoil has a high shrink-swell potential. The erosion hazard is moderate. The root zone commonly extends to a depth of 50 inches or more. Reaction is very strongly acid or strongly acid unless the soil is limed. The depth to the seasonal high water table ranges from 1.5 to 3 feet during wet periods.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture.

This soil is suited to cultivated crops and hay. The hazard of water erosion is a major management concern. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff and control erosion in cultivated areas. Increasing organic matter content, using lime and fertilizer, and providing surface drainage are major management needs.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Using stocking rates, pasture rotation, deferred grazing, and liming and fertilizing are major pasture management practices. If the pasture is overgrazed, runoff and erosion increase. Grazing during periods of seasonal wetness often cuts and compacts the surface layer, which increases erosion.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal water table, high shrink-swell potential, and very slow permeability are the main limitations of this soil for nonfarm use. They especially limit the soil as a site for buildings, sanitary landfills, or septic tank absorption fields and for most recreational uses. The soil is poor subgrade material for local roads and streets.

The capability subclass is IIe.

2—Bibb and Levy soils. This unit consists of deep, poorly drained and very poorly drained soils along drainageways and adjacent to or near tidal marshes. The areas of the soils are long and winding and range from 5 to 100 acres. The mapped acreage of the unit is about 50 percent Bibb soils, 30 percent Levy soils, and 20 percent other soils. Some areas of the unit consist entirely of Bibb soils. some of Levy soils, and some of both. The soils were mapped together because they have no major differences in use and management. Many areas of this unit are flooded during storms. The areas near tidal marshes are also flooded by exceptionally high tides.

Typically, the surface layer of the Bibb soils is dark grayish brown sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. It is light brownish gray loam and silt loam to a depth of 31 inches and dark grayish brown and very dark grayish brown silt loam and silty clay loam at a depth of more than 31 inches.

Typically, the surface layer of the Levy soils is grayish brown silty clay loam about 3 inches thick. The substratum is mostly grayish brown, gray, dark gray, and very dark gray silty clay and clay to a depth of 60 inches or more.

Included with these soils in mapping are somewhat excessively drained, gently sloping Catpoint soils on benches that are slightly higher on the landscape than these Bibb and Levy soils. Also included are moderately well drained soils along the outer edge of this unit and very poorly drained Bohicket and Rappahannock soils that are adjacent to tidal areas. Included soils make up as much as 30 percent of this unit.

Permeability is moderate in the Bibb soils and slow in the Levy soils. Available water capacity is high in both soils, and the organic matter content in the surface layer is moderate to high. The root zone extends to a depth of 60 inches or more for water-tolerant plants. Reaction ranges from very strongly acid to strongly acid. The seasonal high water table is at a depth of 6 inches to 1.5 feet in the Bibb soils and is at the surface of the Levy soils. The substratum of the Levy soils has a high shrink-swell potential.

Most areas of these soils are in woodland (fig. 1). A few areas of the Bibbs soils are used for pasture.

The hazard of flooding and the seasonal high water table make this unit generally unsuitable for farming, but the Bibb soils are moderately well suited to pasture. Drainage and flood control are the main management needs.

Figure 1.—Hardwoods on an area of Bibb and Levy soils.

The potential for pines and hardwoods on the Bibb soils is very high; the Levy soils are suited only to water-tolerant trees. The use of timber equipment is limited by seasonal wetness and flooding.

Seasonal wetness and flooding are the major limitations of these soils for most types of nonfarm use.

The capability subclass is VIIw.

3—Bohicket silty clay loam. This soil is deep, level, and very poorly drained. It is on low-lying tidal flats along the Potomac River and its larger tributaries. The soil is flooded twice daily by saltwater and is continuously waterlogged. The areas of this soil are elongated, irregularly oval, or irregularly rectangular. They range from 5 to 200 acres.

Typically, the surface layer is dark olive gray silty clay loam about 8 inches thick. The substratum extends to a depth of 60 inches or more. It is very dark grayish brown mucky silty clay to a depth of 30 inches, very dark brown muck between depths of 30 and 44 inches, and dark olive gray mucky clay at a depth of more than 44 inches.

Included with this soil in mapping are small areas that are at a higher landscape position than this Bohicket soil and that support water-tolerant trees. Also included are small areas of very poorly drained Rappahannock soils. Included soils make up as much as 15 percent of this unit.

Most areas of this Bohicket soil are covered by reeds, cattails, arrowleaf, rushes, and other aquatic plants. The daily flooding makes the soil unsuitable for most uses other than wetland wildlife habitat.

The capability subclass is VIIIw.

4—Bojac loamy sand. This soil is deep, nearly level, and well drained. It is on broad flats mainly near or adjacent to the Rappahannock River. The areas of this soil are elongated or irregularly oval. They range from 5 to 100 acres.

Typically, the surface layer is dark brown loamy sand 10 inches thick. The subsoil is 44 inches thick. The upper 24 inches of the subsoil is reddish brown sandy loam, and the lower 20 inches is brown loamy sand. The substratum is brown sand to a depth of 60 inches or more.

Included with the soil in mapping are areas, generally less than 3 acres in size, of well drained Pamunkey soils at low landscape positions and moderately well drained Tetotum soils in depressions. Included soils make up as much as 20 percent of the unit.

The permeability of this Bojac soil is moderately rapid. Available water capacity is low, and runoff is slow. The organic matter content in the surface layer is low. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and subsoil are slightly acid through mildly alkaline and the substratum is medium acid.

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

This soil is well suited to cultivated crops and hay. The hazard of water erosion is slight, but the hazard of wind erosion is severe. Using lime and fertilizer helps to offset low natural fertility. The use of minimum tillage and the use of cover crops and grasses and legumes in the cropping system help to increase organic matter content, improve tilth, and prevent wind erosion.

The soil is well suited to intensively used, year-round pasture and supports a wide variety of grasses and legumes. Pasture production is lower in some years during a prolonged summer drought, but good drainage makes the soil especially suitable during a wet winter.

The soil is suitable for most types of nonfarm use, but a hazard of seepage limits the soil for sewage lagoons and sanitary landfills. The soil is a good subgrade material for local roads and streets.

The capability subclass is IIs.

5B—Catpoint loamy sand, 0 to 6 percent slopes. This soil is deep, nearly level to gently sloping, and somewhat excessively drained. It is on broad, low-lying terraces along the Potomac and Rappahannock Rivers and their larger tributaries. The areas of this soil commonly are elongated or irregularly oval. They range from 5 to 20 acres.

Typically, the surface layer of this soil is dark grayish brown and light olive brown loamy sand about 9 inches thick. The underlying layers extend to a depth of 60 inches or more. They consist of yellowish brown and light yellowish brown sand to a depth of 32 inches and very pale brown gravelly and very gravelly sand at a depth of more than 32 inches.

Included with this soil in mapping are small areas of well drained Bojac and Rumford soils and moderately well drained Nansemond soils. The Bojac and Rumford soils are on ridges, and the Nansemond soils are in shallow depressions. Included soils make up as much as 15 percent of this unit.

The permeability of this Catpoint soil is rapid, and the available water capacity is low. Surface runoff is slow. The surface layer is very friable and easily tilled. The root zone commonly extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It is commonly very strongly acid to medium acid throughout, but the reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are in crops. A few areas are in residential developments, woodland, pasture, or hay.

This soil is moderately well suited to cultivated crops and hay. It is droughty during the growing season. The hazard of water erosion is slight, but the hazard of wind erosion is severe. Using lime and fertilizer helps to offset the acidity and low natural fertility of the soil. Minimum tillage, the use of cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content, maintain tilth, and prevent wind erosion in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main management practices.

The potential for trees on this soil is moderately high, especially for loblolly pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The use of timber equipment is limited because the soil is soft and loose.

A seepage hazard and the sandy texture are the main limitations of the soil for nonfarm use. Seepage limits the soil as a site for sewage lagoons and sanitary landfills. The sandy texture limits shallow excavations and limits use of the soil as daily cover for landfill. The soil is a good subgrade material for local roads and streets.

The capability subclass is IIIs.

6B—Emporia loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on narrow to broad ridgetops at an elevation of more than 100 feet. The areas of this unit are elongated, irregularly rectangular, or irregularly oval. They range from 5 acres to more than 50 acres.

Typically, the surface layer is pale brown loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part of the subsoil is yellowish brown loam and clay loam. The middle part is strong brown clay. The lower part is strong brown, red, and light brownish gray sandy clay.

Included with this soil in mapping are a few small intermingled areas of well drained Kempsville and Suffolk soils and areas with gray mottles at a depth of less than 40 inches. Included soils make up as much as 20 percent of the unit.

The permeability of this Emporia soil is moderate in the upper part of the subsoil and moderately slow or slow in the lower part. The available water capacity is moderate. Surface runoff is medium. The soil has low organic matter content in the surface layer and low natural fertility. The surface layer and subsoil are commonly very strongly acid or strongly acid unless the soil is limed. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 30 to 45 inches, and a seasonal high water table is at a depth of 3.0 to 4.5 feet.

A large acreage of this soil is in woodland. The remaining acreage is farmland.

This soil is well suited to cultivated crops and hay. The hazard of water erosion is moderate. Minimum tillage, contour tillage, the use of cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content, maintain tilth, and reduce erosion in cultivated areas. The use of lime and fertilizer helps to offset the acidity and low natural fertility of the soil.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

The potential for trees on this soil is moderately high. The soil is managed for pine and hardwoods.

The slow or moderately slow permeability in the lower part of the subsoil and the seasonal high water table are the main limitations of the soil for nonfarm use. They limit the use of the soil as a building site or as a site for sanitary landfills and septic tank absorption fields. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIe.

7A—Kempsville loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is on broad ridgetops at an elevation of more than 100 feet. The areas of this soil are commonly elongated, irregularly oval, or irregularly rectangular. They range from 10 to 100 acres or more.

Typically, the surface layer of this soil is dark brown loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It is friable, strong brown loam to a depth of 23 inches. Between depths of 23 and 32 inches, it is firm, strong brown loam with many light yellowish brown mottles. At a depth of more than 32 inches, it is very firm, yellowish red sandy loam.

Included with this soil in mapping are areas, generally less than 2 acres in size, of well drained Emporia soils and moderately well drained Savannah soils that are mainly at the outer edge of the unit. Also included are small areas of well drained Suffolk soils on ridgetops. Included soils make up as much as 25 percent of this unit.

The permeability of this Kempsville soil is moderate, and the available water capacity is moderate. Surface runoff is slow. The surface layer is friable and easily tilled. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It is mainly very strongly acid or strongly acid throughout, but the reaction of the surface layer varies because of local liming practices.

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

This soil is very well suited to cultivated crops and hay. The use of lime and fertilizer helps to offset the acidity and low natural fertility of the soil. Minimum tillage, the use of cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil helps to increase organic matter and maintain tilth in cultivated areas.

The soil is very well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is moderately high, especially for loblolly pine. Seeds and seedlings survive and grow well if competing vegetation is controlled.

This soil is suitable for many types of nonfarm use, but the permeability limits the soil for septic tank absorption fields. The soil is a fair subgrade material for local roads and streets.

The capability class is I.

7B—Kempsville loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on broad to narrow ridgetops at an elevation of more than 100 feet. The areas of this soil are commonly irregularly shaped. They range from 5 to about 70 acres.

Typically, the surface layer of this soil is dark brown loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It is friable, strong brown loam to a depth of 23 inches. Between depths of 23 and 32 inches, it is firm, strong brown loam with many light yellowish brown mottles. At a depth of more than 32 inches, it is firm, yellowish red sandy loam.

Included with this soil in mapping are areas, generally less than 2 acres in size, of well drained Emporia soils and moderately well drained Savannah soils generally at the outer edge of the unit or on ridgetops. Included soils make up about 30 percent of this unit.

The permeability of this Kempsville soil is moderate, and the available water capacity is moderate. Surface runoff is slow to medium. The surface layer is friable and easily tilled. The erosion hazard is moderate. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It is mainly very strongly acid or strongly acid throughout, but the reaction of the surface layer varies because of local liming practices.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture.

This soil is very well suited to cultivated crops and hay. The moderate hazard of water erosion is a major management concern. The main management concerns are increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil. Minimum tillage, use of cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to control runoff and erosion, increase organic matter content, and maintain tilth in cultivated areas.

This soil is very well suited to pasture (fig. 2). Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is moderately high, especially for loblolly pine. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The soil is suitable for many types of nonfarm use. The permeability limits the soil for septic tank absorption fields. The soil is fair subgrade material for local roads and trees.

The capability subclass is IIe.

8—Leaf silt loam. This soil is deep, nearly level, and poorly drained. It is on broad, low-lying flats at an elevation of less than 50 feet. The areas of this soil are irregularly rectangular, irregularly oval, or elongated. They range from 25 to about 500 acres.

Typically, the surface layer of this soil is dark gray silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. To a depth of 47 inches, it is mostly dark gray, firm clay and silty clay that is commonly mottled. At a depth of more than 47 inches, it is very firm, light gray clay mottled with brownish yellow.

Included with this soil in mapping are intermingled areas, generally less than 3 acres in size, of moderately well drained Tetotum soils, somewhat poorly drained Lenoir soils, and poorly drained Lumbee soils. Included soils make up as much as 15 percent of this unit.

The permeability of this Leaf soil is very slow, and the available water capacity is moderate. Runoff is slow to very slow. This soil is wet during the winter and spring and has a seasonal high water table at a depth of 6 inches to 1.5 feet. The soil is low in natural fertility and has a moderate organic matter content in the surface layer. The subsoil has a high shrink-swell potential. The root zone extends to a depth of about 60 inches, but the water table restricts root growth to a depth of about 20 inches in spring. The surface layer and subsoil are commonly very strongly acid to strongly acid unless lime has been applied. Some areas of this soil frequently have water ponded on the surface in winter.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture and hay.

This soil is poorly suited to cultivated crops and moderately well suited to hay. The main management concerns are the need for artificial drainage and the need for lime and fertilizer to offset the acidity and low natural fertility of the soil.

The soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, the prevention of overgrazing, and providing surface and subsurface drainage are the major pasture management concerns. Use of proper stocking rates, pasture rotation, and deferred grazing are the main pasture management practices. Grazing during periods of seasonal wetness cuts and compacts the surface layer.

The potential for trees on this soil is high. The soil is managed for pines and hardwoods, and the rate of seedling mortality is severe for both. The use of timber equipment is limited by prolonged periods of wetness.

Figure 2.—An area of pasture on Kempsville loam, 2 to 6 percent slopes.

The seasonal high water table and the very slow permeability are the main limitations of the soil for nonfarm use. Both limit the use of the soil as a building site, as a site for sanitary landfills or septic tank absorption fields, and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is VIw.

9—Lenoir silt loam. This soil is deep, somewhat poorly drained, and nearly level. It is on broad flats at an elevation of less than 50 feet. The areas of this soil are irregular in shape. They range from 15 to about 200 acres.

Typically, the surface layer is grayish brown silt loam 5 inches thick. The subsoil extends to a depth of 60 inches or more. It is light olive brown silty clay loam to a depth of 12 inches and gray and light gray clay at a depth of more than 12 inches.

Included with this soil in mapping are areas, generally less than 3 acres in size, of poorly drained Leaf soils and moderately well drained Tetotum soils. The Leaf soils are generally in a lower landscape position than the Lenoir soils, and the Tetotum soils are at a higher landscape position. Also included are small areas of soils that range from sandy clay loam to loamy sand and have various amounts of gravel. Included soils make up as much as 20 percent of this unit.

The permeability of this Lenoir soil is slow, and the available water capacity is moderate. Runoff is slow. The soil is low in natural fertility and organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of about 60 inches. The surface layer and subsoil are commonly very strongly acid to strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1 to 2.5 feet during winter and early in spring.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture and hay.

This soil is moderately well suited to cultivated crops and hay. The main management needs are artificial drainage, an increase in organic matter content, and lime and fertilizer to offset the acidity and low natural fertility of the soil. Minimum tillage, the use of cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content and maintain tilth in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer and artificial drainage are the main pasture management practices. Grazing during periods of seasonal wetness often cuts and compacts the surface layer.

The potential for trees on this soil is high. The soil is managed mostly for pine, and the rate of seedling mortality is moderate. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal high water table and slow permeability are the main limitations of the soil for nonfarm use. Both limit the use of the soil as a building site, as a site for sanitary landfills or septic tank absorption fields, and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIIw.

10—Lumbee loam. This soil is deep, nearly level, and poorly drained. It is on very broad flats at an elevation of less than 50 feet. The areas of this soil are elongated, irregularly oval, or irregularly rectangular. They range from 20 to 150 acres.

Typically, the surface layer of this soil is dark grayish brown loam about 7 inches thick. The subsoil is about 20 inches thick. It is light brownish gray loam and clay loam mottled with light olive brown and strong brown. The substratum extends to a depth of 60 inches or more. It is gray fine sand, loamy fine sand, and sandy clay.

Included with this soil in mapping are areas, generally less than 4 acres in size, of poorly drained Leaf and Bibb soils with a gravelly or clayey substratum. Included soils Nansemond soils. Also included are a few small areas of soils with a gravelly or clayey sustratum. Included soils make up as much as 15 percent of this unit.

The permeability of this Lumbee soil is moderate, and the available water capacity is low. Surface runoff is slow to very slow. The surface layer is very friable and easily tilled. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It is very strongly acid or strongly acid throughout unless lime has been applied. During winter and spring, water is frequently ponded on the surface of the soil for brief periods and a seasonal high water table is between the surface and a depth of 1.5 feet.

Most areas of this soil are in woodland. A few areas have been drained and are used for pasture or hay.

Undrained areas of this soil are poorly suited to cultivated crops. The use of lime and fertilizer helps to offset the acidity and low natural fertility of the soil. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter and maintain tilth in cultivated areas.

The soil is moderately well suited to pasture and hay. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, the use of lime and fertilizer, and artificial drainage are the main pasture management practices. Grazing during periods of seasonal wetness cuts and compacts the surface layer.

The potential for trees on this soil is high. The soil is managed for pines and hardwoods, but wetness causes a high rate of seedling mortality. When wet, the soil is soft and will not support heavy timber equipment.

The seasonal high water table and occasional ponding are the main limitations of the soil for nonfarm use. They especially limit the use of the soil as a building site, as a site for sanitary landfills or septic tank absorption fields, and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIIw.

11A—Montross silt loam, 0 to 2 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on very broad ridgetops between elevations of 50 and 100 feet and on ridgetops and small flats above an elevation of 100 feet. The areas at an elevation of less than 100 feet range from 100 to 1,000 acres, but most are between 100 and 500 acres. Those above 100 feet range from 5 to 20 acres.

Typically, the surface and subsurface layers are grayish brown and light yellowish brown silt loam with a combined thickness of 11 inches. The subsoil extends to a depth of 60 inches or more. It is yellowish brown, friable silt loam to a depth of 21 inches; yellowish brown, mottled, very firm silty clay loam between depths of 21 and 48 inches; and multicolored, mottled clay and clay loam at a depth of more than 60 inches.

Included with this soil in mapping are areas, generally less than 2 acres in size, of moderately well drained Ackwater soils that make up as much as 10 percent of this unit.

The permeability of this Montross soil is moderately slow or slow. Available water capacity is high, and runoff is slow. The organic matter content in the surface layer is low. The subsoil is commonly very firm and has a moderate shrink-swell potential. The root zone extends to the very firm part of the subsoil at a depth of 20 to 40 inches. The surface layer and subsoil are extremely acid to strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1 to 2.5 feet from December to April.

Most areas of this soil are in woodland. A few areas are farmed and used for pasture.

This soil is suited to cultivated crops and hay. Increasing the organic matter content, using lime and fertilizer to offset the acidity and low natural fertility, and providing drainage are some of the main management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content and maintain tilth in cultivated areas.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Grazing during periods of seasonal wetness often cuts and compacts the surface layer.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal high water table and slow to moderately slow permeability are the main limitations of the soil for nonfarm use. Both limit the use of the soil as a building site, as a site for sanitary landfills or septic tank absorption fields, and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIw.

11B—Montross silt loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on narrow ridgetops and side slopes. The areas of this soil are elongated and range from 5 to about 20 acres.

Typically, the surface and subsurface layers are grayish brown and light yellowish brown silt loam with a combined thickness of 11 inches. The subsoil extends to a depth of 60 inches or more. It is yellowish brown, friable silt loam to a depth of 21 inches; yellowish brown, mottled, very firm silty clay loam between depths of 21 and 48 inches; and multicolored, mottled clay and clay loam at a depth of more than 60 inches.

Included with this soil in mapping are small areas, generally less than 2 acres in size, of moderately well drained Ackwater soils that make up as much as 15 percent of this unit.

The permeability of this Montross soil is moderately slow or slow. Available water capacity is high, and runoff is medium. The organic matter content in the surface layer is low. The subsoil is commonly very firm and has a moderate shrink-swell potential. The root zone extends to the very firm part of the subsoil at a depth of 20 to 40 inches. The surface layer and subsoil are extremely acid to strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1 to 2.5 feet from December to April.

This soil is suited to cultivated crops and hay. The hazard of water erosion is moderate and is a major management concern. Increasing organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil and providing drainage are some of the major management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff and control erosion in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are major management practices. If the pasture is overgrazed, runoff and erosion increase. Grazing during periods of seasonal wetness often cuts and compacts the surface layer.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal high water table and slow to moderately slow permeability are the main limitations of the soil for nonfarm use. Both limit the use of the soil as a building site, as a site for sanitary landfills or septic tank absorption fields, and for most recreational uses. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIe.

12—Nansemond fine sandy loam. This soil is deep, nearly level, and moderately well drained. It is on broad flats at an elevation of less than 50 feet. The areas of this soil are irregular in shape. They range from 5 to about 60 acres.

Typically, the surface layer is brown fine sandy loam 11 inches thick. The subsoil is 25 inches thick. The upper 21 inches of the subsoil is olive brown fine sandy loam; the lower 4 inches is light olive brown loamy fine sandy. The substratum is mottled, light yellowish brown and light gray loamy fine sand to a depth of 60 inches or more.

Included with this soil in mapping are areas, generally less than 2 acres in size, of moderately well drained Tetotum soils and well drained State and Rumford soils. Also included are a few areas of soils with a clayey substratum and areas with a dark surface layer. Included soils make up as much as 20 percent of this unit.

The permeability of this Nansemond soil is moderately rapid. Available water capacity is moderate, and runoff is slow. The organic matter content in the surface layer is low. The root zone extends to a depth of 60 inches or more. The surface layer and subsoil are very strongly acid or strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1.5 to 2.5 feet during winter and early in spring.

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

This soil is well suited to cultivated crops and hay. The seasonal high water table is the major management concern. Wind erosion is a moderate hazard. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low to moderate natural fertility of the soil are major management needs. The use of a winter cover crop and keeping all crop residue on the soil help to control wind erosion.

The potential for trees on this soil is high, and the soil is managed mostly for pine. The use of timber equipment is limited by seasonal wetness.

The seasonal high water table is the main limitation of the soil for nonfarm use. It especially limits this soil as a site for septic tank absorption fields, shallow excavations, and dwellings with basements. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIw.

13—Pamunkey fine sandy loam, wet substratum. This soil is deep, nearly level, and well drained. It is on broad, low terraces along the Rappahannock River. The areas are elongated and range from 5 to 100 acres.

Typically, the surface layer is brown fine sandy loam about 11 inches thick. The subsoil is mostly reddish brown, friable sandy clay loam and fine sandy loam 39 inches thick. The substratum is reddish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of moderately well drained Tetotum soils and well drained Bojac soils. The Tetotum soils are in depressions, and the Bojac soils are on ridges. Included soils make up 10 percent of this unit.

The permeability of this Pamunkey soil is moderate. Available water capacity is moderate, and runoff is slow. The soil has medium natural fertility and low organic matter content in the surface layer. The root zone extends to a depth of 60 inches or more. The surface layer and subsoil are commonly neutral to medium acid. A seasonal high water table is at a depth of 3 to 4 feet late in winter and early in spring.

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

This soil is very well suited to cultivated crops and hay. The hazard of water erosion is slight, but the hazard of wind erosion is moderate. Increasing the organic matter content and using lime and fertilizer are major management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content, control wind erosion, and maintain tilth in cultivated areas.

The soil is very well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are major pasture management practices.

The potential for trees on this soil is high. The soil is managed for pines and hardwoods.

The seasonal water table and a seepage hazard are the main limitations of the soil for nonfarm use, especially as a site for septic tank absorption fields, sewage lagoons, and trench sanitary landfills. The soil is a fair subgrade material for local roads and streets.

The capability class is I.

14—Pits, sand and gravel. This unit consists of areas from which gravel and sand have been removed for construction purposes. The excavations are mostly 5 to 15 feet deep and have steep sides and a nearly level floor. They are commonly irregular in shape and range from 2 to about 40 acres. Some have been partially filled and used as a dump. Some areas of the unit have small pools of water.

Very low available water capacity makes this unit droughty. Runoff is generally slow. Permeability varies, but it is mainly moderately rapid to very rapid.

A few areas of this unit have been reclaimed and used for recreation or pine trees. Most are abandoned and have a sparse vegetation of woody bushes, grasses, and other annuals.

The very low available water capacity makes this unit generally unsuitable for farming or woodland. A hazard of ground-water pollution limits the unit for waste disposal. Onsite investigation is needed to determine the potential of the unit for most uses and to determine the feasibility of reclamation.

Capability subclass not assigned.

15—Rappahannock muck. This soil is deep, level, and very poorly drained. It is in low-lying tidal flats along the Rappahannock River and its larger tributaries. The soil is covered twice daily by brackish water and is continuously waterlogged. The areas of this soil are elongated, irregularly oval, or irregularly rectangular. They range from 5 to about 200 acres.

Typically, the surface layer of this soil is black muck about 16 inches thick. The substratum is dark gray silty clay loam to a depth of 32 inches. Below this is very dark gray organic material to a depth of 60 inches or more.

Included with the soil in mapping are small areas of Pamunkey soils that are higher on the landscape than the surrounding Rappahannock soils and that support water-tolerant trees. Also included are small areas of very poorly drained Bohicket soils. Included soils make up as much as 15 percent of this unit.

This soil is well suited to wetland wildlife habitat and wetland plants. Most areas are covered by big cordgrass, reeds, cattails, arrowleaf, rushes, and other aquatic plants. The soil is generally unsuitable for most other uses.

The capability subclass is VIIIw.

16B—Rumford fine sandy loam, 0 to 6 percent slopes. This soil is deep, nearly level to gently sloping, and well drained. It is on broad flats at an elevation of less than 50 feet. The areas of this soil are elongated or irregularly oval and range from 5 to about 50 acres.

Typically, the surface layer is dark brown fine sandy loam 8 inches thick. The subsurface layer is mixed dark brown and light yellowish brown fine sandy loam 8 inches thick. The subsoil is yellowish brown fine sandy loam 15 inches thick. The substratum extends to a depth of 60 inches or more. It is very pale brown fine sand to a depth of 36 inches. At a depth of more than 36 inches, it is yellowish brown and light gray fine sandy loam that is mottled in the lower part.

Included with this soil in mapping are areas, generally less than 2 acres in size, of well drained State soils and moderately well drained Nansemond and Tetotum soils. Included soils make up as much as 20 percent of this unit.

The permeability of this Rumford soil is moderately rapid. Available water capacity is low, and runoff is slow or medium. The organic matter content in the surface layer is low. The root zone extends to a depth of 60 inches or more. The surface and subsurface layers and the subsoil are very strongly acid to medium acid unless lime has been applied.

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

This soil is well suited to cultivated crops and hay. The hazard of erosion is moderate. The use of lime and fertilizer helps to offset the low natural fertility and acidity of the soil. Minimum tillage and the use of cover crops and grasses and legumes in the cropping system help to increase organic matter content, improve tilth, and control erosion.

The soil is also well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase. Pasture production is lower in some years during a prolonged summer drought, but good drainage makes the soil especially suitable during a wet winter.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine.

The soil is suitable for many nonfarm uses, but the permeability causes a seepage hazard and limits the use of this soil for sewage lagoons and sanitary landfills. The permeability also causes a hazard of ground-water pollution in septic tank absorption fields. The soil is a good subgrade material for local roads and streets.

The capability subclass is IIe.

17E—Rumford soils, 15 to 50 percent slopes. This unit consists of deep, moderately steep to steep, well drained soils on side slopes of drainageways and on scarps between terraces. The areas of these soils are elongated and range from 10 to about 500 acres.

Typically, the surface layer is dark brown loamy sand 8 inches thick. The subsurface layer is light yellowish brown loamy sand 8 inches thick. The subsoil is yellowish brown fine sandy loam 15 inches thick. The substratum extends to a depth of 60 inches or more. It is very pale brown fine sand to a depth of 36 inches. At a depth of more than 36 inches, it is yellowish brown and light gray fine sandy loam that is mottled in the lower part.

Included with this soil in mapping are many areas, generally less than 5 acres in size, of well drained Kempsville and Emporia soils and moderately well drained Ackwater soils. Also included are small areas of Bibb soils along drainageways. Included areas make up about 25 percent of the unit.

The permeability of these Rumford soils is moderately rapid. Available water capacity is low, and runoff is very rapid. The organic matter content in the surface layer is low. The root zone extends to depth of 60 inches or more. The surface layer and subsoil are commonly very strongly acid to medium acid unless lime has been applied. Seeps and springs are common at the lower edge of slopes of this soil.

Most areas of this soil are in woodland. A few are farmed and are in pasture or hay.

Drought during the growing season and a very severe hazard of water erosion make these soils generally unsuitable for cultivated crops and poorly suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Overgrazing increases runoff and erosion.

The potential for trees on these soils is moderately high. The soils are managed mostly for pine. The use of timber equipment is limited by slope, and its use increases the erosion hazard.

Slope limits these soils for most types of nonfarm use, especially as a site for septic tank absorption fields and buildings and for many recreational uses. Slope makes the soil a poor subgrade material for local roads and streets.

The capability subclass is VIIe.

18D—Rumford and Tetotum soils, 6 to 15 percent slopes. This unit consists of deep, sloping and strongly sloping soils on side slopes of drainageways. The areas of these soils are elongated or irregularly rectangular and range from 5 to about 20 acres. The total acreage of the unit is about 45 percent well drained Rumford soils, 30 percent moderately well drained Tetotum soils, and 25 percent other soils. Some areas of the unit consist entirely of Rumford soils, some of Tetotum soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Rumford soils is dark brown sandy loam 8 inches thick. The subsurface layer is mixed dark brown and light yellowish brown fine sandy loam 8 inches thick. The subsoil is yellowish brown fine sandy loam 15 inches thick. The substratum extends to a depth of 60 inches or more. It is very pale brown fine sand to a depth of 36 inches. At a depth of more than 36 inches, it is yellowish brown and light gray fine sandy loam that is mottled in the lower part.

Typically, the surface layer of the Tetotum soils is grayish brown loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It is mostly yellowish brown loam and mottled sandy clay loam to a depth of 26 inches; multicolored, mottled sandy clay loam and sandy loam between depths of 26 and 46 inches; and light brownish gray sandy clay loam and sandy loam at a depth of more than 46 inches.

Included with these soils in mapping are many areas, generally less than 5 acres in size, of well drained Kempsville and Emporia soils and moderately well drained Ackwater soils.

Permeability is moderately rapid in the Rumford soils and moderate in the Tetotum soils. Available water capacity is low to moderate, and runoff is rapid. The surface layer of both soils has a low organic matter content. The root zone extends to a depth of about 60 inches or more. In unlimed areas the Rumford soils are commonly very strongly acid to medium acid and the Tetotum soils are very strongly acid or strongly acid. Seeps and springs are common at the lower edge of slopes of these soils.

Most areas of these soils are in woodland. A few areas are farmed (fig. 3) and used for pasture and hay.

These soils are poorly suited to cultivated crops but are moderately well suited to hay. Some areas are droughty during the growing season, and the hazard of water erosion is severe. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soils are major management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and contour cropping and stripcropping help to reduce runoff and erosion in cultivated areas.

Figure 3.—Soybeans planted after barley on Rumford and Tetotum soils, 6 to 15 percent slopes.

The soils are moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

The potential for trees on these soils is moderately high. The soils are managed mostly for pine.

Slope and the permeability of the soils are the main limitations for nonfarm use. They especially limit use of the soil as a site for septic tank absorption fields, as a building site, and for many recreational uses. The soils are a good to fair subgrade material for local roads and streets.

The capability subclass is IVe.

19A—Savannah loam, 0 to 2 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on broad ridgetops generally at an elevation of more than 100 feet. The areas of this soil are elongated or irregularly shaped and range from 5 to 25 acres.

Typically, the surface layer of this soil is light gray and yellowish brown loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 12 inches of the subsoil is yellowish brown, firm loam. Between depths of 19 and 56 inches, the subsoil is pale brown and strong brown, brittle and compact sandy loam and sandy clay loam. At a depth of more than 56 inches, it is strong brown, mottled clay loam.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of well drained Kempsville and Suffolk soils that are generally at the same landscape position as this Savannah soil. Included soils make up as much as 15 percent of this unit.

The permeability of this Savannah soil is moderately slow in the brittle part of the subsoil. Available water capacity is low to moderate, and runoff is slow. The soil is low in natural fertility and organic matter content. Root growth is severely restricted by the brittle part of the subsoil at a depth of 19 to 35 inches. The surface layer and subsoil are commonly extremely acid to strongly acid unless lime has been applied. A seasonal perched water table is at a depth of 1.5 to 3 feet during winter and early spring.

Most areas of this soil are in cropland. Some areas are in woodland or pasture.

This soil is moderately well suited to cultivated crops and hay. The soil is droughty during the dry season. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil are the main management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content and maintain tilth in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are major management practices. Grazing during periods of seasonal wetness often cuts and compacts the surface layer.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal high water table and moderately slow permeability are the main limitations of this soil for nonfarm use. Both limit the use of the soil as a building site or as a site for septic tank absorption fields. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIw.

19B—Savannah loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on narrow to broad ridgetops generally at an elevation of more than 100 feet. The areas of this soil are elongated and range from 5 to 10 acres.

Typically, the surface layer of this soil is light gray and yellowish brown loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 12 inches of the subsoil is yellowish brown, firm loam. Between depths of 19 and 56 inches, the subsoil is pale brown and strong brown, brittle and compact sandy loam and sandy clay loam. At a depth of more than 56 inches, it is strong brown, mottled clay loam.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of well drained Kempsville and Suffolk soils that are generally at the same landscape position as this Savannah soil. Included soils make up as much as 15 percent of this unit.

The permeability of this Savannah soil is moderately slow in the brittle part of the subsoil. Available water capacity is low to moderate, and runoff is medium. The soil is low in natural fertility and organic matter content. Root growth is severely restricted by the brittle part of the subsoil at a depth of 19 to 35 inches. The surface layer and subsoil are commonly extremely acid to strongly acid unless lime has been applied. A seasonal perched water table is at a depth of 1.5 to 3 feet during winter and early in spring.

Most areas of this soil are in cropland. Some areas are in woodland or pasture.

This soil is moderately well suited to cultivated crops and hay. The soil is droughty during the dry season. The hazard of water erosion is moderate and is a major management concern. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil are major management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to increase organic matter content and maintain tilth in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase. Grazing during periods of seasonal wetness often cuts and compacts the surface layer, which increases erosion.

The potential for trees on this soil is moderately high. The soil is managed mostly for pine. The use of timber equipment on this soil is limited by seasonal wetness.

The seasonal high water table and moderately slow permeability are the main limitations of the soil for nonfarm use. Both limit the use of the soil as a building site or as a site for septic tank absorption fields. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIe.

20A—State fine sandy loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is at an elevation of less than 50 feet in irregularly shaped areas that range from 5 to 50 acres.

Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The subsoil is 42 inches thick. The upper part of the subsoil is brown loam, the middle part is strong brown sandy clay loam and clay loam, and the lower part is strong brown sandy loam. The substratum is brownish yellow coarse sand to a depth of 60 inches or more.

Included with this soil in mapping are areas, generally less than 3 acres in size, of moderately well drained Tetotum soils in depressions and well drained Rumford soils on low, narrow ridges. Also included are a few small areas of soils with a dark surface layer. Included soils make up about 10 percent of this unit.

The permeability of this State soil is moderate. Available water capacity is moderate, and surface runoff is slow. The soil has a low to moderate organic matter content in the surface layer. Natural fertility is low. The surface layer and subsoil are very strongly acid or strongly acid unless lime has been applied. The root zone extends to a depth of about 60 inches. A seasonal high water table is mainly at a depth of 4 to 6 feet during the wet period of the year.

Most areas of this soil are farmed and used for cultivated crops (fig. 4). A few areas are in woodland.

This soil is very well suited to cultivated crops and hay. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility are the main management needs. Minimum tillage and the use of a cover crop help to control a moderate hazard of wind erosion.

The soil is very well suited to pasture. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is very high. The soil is managed mostly for loblolly pine.

This soil is generally suitable for nonfarm use, but the seasonal high water table is a limitation for dwellings with basements and for septic tank absorption fields. The soil is a good subgrade material for local roads and streets.

The capability class is I.

20B—State fine sandy loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained and is at an elevation of less than 50 feet. The soil is around the heads of draingageways in narrow areas that range up to 10 acres, and it is on irregularly shaped low ridges that range from 5 to 20 acres and that are between areas of more poorly drained soils.

Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The subsoil is 42 inches thick. The upper part of the subsoil is brown loam, the middle part is strong brown sandy clay loam and clay loam, and the lower part is strong brown sandy loam. The substratum is brownish yellow coarse sand to a depth of 60 inches or more.

Included with this soil in mapping are areas, generally less than 3 acres in size, of moderately well drained Tetotum soils in depressions and well drained Rumford soils on ridges. Also included are a few small areas of soils with a dark surface layer. Included soils make up about 10 percent of this unit.

The permeability of this State soil is moderate. Available water capacity is moderate, and surface runoff is medium. The soil has a low to moderate organic matter content in the surface layer. Natural fertility is low. The surface layer and subsoil are commonly very strongly acid or strongly acid unless lime has been applied. The root zone extends to a depth of about 60 inches. A seasonal high water table is mainly at a depth of 4 to 6 feet during the wet period of the year.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is very well suited to cultivated crops and hay. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility are main management needs. Minimum tillage and the use of cover crops and grasses and legumes in the cropping system help to control a moderate hazard of erosion.

The soil is very well suited to pasture. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the major pasture management practices.

The potential for trees on this soil is very high, and the soil is managed mostly for loblolly pine.

The soil is suitable for many types of nonfarm use, but the seasonal high water table limits the soil as a site for septic tank absorption fields and dwellings with basements. The soil is a good subgrade material for local roads and streets.

The capability subclass is IIe.

Figure 4.—Soybeans on State fine sandy loam, 0 to 2 percent slopes.

21A—Suffolk sandy loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is on broad ridgetops at an elevation of more than 100 feet. The areas of this soil are irregularly shaped and range from 10 to about 60 acres.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is mostly strong brown sandy loam and loamy sand 40 inches thick. Beneath the subsoil is a compact layer of pale brown loamy sand 7 inches thick. The bottom layer is mostly red sandy clay loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are a few areas, generally less than 2 acres in size, of well drained Rumford soils on high parts of the landscape, well drained Kempsville soils on ridges, and soils that are coarse textured in the lower part of the subsoil. These included soils make up about 10 to 20 percent of this unit. Also included, to a lesser extent, are small areas of moderately well drained Savannah soils and well drained Emporia soils at the tops of slopes. The Savannah and Emporia soils make up less than 5 percent of the unit.

The permeability of this Suffolk soil is moderate. Available water capacity is low to moderate, and runoff is slow. The soil is low in natural fertility and organic matter content. The root zone extends to a depth of about 60 inches or more. The surface layer and subsoil are commonly strongly acid unless lime has been applied.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is well suited to cultivated crops and hay. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility are main management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to decrease a moderate wind erosion hazard, increase organic matter content, and maintain tilth.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is moderately high to high. The soil is managed mostly for pine.

The soil is generally suitable for nonfarm use, including septic tank absorption fields and as a site for dwellings and local roads and streets. It is a good subgrade material for local roads and streets.

The capability class is I.

21B—Suffolk sandy loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on broad to narrow ridgetops at an elevation of more than 100 feet. The areas of this soil are irregularly shaped, and range from 5 to about 100 acres.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is mostly strong brown sandy loam and loamy sand 40 inches thick. Beneath the subsoil is a compact layer of pale brown loamy sand 7 inches thick. The bottom layer is most red sandy clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas, generally less than 2 acres in size, of well drained Rumford soils on high parts of the landscape, well drained Kempsville soils on ridges, and soils that are coarse textured in the lower part of the subsoil. These included soils make up about 10 to 20 percent of the unit. Also included, to a lesser extent, are small areas of moderately well drained Savannah soils and well drained Emporia soils. These Savannah and Emporia soils are on narrow ridges, at the top edge of slopes, and at the ends of ridges. They make up less than 5 percent of the unit.

The permeability of this Suffolk soil is moderate. Available water capacity is low to moderate, and runoff is medium. The soil is low in natural fertility and organic matter content. The root zone extends to a depth of about 60 inches or more. The surface layer and subsoil are commonly strongly acid unless lime has been applied.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is well suited to cultivated crops and hay (fig. 5). Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil are major management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff, decrease wind erosion, and control a moderate hazard of water erosion.

Figure 5.—Soybeans on Suffolk sandy loam, 2 to 6 percent slopes.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

The potential for trees on this soil is moderately high to high. The soil is managed mostly for pine.

The soil is suitable for most nonfarm uses, including septic tank absorption fields and as a site for dwellings and local roads and streets. The soil is good as a subgrade material for local roads and streets.

The capability subclass is IIe.

22A—Tetotum loam, 0 to 2 percent slopes. This soil is deep, nearly level, and moderately well drained. It is in broad areas along the Potomac and Rappahannock Rivers at an elevation of less than 50 feet. The areas are irregularly oval and range from 5 to 50 acres.

Typically, the surface layer is grayish brown loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 8 inches of the subsoil is yellowish brown loam. Between depths of 16 and 26 inches, the subsoil is mottled, light olive brown and yellowish brown sandy clay loam. At a depth of more than 26 inches, it is multicolored sandy clay loam and sandy loam.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of moderately well drained Nansemond soils, well drained Rumford and State soils, and poorly drained Lumbee soils. Also included are a few small areas of soils with a dark surface layer. Included soils make up as much as 20 percent of this unit.

The permeability of this Tetotum soil is moderate. Available water capacity is moderate, and runoff is slow. The organic matter content in the surface layer is moderate. The root zone extends to a depth of at least 50 inches. The surface layer and subsoil are strongly acid or very strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1.5 to 2.5 feet late in winter and early in spring.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is well suited to cultivated crops and hay. The seasonal high water table is a main management concern. Increasing the organic matter content and using lime and fertilizer to offset acidity and low natural fertility are major management needs.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Grazing during periods of seasonal wetness often cuts and compacts the surface layer.

The potential for trees on this soil is moderately high, and the soil is managed for hardwoods and pines. Seasonal wetness limits the use of equipment.

The seasonal high water table is the main limitation for nonfarm use. It especially limits the use of this soil as a site for septic tank absorption fields and sanitary landfills. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIw.

22B—Tetotum loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and moderately well drained. It mainly is on narrow side slopes and ridgetops. Some areas are around the heads of drainageways. The areas of this soil are long and winding and range from 2 to 25 acres.

Typically, the surface layer is grayish brown loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 8 inches of the subsoil is yellowish brown loam. Between depths of 16 and 26 inches, the subsoil is mottled, light olive brown and yellowish brown sandy clay loam. At a depth of more than 26 inches, it is multicolored sandy clay loam and sandy loam.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of moderately well drained Nansemond soils and well drained Rumford and State soils. Included soils make up about 15 to 20 percent of this unit.

The permeability of this Tetotum soil is moderate. Available water capacity is moderate, and runoff is medium. The organic matter content is moderate in the surface layer. The root zone extends to a depth of at least 50 inches. The surface layer and subsoil are strongly acid or very strongly acid unless lime has been applied. A seasonal high water table is at a depth of 1.5 to 2.5 feet late in winter and early in spring.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is well suited to cultivated crops and hay. The hazard of water erosion is moderate and is a major managment concern. Increasing organic matter content and using lime and fertilizer to offset acidity and low natural fertility are main management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff and control erosion in cultivated areas.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

The potential for trees on this soil is moderately high, and the soil is suitable for hardwoods and pines. Seasonal wetness limits the use of equipment.

The seasonal high water table is the main limitation for nonfarm use. It especially limits the use of this soil as a site for septic tank absorption fields and sanitary landfills. The soil is a fair subgrade material for local roads and streets.

The capability subclass is IIe.

23A—Turbeville loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is on broad ridgetops at an elevation of more than 120 feet. The areas of this soil are irregularly shaped and range from 5 to 15 acres.

Typically, the surface layer of this soil is dark yellowish brown loam about 10 inches thick. The subsoil is mostly yellowish red and red clay loam to a depth of 60 inches or more.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of well drained Emporia and Kempsville soils that make up about 10 to 15 percent of this unit. The Emporia soils are along the edge of the unit where slopes are 2 percent or more, and the Kempsville soils are at an elevation of more than 120 feet. Also included, on the crests of ridges, are spots of severely eroded soils where the surface layer is yellowish red clay loam. These make up about 5 percent of the unit.

The permeability of this Turbeville soil is moderate. Available water capacity is high, and runoff is slow. The soil is low in natural fertility and organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. The surface layer and subsoil are commonly very strongly acid to strongly acid unless lime has been applied.

Most areas of this soil are farmed and used for cultivated crops. A few areas are in woodland.

This soil is very well suited to cultivated crops and hay. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil are the main management needs. Using cover crops and grasses and legumes in the cropping system and mixing crop residue into the soil help to increase organic matter content and improve tilth in cultivated areas.

The soil is very well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is moderately high. The soil is managed for pines and hardwoods.

The soil is suitable for most nonfarm uses, but the permeability is a limitation for septic tank absorption fields and the shrink-swell potential is a hazard for buildings. The soil is a poor subgrade material for local roads and streets.

The capability class is I.

23B—Turbeville loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on ridgetops at an elevation of more than 120 feet. The areas of this soil are irregularly shaped and range from 20 to about 100 acres.

Typically, the surface layer of this soil is dark yellowish brown loam about 10 inches thick. The subsoil is mostly yellowish red and red clay loam to a depth of 60 inches or more.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of well drained Emporia and Kempsville soils that make up about 10 to 15 percent of the acreage of this unit. The Emporia soils are along the edge of the unit where slopes are 2 percent or more, and the Kempsville soils are at an elevation of more than 120 feet. Also included, on the crests of ridges, are spots of severely eroded soils where the surface layer is yellowish red clay loam. These make up about 5 percent of the unit.

The permeability of this Turbeville soil is moderate. Available water capacity is high, and runoff is medium. The soil is low in natural fertility and organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. The surface layer and subsoil are commonly very strongly acid to strongly acid unless lime has been applied.

Most areas of this soil are farmed and used for cultivated crops (fig. 6). A few areas are in woodland.

This soil is very well suited to cultivated crops and hay. The hazard of water erosion is moderate and is a major management concern. Increasing the organic matter content and using lime and fertilizer to offset the acidity and low natural fertility of the soil are main management needs. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and mixing crop residue into the soil help to reduce runoff and erosion and increase organic matter content and improve tilth.

The soil is very well suited to pasture. Establishing and maintaining a mixture of grass and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The potential for trees on this soil is moderately high. The soil is managed for pines and hardwoods.

The soil is suitable for most nonfarm uses, but the permeability is a limitation for septic tank absorption fields and the shrink-swell potential is a hazard for buildings. This soil is a poor subgrade material for local roads and streets.

The capability subclass is IIe.

23C—Turbeville loam, 6 to 10 percent slopes. This soil is deep, sloping, and well drained. It is on the sides of narrow ridgetops and around the heads of natural drainageways at an elevation of more than 120 feet. The areas of this soil are commonly narrow and winding. They range from 5 to about 20 acres.

Typically, the surface layer of this soil is dark yellowish brown loam about 10 inches thick. The subsoil is mostly yellowish red and red clay loam to a depth of 60 inches or more.

Included with this soil in mapping are intermingled areas, generally less than 2 acres in size, of well drained Emporia and Kempsville soils that make up about 10 to 15 percent of this unit. The Emporia soils are along the edge of the unit where slopes are 2 percent or more, and the Kempsville soils are at an elevation of more than 120 feet. Also included, on the crests of ridges, are spots of severely eroded soils where the surface layer is yellowish red clay loam. These make up about 5 percent of the unit.

The permeability of this Turbeville soil is moderate. Available water capacity is high, and runoff is rapid. The soil is low in natural fertility and organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. The

Figure 6.—Barley stubble on Turbeville loam, 2 to 6 percent slopes. An area of nursery stock is in the background.

surface layer and subsoil are commonly very strongly acid to strongly acid unless lime has been applied.

Most areas of this soil are in woodland. Some areas are farmed and used for pasture or hay.

This soil is moderately well suited to cultivated crops and hay. The hazard of water erosion is severe, making intensive management necessary in cultivated areas. Minimum tillage, sod seeding, using grassed waterways, contour cropping and stripcropping, and using cover crops and grasses and legumes in the cropping system help to reduce runoff and control erosion. Mixing crop residue into the soil to increase organic matter content and using lime and fertilizer to offset the acidity and low natural fertility are major management needs.

The soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, pasture rotation, deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase, making it difficult to reestablish the pasture.

The potential for trees on this soil is moderately high. The soil is managed for pines and hardwoods.

The soil is suited to most nonfarm uses, but slope limits the soil as a site for septic tank absorption fields and as a building site. The permeability of the soil is also a limitation for septic tanks, and the shrink-swell potential is a limitation for buildings. The soil is a poor subgrade material for local roads and streets.

The capability subclass is IIIe.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U. S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U. S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U. S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service.

About 68,636 acres, or nearly 42 percent, of Westmoreland County meets the soil requirements for prime farmland. Areas are scattered throughout the county but most are in the southern part, mainly in associations 2, 4, 5, and 7 of the general soil map. Approximately 50,000 acres of this prime farmland is used for crops. Crops grown on this land, mainly corn and soybeans, account for an estimated two-thirds of county's total agricultural income each year.

A recent trend in land use in some parts of the county has been the loss of some prime farmlands to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and usually less productive.

Soil map units that make up prime farmland in Westmoreland County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Some of the soils in this survey area that have limitations—a high water table, flooding, or inadequate rainfall—may also qualify for prime farmland if these limitations are overcome by such measures as drainage, flood control, or irrigation.

The map units that meet the soil requirements for prime farmland are:

1A—Ackwater silt loam, 0 to 2 percent slopes
1B—Ackwater silt loam, 2 to 6 percent slopes
4—Bojac loamy sand
6B—Emporia loam, 2 to 6 percent slopes
7A—Kempsville loam, 0 to 2 percent slopes
7B—Kempsville loam, 2 to 6 percent slopes
12—Nansemond fine sandy loam
13—Pamunkey fine sandy loam, wet substratum
16B—Rumford fine sandy loam, 0 to 6 percent slopes
20A—State fine sandy loam, 0 to 2 percent slopes
20B—State fine sandy loam, 2 to 6 percent slopes
21A—Suffolk sandy loam, 0 to 2 percent slopes
21B—Suffolk sandy loam, 2 to 6 percent slopes
22A—Tetotum loam, 0 to 2 percent slopes
22B—Tetotum loam, 2 to 6 percent slopes
23A—Turbeville loam, 0 to 2 percent slopes
23B—Turbeville loam, 2 to 6 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where wetness or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Carl E. Robinette, soil scientist, Soil Conservation Service, and H. M. Camper, Jr. Warsaw Experiment Station, Virginia Polytechnic Institute and State University assisted with this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1977, according to the Virginia Crop Reporting Service, about 37,000 acres, or 24 percent of the land area in Westmoreland County, was used for close-grown crops. Cash-grain is the main type of farming in the county. The major crops produced are soybeans, corn, and small grains (wheat and barley). A limited acreage is used for truck crops, particularly tomatoes, but the acreage of these crops has decreased substantially over the past 10 years.

In recent years the acreage of grassland and pasture has decreased and the acreage of cash grain-crops has increased. The acreage of soybeans has increased through the practice of double-cropping soybeans in barley and wheat stubble.

The nearly level and gently sloping soils in Westmoreland County are well suited to the commonly grown crops and to the less commonly grown truck crops and ornamentals. Such suitable soils include the Kempsville and Suffolk soils on the upland and the Pamunkey, State, and Tetotum soils on the neckland.

Erosion is the major hazard on the gently sloping areas of the soils well suited to crops, and the gently sloping areas make up about 70 percent of the acreage. If the surface layer of a soil is lost through erosion, most of the available nutrients and most of the organic matter content are lost. The organic matter content affects soil structure, rate of water infiltration, available water capacity, and tilth. The erosion hazard is even more severe on soils with a subsoil of firm clay loam, or a fragipan, such as the Emporia, Savannah, or Montross soils. Soil erosion on farmland in many areas further results in the pollution of streams by sediment. Controlling erosion minimizes such pollution and improves the quality of water for fish and other wildlife

Erosion-control practices provide a protective surface cover, reduce runoff, and increase infiltration. For example, a cropping system that keeps plant cover on the soil for extended periods reduces erosion and preserves the productive capacity of the soils. Use of minimum tillage, contouring, and using a cropping system that rotates grass or close-growing crops with row crops help to control erosion on cropland (fig. 7). The practice of contouring is especially effective in areas where chisel plowing is used.

Drainage of excess water from the soil is needed on some of the acreage used for crops. On the upland, drainage is needed to a limited extent to eliminate seeps and wet spots in drainageways and depressions and to lower the perched water table in the Savannah and Montross soils. Drainage is needed to lower the seasonal high water table in the Lumbee, Leaf, and Lenoir soils, for example, and to a limited extent in the Nansemond and Tetotum soils on the neckland.

The design of surface and subsurface drainage systems varies with the kind of soil. Generally, a subsurface system is needed in areas of Lumbee, Nansemond, and Tetotum soils, but a combined surface and subsurface system is needed on intensively row cropped Leaf and Lenoir soils.

Soil blowing, or wind erosion, is a hazard on areas of Pamunkey, Suffolk, Catpoint, Bojac, and Rumford soils. Maintaining a plant cover or using crop residue as a surface mulch provides protection from soil blowing.

Most of the arable soils in the county respond well to nitrate, phosphate, and potash fertilizers. The soils are medium acid to strongly acid and require periodic applications of ground limestone to maintain their reaction at a sufficient level for good growth of corn, soybeans, and small grains. The high aluminum content in the Montross soil creates the need for heavy applications of lime to maintain a good plant root environment. On all soils, the amount of lime and fertilizer used should be based on the results of soil

Figure 7.—No-till soybeans planted after barley on Suffolk sandy loam, 2 to 6 percent slopes.

tests, on the needs of the crop, and on the expected yield.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined 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. The classes are defined as follows:

Class I soils have slight 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 or that require special conservation practices, or both.

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

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

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

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

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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

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

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

woodland management and productivity

William H. Guerrant, county forester, Virginia Division of Forestry, and Norman O. Wilson, forester, Soil Conservation Service, assisted with this section.

Woodland is the most extensive land use in Westmoreland County; about 100,000 acres, or 60 percent of the county, is in woodland.

Four major forest cover types are in the county: (1) The oak-hickory forest covers 57 percent of the wooded area and is mainly on Rumford, Kempsville, and Emporia soils. (2) The loblolly pine-shortleaf pine forest covers 27 percent and commonly is on Emporia, Suffolk, and Kempsville soils. (3) The oak-pine forest covers 13 percent and is generally on Lumbee, Lenoir, and Montross soils. (4) The oak-gum forest covers 3 percent and mainly is on the Bibb and Levy soils.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *c*, clay in the upper part of the soil; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: w, c, and r.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

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

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

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

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

recreation

Lawrence H. Robinson, biologist, Soil Conservation Service, assisted with this section.

The major public recreation facility in the county is Westmoreland State Park, which has picnic and camping sites, cabins, and a swimming area. The park is about 1,300 acres and is generally on Rumford, Kempsville, and Emporia soils.

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area, and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require such site preparation as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are tall fescue, orchardgrass, and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are broomsedge, goldenrod, beggarweed, ragweed, foxtail millet, and wild strawberry.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, holly, hawthorn, dogwood, hickory, blackberry, and blueberry Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, and slope. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include mourning dove, bobwhite quail, woodchuck, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over a cemented pan or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by gravel, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, gravel content, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. The content of large stones affects the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to a cemented pan or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

If the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*3*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 16, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquult (*Aqu*, meaning water, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Albaquults (*Alba*, meaning white, plus *Aquult*, the suborder of the Ultisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Albaquults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is clayey, mixed, thermic Typic Albaquults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*3*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ackwater series

Soils of the Ackwater series are deep and moderately well drained. They formed in clayey fluvial sediments. The soils are on broad areas. Slopes range from 0 to 6 percent.

The Ackwater soils in this survey area are a taxadjunct because they have montmorillinitic mineralogy. In this survey area they are classified clayey, montomorillintic, thermic Aquic Paleudults.

Ackwater soils are commonly near Leaf, Emporia, Montross, and Savannah soils. Ackwater soils are better drained than Leaf soils, have more clay in the subsoil than Emporia or Montross soils, and do not have the fragipan typical of Savannah soils.

Typical pedon of Ackwater silt loam, 0 to 2 percent slopes, 70 yards west of VA-631 and 1.25 miles south of the junction of VA-205 and VA-631, south of Maple Grove:

O1—1 to 1/2 inch; loose leaves, pine needles, and twigs.
O2—1/2 inch to 0; partially decomposed leaves, pine needles, and twigs.
A1—0 to 1 inch; dark yellowish brown (10YR 4/4) silt loam; weak very fine granular structure; friable, slightly sticky, slightly plastic; many fine and few large roots; strongly acid; clear smooth boundary.
A2—1 to 7 inches; light yellowish brown (2.5Y 6/4) silt loam; moderate fine granular structure; friable, sticky, slightly plastic; common fine roots; strongly acid; clear wavy boundary.
B1t—7 to 10 inches; light yellowish brown (10YR 6/4) silt loam; weak fine subangular blocky structure; friable, sticky, plastic; common fine roots; thin patchy clay films; very strongly acid; gradual smooth boundary.
B21t—10 to 16 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine subangular blocky structure; firm, sticky, plastic; few fine roots; thin patchy clay films; very strongly acid; gradual smooth boundary.
B22t—16 to 23 inches; light yellowish brown (10YR 6/4) silty clay; moderate medium angular blocky structure; very firm, sticky, plastic; few fine roots; thin continuous clay films; very strongly acid; gradual wavy boundary.
B23t—23 to 46 inches; yellowish brown (10YR 5/6) silty clay; common coarse distinct light gray (10YR 7/1) mottles and few fine distinct yellowish red (5YR 5/8) mottles; moderate medium platy structure; very firm, sticky, very plastic; few fine roots; thin patchy clay films; very strongly acid; clear wavy boundary.
B3g—46 to 70 inches; light gray (N 7/0) clay; common medium prominent brownish yellow (10YR 6/6) mottles and common coarse prominent strong brown (7.5YR 5/8) mottles; coarse angular blocky structure; very firm, sticky, very plastic; very strongly acid.

The solum is more than 60 inches thick. Reaction is strongly acid or medium acid in the A horizon and very strongly acid or strongly acid in the B horizon.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 4 through 6. It is silt loam.

The Bt horizon has value of 5 or 6 and chroma of 4 or 8. High- and low-chroma mottles range from common to many in the lower part. The horizon mainly is silty clay loam, silty clay, or clay, but the B1 horizon ranges to silt loam.

The B3 horizon has hue of 10YR, 2.5Y, or is neutral. It has value of 5 through 7 and chroma of 0 through 6. High- and low-chroma mottles range from common to many. The horizon is clay or silty clay.

Bibb series

Soils of the Bibb series are poorly drained. They formed in loamy alluvium on flood plains. Slopes are dominantly less than 1 percent but range to 2 percent. Bibb soils in this survey area are mapped in an undifferentiated group with Levy soils.

Bibb soils are commonly near Bohicket, Rappahannock, and Rumford soils. Bibb soils do not stay waterlogged, as is typical for Bohicket and Rappahannock soils. Bibb soils are not as well drained as Rumford soils.

Typical pedon of Bibb sandy loam, 100 yards north of the intersection of VA-612 and Nomini Creek, 67 yards east of Nomini Creek:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam; common medium faint dark brown (10YR 4/3) mottles and common medium distinct dark brown (7.5YR 4/4) mottles; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; very strongly acid; clear wavy boundary.
C1g—6 to 21 inches; light brownish gray (2.5Y 6/2) loam; many medium distinct yellowish red (5YR 4/6) mottles; massive; slightly sticky, slightly plastic; many fine roots; very strongly acid; gradual wavy boundary.
C2g—21 to 31 inches; light brownish gray (2.5Y 6/2) silt loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; massive; sticky, slightly plastic; common fine roots; very strongly acid; gradual wavy boundary.
C3g—31 to 46 inches; dark grayish brown (2.5Y 4/2) silt loam; massive; slightly sticky, nonplastic; common fine roots; flows easily between fingers when squeezed; strongly acid; gradual wavy boundary.
C4g—46 to 65 inches; very dark grayish brown (2.5Y 3/2) clay loam; many coarse faint gray (10YR 5/1) mottles; massive; slightly sticky, nonplastic; common fine roots; flows easily between fingers when squeezed; few loamy sand lenses; strongly acid.

Unless limed, the soil is very strongly acid in the A horizon and upper part of the C horizon and strongly acid in the lower part of the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. It is sandy loam, loam, or silt loam.

Above a depth of 40 inches, the C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 0 or 2. It is loamy sand, sandy loam, loam, or silt loam.

Below a depth of 40 inches, the C horizon has hue of 10YR or 2.5Y, value of 3 through 6, and chroma of 1 or 2. It is sand, loamy sand, sandy loam, loam, silt loam, or silty clay loam.

Bohicket series

Soils of the Bohicket series are deep and very poorly drained. They formed in stratified fluvial sediments. The soils are along the Potomac River and its tributaries where they are inundated twice daily by brackish water. Slopes are less than 1 percent.

Bohicket soils are commonly near Bibb and Levy soils. Bohicket soils have sulfidic material within 20 inches of the surface, but Bibb and Levy soils do not.

Typical pedon of Bohicket silty clay loam, 110 yards southeast of the intersection of VA-205 and VA-631, near Mattox Creek:

A—0 to 8 inches; dark olive gray (5Y 3/2) silty clay loam; massive; slightly sticky; many fine roots; 25 percent organic matter; flows very easily between fingers when squeezed; weak sulfide odor; moderately alkaline when wet; gradual boundary.

C1g—8 to 30 inches; very dark grayish brown (2.5Y 3/2) mucky silty clay; massive; slightly sticky; many fine roots; 20 percent organic matter; flows very easily between fingers when squeezed; moderate sulfide odor; moderately alkaline when wet; gradual boundary.

Oa—30 to 44 inches; very dark brown (10YR 2/2) sapric material; 48 percent organic matter; rubbed fiber content less than 10 percent; moderate sulfide odor; moderately alkaline when wet; gradual boundary.

IIC2g—44 to 60 inches; dark olive gray (5Y 3/2) mucky clay; massive; slightly sticky; few fine roots; 25 percent organic matter; flows easily between fingers when squeezed; moderate sulfide odor; moderately alkaline when wet.

Some pedons have thin organic layers in the surface layer or in the upper part of the substratum. Reaction ranges from slightly acid through moderately alkaline throughout when the soil is wet.

The A horizon has hue of 10YR through 5Y, value of 3, and chroma of 1 or 2. The *n* value is 0.7 to 2.0. There is a weak or moderate sulfide odor. The horizon is silty clay loam.

The C horizon has hue of 10YR through 5Y, value of 2 through 4, and chroma of 1 or 2. The *n* value ranges from 0.7 to 1.0 or more. There is a moderate or strong sulfide odor in the upper part of the C horizon. The horizon is clay loam, silty clay, or clay and their mucky analogues. Some pedons have thin strata of silt loam, sandy loam, loamy sand, or sand in the lower part of the C horizon.

Bojac series

Soils of the Bojac series are deep and well drained. They formed in loamy and sandy fluvial sediments. These soils are on the broad terraces of the Rappahannock River. Slopes range from 0 to 2 percent.

Bojac soils are commonly near Catpoint, Pamunkey, and Tetotum soils. Bojac soils have less clay in the control section than Pamunkey or Tetotum soils and have an argillic horizon that is not typical of Catpoint soils.

Typical pedon of Bojac loamy sand, 500 yards east of the junction of VA-637 and VA-641, 78 yards north of VA-641, and 5 yards north of a field road, east of Leedstown:

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy sand; weak fine and medium granular structure; very friable, nonsticky, nonplastic; few fine roots; few fine flakes of mica; mildly alkaline; abrupt smooth boundary.

B1—10 to 14 inches; reddish brown (5YR 4/4) sandy loam; few medium distinct dark brown (10YR 4/3) areas of material from the Ap horizon; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; few soft manganese concretions up to 1 inch in diameter; few fine flakes of mica; mildly alkaline; clear smooth boundary.

B21t—14 to 23 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; some clay bridging between sand grains; few manganese concretions up to 1 inch in diameter; few fine flakes of mica; mildly alkaline; gradual smooth boundary.

B22t—23 to 34 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; clay bridging and coating on sand grains; few manganese concretions up to 1 inch in diameter; few fine flakes of mica; slightly acid; gradual smooth boundary.

B3—34 to 54 inches; brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; few fine flakes of mica; slightly acid; gradual smooth boundary.

C—54 to 70 inches; brown (7.5YR 4/4) sand; single grain; loose, nonsticky, nonplastic; 10 percent pebbles up to 1/4 inch in diameter; few fine flakes of mica; medium acid.

The solum thickness ranges from 35 to 55 inches. Gravel content ranges from 0 to 5 percent in the solum and from 0 to 15 percent in the C horizon. The A and B horizons are slightly acid through mildly alkaline unless limed. The C horizon is medium acid.

The Ap horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4. It is loamy sand or loamy fine sand.

The B1 horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4. It is loamy sand or sandy loam.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 through 6. It is sandy loam with thin subhorizons of sandy clay loam.

The C horizon is sand or loamy sand.

Catpoint series

Soils of the Catpoint series are deep and somewhat excessively drained and are along drainageways. The soils formed in sandy fluvial sediments. Slopes range from 0 to 6 percent.

Catpoint soils are commonly near Bibb, Bohicket, Bojac, Levy, and Rappahannock soils. Catpoint soils have coarser, less developed subhorizons than Bojac soils and are better drained than Bibb, Bohicket, Levy, or Rappahannock soils.

Typical pedon of Catpoint loamy sand, 0 to 6 percent slopes, 1,100 yards east-northeast of VA-205, at Mattox Creek:

O1—2 inches to 1 inch; loose leaves, pine needles, and twigs.

O2—1 inch to 0; partially decomposed leaves, pine needles, and twigs.

A11—0 to 3 inches; dark grayish brown (2.5Y 4/2) loamy sand; weak very fine granular structure; very friable; many fine roots; 2 percent pebbles 1/2 inch or less in diameter; very strongly acid; abrupt wavy boundary.

A12—3 to 9 inches; light olive brown (2.5Y 5/4) loamy sand; weak fine granular structure; very friable; common fine roots; 2 percent pebbles 1/2 inch or less in diameter; strongly acid; abrupt wavy boundary.

B2—9 to 14 inches; yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; very friable; common fine roots; 2 percent pebbles 1/2 inch or less in diameter; very strongly acid; gradual smooth boundary.

B3—14 to 21 inches; yellowish brown (10YR 5/6) sand; massive; very friable; common fine roots; 2 percent pebbles 1/2 inch or less in diameter; very strongly acid; gradual smooth boundary.

A21—21 to 32 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; common fine roots; 15 percent pebbles 1/2 inch or less in diameter; very strongly acid; gradual wavy boundary.

A22—32 to 45 inches; very pale brown (10YR 7/4) gravelly sand; single grain; loose; few fine roots; 25 percent pebbles 1/2 inch or less in diameter; very strongly acid; abrupt wavy boundary.

A23—45 to 55 inches; very pale brown (10YR 7/4) very gravelly sand; single grain; loose; few fine roots; 65 percent pebbles 2 inches or less in diameter; strongly acid; abrupt smooth boundary.

A&B—55 to 68 inches; very pale brown (10YR 7/3) gravelly sand (A2); single grain; loose; few fine roots; 45 percent pebbles 1 inch or less in diameter; brown (7.5YR 4/4) gravelly sandy loam lamellae (Bt) 1/4 to 1 inch thick with a combined thickness of 2-1/2 inches; sand grains in lamellae coated and bridged with clay; strongly acid.

The thickness of sandy and gravelly material exceeds 60 inches. Rounded pebbles make up 0 to 25 percent, by volume, of the soil above a depth of 40 inches and 0 to 70 percent below a depth of 40 inches. Reaction in unlimed areas ranges from very strongly acid to medium acid throughout the soil. Lamellae are at a depth of less than 60 inches and have a total thickness of less than 6 inches. The lamellae have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. They are sandy loam or gravelly sandy loam.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 through 4. It is loamy sand.

The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 6. It is sand or loamy sand.

The A2 horizon has hue of 10YR or 2.5Y, value of 6 through 7, and chroma of 2 through 4. The A2 horizon is sand or gravelly sand. The texture below a depth of 40 inches ranges to very gravelly sand.

Emporia series

Soils of the Emporia series are deep and well drained. They formed in sandy and loamy fluvial sediments. The soils are on upland knolls and ridges. Slopes range from 2 to 6 percent.

Emporia soils are commonly near Kempsville, Rumford, and Savannah soils. Emporia soils have low-chroma mottles nearer to the surface than Emporia soils and are not as well drained. Emporia soils have more clay in the control section than Rumford soils and do not have the fragipan of the Savannah soils.

Typical pedon of Emporia loam, 2 to 6 percent slopes, 100 yards south of VA-3 and 1,530 yards southwest of the junction of VA-3 and VA-642, at Baynesville:

O2—2 inches to 0; loose leaves, pine needles, and twigs.

Ap—0 to 7 inches; pale brown (10YR 6/3) loam stained with brown (10YR 5/3); weak fine subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; common fine roots; many medium tubular pores; very strongly acid; abrupt smooth boundary.

B21t—7 to 14 inches; yellowish brown (10YR 5/8) loam; moderate fine subangular blocky structure; hard, friable, nonsticky, slightly plastic; few fine roots; common fine interstitial pores; thin patchy clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

B22t—14 to 20 inches; yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; hard, firm, slightly sticky, plastic; few fine roots; few fine tubular pores; thin patchy clay films on faces of peds and pores; very strongly acid; gradual wavy boundary.

B23t—20 to 35 inches; strong brown (7.5YR 5/8) clay; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; common very fine interstitial pores; thin patchy clay films on faces of peds and thin continuous films in pores; very strongly acid; gradual wavy boundary.

B24t—35 to 44 inches; strong brown (7.5YR 5/6) clay; few medium distinct red (2.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; hard, very firm, very sticky, very plastic; few fine roots; few very fine interstitial pores; thin continuous clay films; less than 2 percent pebbles up to 1/2 inch in diameter; very strongly acid; clear wavy boundary.

B25t—44 to 65 inches; strong brown (7.5YR 5/6), red (2.5YR 4/6), and light brownish gray (10YR 6/2) sandy clay; weak very thick platy structure parting to weak medium subangular blocky; hard, very firm, slightly sticky, plastic; few very fine vesicular pores; thick continuous clay films on vertical and horizontal faces of plates; less than 2 percent pebbles up to 1/2 inch in diameter; few black oxide concretions in lower half of horizon; very strongly acid.

The solum thickness ranges from 40 to 75 inches. The content of coarse fragments less than 1 inch in size ranges from 0 to 5 percent in the A horizon and upper part of the B horizon and from 0 to 15 percent in the lower part of the B horizon. Reaction of the solum is very strongly acid or strongly acid unless the soil is limed.

The A horizon has value of 5 or 6 and chroma of 2 through 4. It is fine sandy loam or loam.

The B2t horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 8. The upper part is sandy loam, loam, sandy clay loam, or clay loam. The lower part ranges to include sandy clay and clay. Mottles are within 50 inches of the surface, but low-chroma mottles are not above a depth of 40 inches.

Kempsville series

Soils of the Kempsville series are deep and well drained. They formed in loamy fluvial sediments and are on uplands. Slopes range from 0 to 6 percent.

Kempsville soils are commonly near Emporia, Rumford, Savannah, and Suffolk soils. Kempsville soils do not have the low-chroma mottles in the Bt horizon typical of Emporia soils or the fragipan typical of Savannah soils. Kempsville soils have more clay in the textural control section than Suffolk or Rumford soils.

Typical pedon of Kempsville loam, 0 to 2 percent slopes, 370 yards north of the junction of VA-609 and VA-1601 and 60 yards west of VA-1601:

Ap—0 to 8 inches; dark brown (10YR 4/3) loam; moderate medium granular structure; friable, nonsticky, nonplastic; many fine roots; neutral; abrupt smooth boundary.

B21t—8 to 14 inches; strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; thin patchy clay films on faces of peds; sand grains coated and bridged with clay; many very fine interstitial pores; neutral; clear smooth boundary.

B22t—14 to 23 inches; strong brown (7.5YR 5/6) loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; thin continuous clay films on faces of peds; sand grains coated and bridged with clay; common very fine tubular pores and many very fine interstitial pores; common fine manganese stains; strongly acid; clear wavy boundary.

B23t—23 to 32 inches; strong brown (7.5YR 5/6) loam; many medium faint light yellowish brown (10YR 6/4) loamy sand mottles; weak fine and medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; thin continuous clay films on faces of peds and in pores; sand grains partially coated and bridged with clay; many very fine interstitial pores; common fine manganese stains; strongly acid; clear wavy boundary.

B24t—32 to 64 inches; yellowish red (10YR 4/6) sandy loam; common medium distinct yellowish brown (5YR 5/4) mottles; weak medium and coarse subangular blocky structure; very firm, slightly sticky, slightly plastic; thin patchy clay films on faces of peds; sand grains coated and bridged with clay; common fine tubular pores, many very fine interstitial pores, and common very fine vesicular pores; common fine dark manganese stains; very strongly acid.

The solum thickness ranges from 50 to 75 inches or more. The content of coarse fragments, mostly smooth quartz pebbles, ranges from 0 to 10 percent throughout the soil. Reaction is very strongly acid or strongly acid unless the soil is limed.

The A horizon has value of 4 or 5 and chroma of 2 through 4. It is fine sandy loam or loam.

The upper part of the B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It ranges from loam through sandy clay loam. The lower part of the Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. It is sandy loam or sandy clay loam. Some pedons have a B3 horizon of sandy loam.

Leaf series

Soils of the Leaf series are deep and poorly drained. They formed in fine textured marine sediments. They are on lowlands of the Coastal Plain. Slopes range from 0 to 2 percent.

Leaf soils are commonly near Lenoir, Lumbee, and Tetotum soils. Leaf soils are not as well drained as Tetotum or Lenoir soils and have more clay in the textural control section than Lumbee soils.

Typical pedon of Leaf silt loam, 35 yards south of the junction of VA-205 and VA-723, west of Colonial Beach:

O1—1 to 3/4 inch; water-stained loose leaves, pine needles, and twigs.

O2—3/4 inch to 0; partially decomposed leaves, pine needles, and twigs.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium and coarse granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and few medium roots; 10 percent pockets of Btg material 1 inch or less in diameter; very strongly acid; abrupt smooth boundary.

B21tg—7 to 12 inches; gray (10YR 5/1) silty clay; many coarse prominent brownish yellow (10YR 6/8) mottles and few fine prominent yellowish red (5YR 5/6) mottles; weak medium and coarse subangular blocky structure; hard, very firm, sticky, very plastic; few fine medium and large roots; thin very patchy clay films on faces of peds; very strongly acid; clear wavy boundary.

B22tg—12 to 19 inches; dark gray (N 4/0) silty clay; common medium distinct yellowish brown (10YR 5/8) mottles and light olive brown (2.5Y 5/4) mottles; weak fine and medium angular blocky structure; very hard, firm, sticky, very plastic; few fine medium roots; thin patchy clay films on faces of peds; 2 percent pebbles 1/2 inch or less in diameter; very strongly acid; gradual irregular boundary.

B23tg—19 to 35 inches; dark gray (N 4/0) clay; common medium distinct yellowish brown (10YR 5/8) mottles and common medium prominent red (2.5YR 4/6) mottles; weak fine and medium angular blocky structure; very hard, firm, sticky, very plastic; few fine and medium roots; thin patchy clay films on faces of peds; wavy line of semirounded to rounded pebbles 1 inch or less in diameter at a depth of 33 inches; very strongly acid; gradual irregular boundary.

B24tg—35 to 47 inches; dark gray (N 4/0) clay; common coarse prominent brownish yellow (10YR 6/8) and light gray (N 7/0) mottles; moderate fine and medium angular blocky structure; very hard, firm, sticky, very plastic; few fine roots; thin continuous clay films on faces of peds; 10 percent semirounded and rounded pebbles 2 inches or less in diameter; very strongly acid; gradual irregular boundary.

B3g—47 to 70 inches; light gray (N 7/0) clay; many medium prominent brownish yellow (10YR 6/8) mottles; weak coarse angular blocky structure; very hard, very firm, sticky, very plastic; few fine roots; very strongly acid.

The solum thickness is 60 inches or more. Reaction is very strongly acid or strongly acid throughout the soil.

The A horizon has hue of 10YR, value of 4 through 6, and chroma of 1 or 2.

The B horizon has hue of 10YR, 2.5Y, or neutral; value of 4 through 7; and chroma of 0 through 2. Few to many, distinct or prominent, high-chroma mottles are throughout the B horizon. The B horizon is silty clay loam, silty clay, or clay.

Lenoir series

Soils of the Lenoir series are deep and somewhat poorly drained. They formed in fine textured marine sediments. The soils are on lowlands of the Coastal Plain. Slopes range from 0 to 2 percent.

Lenoir soils are commonly near Leaf, Lumbee, and Tetotum soils. Lenoir soils are better drained than Leaf or Lumbee soils and are not as well drained as Tetotum soils.

Typical pedon of Lenoir silt loam, 100 yards southeast of VA-205 and 467 yards south-southeast of the junction of VA-205 and VA-723:

O1—1 to 1/2 inch; loose leaves, pine needles, and twigs.

O2—1/2 inch to 0; partially decomposed leaves, pine needles, and twigs.

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

B1t—5 to 12 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine faint grayish brown (2.5Y 5/2) mottles; moderate fine subangular blocky structure; firm, sticky, plastic; common fine roots; thin patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

B21tg—12 to 30 inches; gray (10YR 5/1) clay; common medium distinct yellowish brown (10YR 5/6) mottles and few fine prominent red (10R 4/8) mottles; moderate fine angular blocky structure; very firm, sticky, very plastic; few fine roots; thin continuous clay films on faces of peds; very strongly acid; clear wavy boundary.

B22tg—30 to 55 inches; light gray (10YR 6/1) clay; few fine prominent yellowish brown (10YR 5/8) mottles and few fine distinct yellowish red (5YR 5/6) mottles; weak fine angular blocky structure; very firm, sticky, very plastic; thin patchy clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3—55 to 65 inches; gray (10YR 5/1) clay; common medium faint light gray (10YR 6/1) mottles and few medium distinct brownish yellow (10YR 6/6) mottles; weak medium angular blocky structure; very firm, sticky, plastic; common pockets of sandy clay; very strongly acid.

The solum thickness ranges from 60 to 80 inches or more. Reaction is very strongly acid or strongly acid unless the soil is limed.

The A1 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 or 2. The Ap or A2 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. The A horizon is silt loam.

The Bt horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 1 through 6. It is clay loam, silty clay loam, silty clay, or clay.

The B3 horizon has hue of 10YR through 5Y or is neutral, value of 5 through 7, and chroma of 0 through 2. It has few to many high-chroma mottles. It is sandy clay, clay loam, or clay.

Levy series

Soils of the Levy series are deep and very poorly drained. They formed in fluvial sediments of low, nearly level backswamp areas and freshwater marshes. They are frequently adjacent to and are on the inland side of tidal marshes and are continuously wet. Slopes are less than 1 percent. Levy soils in this survey area are mapped only in an undifferentiated group with Bibb soils.

Levy soils are commonly near Bibb, Bohicket, Rappahannock, and Rumford soils. Levy soils do not have sulfidic materials within 20 inches of the mineral surface layer as is typical of Bohicket and Rappahannock soils. Levy soils have more clay in the textural control section than Bibb soils and are not as well drained as Rumford soils.

Typical pedon of Levy silty clay loam, 1 mile west of Kremlin, 267 yards north-northwest of a bridge over Nomini Creek, on VA-612:

A1—0 to 3 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark brown (7.5YR 4/4) mottles; massive; flows very easily between fingers when squeezed; very strongly acid; abrupt smooth boundary.

C1g—3 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; flows easily between fingers when squeezed; very strongly acid; clear smooth boundary.

C2g—12 to 16 inches; gray (5Y 5/1) clay; massive; flows easily between fingers when squeezed; strongly acid; clear smooth boundary.

C3g—16 to 54 inches; dark gray (5Y 4/1) silty clay; massive; common partially decomposed stems in upper 16 to 36 inches; flows easily between fingers when squeezed; strongly acid; clear smooth boundary.

C4g—54 to 60 inches; very dark gray (10YR 3/1) light silty clay; massive; flows easily between fingers when squeezed; strongly acid.

These soils have an *n* value of 0.7 or more in all mineral layers to a depth of 40 inches. Reaction ranges from very strongly acid to strongly acid in the surface layer and subsoil.

The A horizon has hue of 10YR through 5Y, value of 4 or 5, and chroma of 1 or 2. Higher chroma mottles are common in many pedons. The A horizon is silty clay loam.

The upper part of the C horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay. The lower part of the C horizon has a wide range of color and ranges from sandy to clayey.

Lumbee series

Soils of the Lumbee series are deep and poorly drained. They formed in loamy or sandy marine sediments. Lumbee soils are on broad flats. Slopes are 0 to 1 percent.

Lumbee soils are commonly near Leaf, State, and Tetotum soils. Lumbee soils have a lower clay content in the textural control section than Leaf soils and are not as well drained as State or Tetotum soils.

Typical pedon of Lumbee loam, 1,333 yards south of the intersection of VA-626 and VA-739, 667 yards west of VA-626, and 105 yards northwest of a farm road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam; weak fine granular structure; very friable, slightly sticky, nonplastic; many fine roots; common very fine discontinuous interstitial pores; strongly acid; abrupt wavy boundary.

B21tg—7 to 14 inches; light brownish gray (2.5Y 6/2) clay loam; many coarse distinct light olive brown (2.5Y 5/4) mottles and few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable, sticky, slightly plastic; common fine roots; common fine discontinuous interstitial pores; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

B22tg—14 to 27 inches; light brownish gray (10YR 6/2) loam; common medium distinct light olive brown (2.5Y 5/4) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, sticky, slightly plastic; common very fine roots; common medium oblique tubular pores; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

C1g—27 to 41 inches; gray (10YR 5/1) fine sand; common medium distinct yellowish brown (10YR 5/4) mottles and few fine distinct strong brown (7.5YR 5/6) mottles; massive; very friable, nonsticky, nonplastic; few very fine roots; few very fine discontinuous interstitial pores; elongated horizontal bodies mottled with yellowish brown (10YR 5/4), pale brown (10YR 6/4), and strong brown (7.5YR 5/6), 4 inches thick; very strongly acid; abrupt smooth boundary.

C2g—41 to 56 inches; dark gray (10YR 4/1) loamy fine sand; common medium distinct yellowish brown (10YR 5/6) mottles and common coarse prominent strong brown (7.5YR 5/8) mottles; common medium distinct light gray (10YR 7/1) pockets of uncoated sand grains; massive; friable, slightly compact, nonsticky, nonplastic; few fine roots; few fine discontinuous interstitial pores; few fine flakes of mica; very strongly acid; clear smooth boundary.

C3g—56 to 65 inches; light gray (10YR 6/1) sandy clay; many coarse faint gray (10YR 5/1) mottles and common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, sticky, plastic; few fine roots; very strongly acid.

The solum thickness ranges from 20 to 40 inches. Content of pebbles in the Bt and C horizons ranges from 0 to 15 percent. Reaction of the soil is very strongly acid or strongly acid unless limed.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. It is fine sandy loam or loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is sandy loam, loam, sandy clay loam, or clay loam.

The C horizon is mainly sand or loamy sand. The lower part is stratified and ranges from sand to sandy clay.

Montross series

Soils of the Montross series are deep and moderately well drained. They formed in fluvial sediments and are on uplands. Slopes range from 0 to 6 percent.

Montross soils are commonly near Ackwater, Emporia, Savannah, and Lenoir soils. Montross soils have less clay in the textural control section than Ackwater or Lenoir soils, are not as well drained as Emporia soils, and do not have the fragipan typical of Savannah soils.

Typical pedon of Montross silt loam, 0 to 2 percent slopes, about 330 yards southeast of the junction of VA-3 and VA-664, and 200 yards south of VA-3:

O1—2 inches to 0; loose leaves and forest debris.

A1—0 to 2 inches; grayish brown (10YR 5/2) silt loam; weak medium granular structure; friable, nonsticky, nonplastic; many fine roots; extremely acid; abrupt smooth boundary.

A2—2 to 11 inches; light yellowish brown (2.5Y 6/4) silt loam; weak medium granular structure; friable, slightly sticky; slightly plastic; many fine roots; extremely acid; clear smooth boundary.

B21t—11 to 21 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; thin patchy clay films; very strongly acid; abrupt wavy boundary.

B22t—21 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate thick platy; very firm and compact in place, 50 percent of the volume brittle when moist; slightly sticky, plastic; few fine roots on faces of plates; thin patchy strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; gradual smooth boundary.

B23t—48 to 65 inches; red (2.5YR 4/8), strong brown (7.5YR 5/6), light gray (10YR 7/1), and light yellowish brown (2.5Y 6/4) clay; moderate medium platy structure parting to strong very fine subangular blocky; very firm, up to 20 percent of the volume brittle when moist; sticky, plastic; thin very patchy clay films; very strongly acid; gradual smooth boundary.

B3t—65 to 75 inches; red (2.5YR 4/8), strong brown (7.5YR 5/6), light gray (10YR 7/1), and light yellowish brown (2.5Y 6/4) clay loam; weak coarse subangular blocky structure; firm; slightly sticky, plastic; very strongly acid.

The solum thickness ranges from 60 to 80 inches or more. Depth to a compact layer with platy structure ranges from 20 to 40 inches. This soil commonly has no coarse fragments, but some pedons have individual horizons in the lower part of the B horizon and in the C horizon that are as much as 5 percent pebbles. Reaction ranges from extremely acid through strongly acid throughout the profile unless the soil is limed.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4.

The upper part of the B2t horizon or the B1 horizon above the compact layer has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 8. The horizon normally has mottles with chroma of 2 or less. It is silt loam or silty clay loam. The lower part of the B2t horizon and the B3t horizon have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 through 8, or are shades of brown, red, gray, and yellow. They are silty clay loam, silty clay, or clay. Structure commonly is platy, and the consistence is firm or very firm and compact.

Nansemond series

Soils of the Nansemond series are deep and moderately well drained. They formed in sandy and loamy marine sediments. Slopes range from 0 to 2 percent.

Nansemond soils are commonly near Leaf, Rumford, State, and Tetotum soils. Nansemond soils have less clay in the upper part of the Bt horizon than Leaf or Tetotum soils and are not as well drained as Rumford or State soils.

Typical pedon of Nansemond fine sandy loam, 433 yards southeast of elbow turn of VA-633 and 1,000 yards north-northwest of Paynes Point, in a field:

Ap—0 to 11 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; very strongly acid; abrupt smooth boundary.

B21t—11 to 15 inches; light olive brown (2.5Y 5/4) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; strongly acid; clear smooth boundary.

B22t—15 to 19 inches; light olive brown (2.5Y 5/4) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; strongly acid; clear smooth boundary.

B23t—19 to 24 inches; light olive brown (2.5Y 5/4) fine sandy loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B24t—24 to 32 inches; olive brown (2.5Y 4/4) fine sandy loam; few fine distinct strong brown (7.5YR 5/6) mottles and common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; very strongly acid; clear irregular boundary.

B3—32 to 36 inches; light olive brown (2.5Y 5/4) loamy fine sand; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; few fine roots; very pale brown (10YR 7/3) ped coatings; very strongly acid; gradual wavy boundary.

C1—36 to 48 inches; light yellowish brown (2.5Y 6/4) loamy fine sand; many coarse distinct light gray (10YR 7/2) mottles and common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; strongly acid; gradual wavy boundary.

C2g—48 to 65 inches; light gray (10YR 7/2) loamy fine sand; common medium distinct light yellowish brown (2.5Y 6/4) mottles; common coarse distinct dark grayish brown (2.5Y 4/2) sand pockets; single grain; loose; very strongly acid.

The solum thickness ranges from 35 to 50 inches. Reaction is very strongly acid or strongly acid throughout unless the soil is limed.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 through 4. Some pedons have an A2 horizon with hue of 10YR or 2.5Y, value of 6, and chroma of 4. The A horizon is fine sandy loam or sandy loam.

The B horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 4 through 6. High- and low-chroma mottles are in the lower part. The horizon mainly is fine sandy loam or sandy loam, but the B3 horizon includes loamy fine sand or loamy sand. Some pedons have lenses of sandy clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 8. It has high- and low-chroma mottles. It is loamy sand or loamy fine sand. Some pedons have lenses or strata of sandy clay loam.

Pamunkey series

Soils of the Pamunkey series are deep and well drained. They formed in sandy and loamy alluvium predominantly of Piedmont origin. These soils are on stream terraces. Slopes range from 0 to 2 percent.

Pamunkey soils are commonly near Bojac and Tetotum soils. Pamunkey soils are better drained than Tetotum soils and are finer textured in the textural control section than Bojac soils.

Typical pedon of Pamunkey fine sandy loam, wet substratum, 900 yards west-northwest of the junction of VA-637 and VA-641:

Ap—0 to 11 inches; brown (7.5YR 4/4) fine sandy loam, pale brown (10YR 6/3) when dry; weak fine and medium granular structure; friable, slightly sticky; few fine flakes of mica; common roots; medium acid; abrupt wavy boundary.

B21t—11 to 17 inches; reddish brown (5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few roots; thin continuous clay films in tubular channels; few fine flakes of mica; few earthworm casts; slightly acid; clear smooth boundary.

B22t—17 to 26 inches; reddish brown (5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few roots; thin patchy clay films on faces of peds; few fine flakes of mica; few earthworm casts; neutral; gradual wavy boundary.

B23t—26 to 33 inches; reddish brown (5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few roots; thin patchy clay films on faces of peds; 25 percent black oxide stains; 2 percent very soft black oxide accumulations; common fine flakes of mica; neutral; gradual wavy boundary.

B24t—33 to 43 inches; reddish brown (5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few roots; 15 percent soft black oxide accumulations 1/4 inch or less in diameter; common fine flakes of mica; neutral; gradual smooth boundary.

B3—43 to 50 inches; yellowish red (5YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; few roots; 10 percent soft black oxide accumulations 1 inch or less in diameter; few fine flakes of mica; neutral; gradual smooth boundary.

IIC—50 to 64 inches; reddish brown (5YR 4/4) loamy sand; massive; very friable; few fine flakes of mica; medium acid.

The solum thickness and depth to unconforming strata range from 40 to more than 60 inches. The content of rounded pebbles is mainly less than 2 percent throughout. Flakes of mica range from few to many throughout. Reaction ranges from medium acid to neutral in the B horizon and is strongly acid or medium acid in the C horizon.

The A horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 2 through 4.

The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is fine sandy loam, loam, sandy clay loam, or clay loam. The B3 horizon ranges to include sandy loam.

The C horizon commonly is stratified and ranges from sand to sandy loam. Some pedons have lenses of finer textured material. Dark-colored accumulations range from none to many.

Rappahannock series

Soils of the Rappahannock series are very poorly drained. They formed in highly decomposed herbaceous organic materials overlying stratified fluvial sediments. The soils are in tidal marsh areas along the Rappahannock River and its major tributaries. Most areas are flooded twice daily by brackish water. Slopes are less than 1 percent.

Rappahannock soils are commonly near Bibb, Catpoint, and Levy soils. Rappahannock soils are organic; Bibb, Catpoint, and Levy soils are mineral. Rappahannock soils are flooded mainly twice daily by brackish water, but Bibb and Levy soils are frequently flooded by freshwater streams.

Typical pedon of Rappahannock muck, 1.4 miles southwest of Leedstown and about 732 yards southwest of the point where Line Creek enters the Rappahannock River:

Oa—0 to 16 inches; black (5Y 2/2) muck; 10 percent fiber when rubbed; weak sulfide odor; flows very easily between fingers when squeezed; strongly acid when wet; clear boundary.

IICg—16 to 32 inches; dark gray (5Y 4/1) silty clay loam; massive; sticky, nonplastic; moderate sulfide odor; flows easily between fingers when squeezed; medium acid when wet; clear boundary.

IIIOe—32 to 70 inches; very dark gray (5Y 3/1) hemic material; 20 percent fiber when rubbed; weak sulfide odor; flows very easily between fingers when squeezed; medium acid when wet.

Reaction of the soil when wet ranges from strongly acid to slightly acid throughout. A few pedons have a thin mineral layer overlying the organic material.

The rubbed color of the organic material within all tiers has hue of 10YR through 5GY or is neutral, value of 2 or 3, and chroma of 0 through 2. The organic layers are muck or mucky peat.

The mineral strata have hue of 10YR through 5GY or are neutral, value of 2 through 5, and chroma of 0 through 2. They range from silt loam through silty clay in the surface and subsurface tiers and include sandy loam and loamy sand in the bottom tier.

Rumford series

Soils of the Rumford series are deep and well drained. They formed in sandy and loamy marine sediments. These soils are on low marine terraces and on side slopes. Slopes range from 0 to 50 percent.

Rumford soils are commonly near and better drained than Lumbee, Nansemond, State, and Tetotum soils.

Typical pedon of Rumford fine sandy loam, 0 to 6 percent slopes, 1.25 miles north of the junction of VA-204 and VA-3, 1 mile northwest of the end of VA-204, and 2.75 miles northeast of Oak Grove:

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; moderate medium and coarse granular structure; friable, slightly sticky, slightly plastic; common fine and few medium roots; mildly alkaline; abrupt smooth boundary.

B&A—8 to 16 inches; light yellowish brown (2.5Y 6/4) fine sandy loam; common medium distinct dark brown (10YR 4/3) Ap material; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; mildly alkaline; gradual smooth boundary.

B21t—16 to 23 inches; yellowish brown (10YR 5/6) fine sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin very patchy clay films on faces of peds; pockets of light yellowish brown (10YR 6/4) loamy fine sand; slightly acid; gradual wavy boundary.

B22t—23 to 31 inches; yellowish brown (10YR 5/8) fine sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin very patchy clay films on faces of peds; 10 percent semirounded to rounded gravel 1/2 inch or less in diameter; strongly acid; abrupt smooth boundary.

C1—31 to 36 inches; very pale brown (10YR 8/3) fine sand; common medium distinct yellow (10YR 7/6) mottles; single grain; loose; strongly acid; gradual irregular boundary.

C2—36 to 44 inches; yellowish brown (10YR 5/6) fine sandy loam; massive; friable, slightly sticky; lower 2 inches is brownish yellow (10YR 6/8) sand with 10 percent semirounded to rounded gravel 1 inch or less in diameter; strongly acid; abrupt smooth boundary.

IIC3—44 to 60 inches; light gray (2.5Y 7/2) fine sandy loam; many coarse distinct olive yellow (2.5Y 6/6) mottles and common medium prominent yellowish brown (10YR 5/8) mottles; massive; friable, slightly sticky, slightly plastic; upper 1 inch is continuous strong brown (7.5YR 5/6) slightly cemented silt loam; very strongly acid.

The solum is 30 to 50 inches thick. The content of rounded quartz pebbles ranges from 0 to 15 percent throughout the soil. Reaction ranges from very strongly acid through medium acid throughout unless the soil is limed.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. It is fine sandy loam, sandy loam, loamy fine sand, or loamy sand.

The B2t horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is sandy loam, fine sandy loam, or sandy clay loam. Mottles of both higher and lower chroma are common in the lower part of the B horizon of some pedons. Low-chroma mottles are from clean sand grains.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 8, and chroma of 1 through 8. It is stratified fine sandy loam, loamy sand, fine sand, or sand.

Savannah series

Soils of the Savannah series are moderately well drained and are shallow to moderately deep to a fragipan. They formed in moderately coarse textured and coarse textured fluvial sediments. The soils are on uplands. Slopes range from 0 to 6 percent.

Savannah soils are commonly near Emporia, Kempsville, and Suffolk soils, none of which has a fragipan.

Typical pedon of Savannah loam, 2 to 6 percent slopes, 1,030 yards northwest of the intersection of VA-1601 and VA-609 and 1,000 yards west of VA-1601:

O2—2 inches to 0; loose pine needles and twigs.

A1—0 to 3 inches; light gray (10YR 6/2) loam; weak medium granular structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium roots; very strongly acid; abrupt smooth boundary.

A&B—3 to 7 inches; yellowish brown (10YR 5/6) loam; streaks of light gray (10YR 6/2) A material; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium roots; common very fine interstitial pores; very strongly acid; clear smooth boundary.

B2t—7 to 19 inches; yellowish brown (10YR 5/6) loam; common fine and medium distinct light brownish gray (10YR 6/2) mottles from stripped sand grains; moderate fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and few medium roots; common fine interstitial and many fine vesicular pores; thin very patchy clay films within pores; very strongly acid; clear wavy boundary.

Bx1—19 to 42 inches; pale brown (10YR 6/3) sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles and common fine faint light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to weak thick platy; very hard, firm, nonsticky, nonplastic; brittle and compact in place; few roots on polygon faces; many fine and common medium vesicular pores; thin continuous clay films on faces of peds and within pores; very strongly acid; gradual wavy boundary.

Bx2—42 to 56 inches; strong brown (7.5YR 5/8) sandy clay loam; many medium distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; brittle and compact in place; common medium and fine interstitial pores; thick clay films in pores; 5 percent quartz pebbles less than 1 inch in diameter; very strongly acid; gradual smooth boundary.

B3t—56 to 66 inches; strong brown (7.5YR 5/6) clay loam; common medium and fine distinct red (10R 4/8) mottles, common fine faint brownish yellow (10YR 6/6) mottles, and few coarse distinct light gray (10YR 7/2) mottles; moderate fine subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine vesicular pores in peds; thick continuous clay films in pores and thin patchy on ped faces; extremely acid.

The solum is more than 60 inches thick. Depth to fragipan is dominantly 19 to 25 inches but ranges to as much as 35 inches. The thickness of the fragipan ranges from 15 to 40 inches. The content of coarse fragments, dominantly rounded pebbles up to 1/2 inch in diameter, ranges from 0 to 5 percent. Reaction ranges from extremely acid through strongly acid.

The A horizon has value of 4 through 6 and chroma of 2 or 3. It is fine sandy loam or loam. Some pedons have an A2 horizon with hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 through 4. It is fine sandy loam or loam.

The upper part of the B horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 through 6. It is loam or sandy clay loam. The Bx horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 through 8. It mainly is mottled with low- and high-chroma mottles. It is sandy loam, loam, or sandy clay loam. The part of the B horizon below the fragipan has hue of 10YR through 5YR, value of 4 or 5, and a chroma of 6. It has reticulate mottling ranging from red (10YR 4/8) to gray (10YR 6/1). It is sandy loam, loam, sandy clay loam, or clay loam.

State series

Soils of the State series are deep and well drained. They formed in sandy and loamy fluvial and marine sediments. The soils are on lowlands of the Coastal Plain. Slopes range from 0 to 6 percent.

State soils are commonly near Nansemond, Rumford, and Tetotum soils. State soils are better drained than Nansemond or Tetotum soils and have more clay in the control section than Rumford soils.

Typical pedon of State fine sandy loam, 0 to 2 percent slopes, 34 yards east of VA-664 and 1,334 yards north-northeast of the junction of VA-3 and VA-664:

Ap—0 to 9 inches; dark brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; neutral; abrupt smooth boundary.

B1t—9 to 21 inches; brown (7.5YR 5/4) loam; moderate fine subangular blocky structure; friable, sticky, plastic; few fine roots; thin patchy clay films; medium acid; gradual wavy boundary.

B21t—21 to 27 inches; strong brown (7.5YR 5/6) clay loam; weak fine subangular blocky structure; friable, sticky, slightly plastic; few fine roots; thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B22t—27 to 37 inches; strong brown (7.5YR 5/6) sandy clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; 2 percent very fine pebbles; strongly acid; gradual wavy boundary.

B3—37 to 51 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, nonplastic; few fine roots; 10 percent nodules of ferruginous sandstone up to 1 inch in diameter; 2 percent very fine pebbles; strongly acid; clear wavy boundary.

C—51 to 69 inches; brownish yellow (10YR 6/6) coarse sand; single grain; loose; few fine roots; 15 percent irregularly shaped nodules of ferruginous sandstone 6 inches or less in diameter; 10 percent very fine pebbles; medium acid.

The solum thickness ranges from 35 to 60 inches. The content of pebbles ranges from 0 to 2 percent in the solum and from 0 to 15 percent in the C horizon. In unlimed areas reaction is very strongly acid or strongly acid and very strongly acid to medium acid in the C horizon.

The Ap horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 2 through 4. It is fine sandy loam, loam, or silt loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. In some pedons, the lower part of the B horizon is mottled. Some pedons have a B1 horizon that is dominantly loam. The Bt horizon is sandy loam, sandy clay loam, loam, or clay loam. The B3 horizon is loam or sandy loam.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 4 through 8. Some pedons are mottled brown and gray. The C horizon is commonly stratified.

Suffolk series

Soils of the Suffolk series are deep and well drained. They formed in coarse textured to medium textured fluvial sediments. These soils are on uplands of the Coastal Plain. Slopes range from 0 to 6 percent.

Suffolk soils in this survey area are a taxadjunct to the Suffolk series. Suffolk soils in this survey area have a thicker solum, have more sand in the particle-size control section, and have leached, brittle and compact areas in the lower part of the B horizon. The Suffolk soils in this survey area are classsified coarse-loamy, siliceous, thermic Typic Hapludults.

Suffolk soils are commonly near Emporia, Kempsville, Rumford and Savannah soils. Suffolk soils have less clay in the textural control section than Emporia or Kempsville soils; have a leached, brittle and compact area not typical of Rumford soils; and do not have the fragipan typical of Savannah soils.

Typical pedon of Suffolk sandy loam, 2 to 6 percent slopes, 500 yards southeast of the intersection of VA-615 and VA-616, 133 yards south of VA-615, and 15 yards northeast of a farm lane:

Ap—0 to 10 inches; brown (10YR 5/4) sandy loam; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; common medium continuous vertical tubular pores; neutral; abrupt smooth boundary.

B21t—10 to 16 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common medium continuous vertical tubular pores and common very fine interstitial pores; thin patchy films of clay in some larger tubular pores; slightly acid; clear smooth boundary.

B22t—16 to 23 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; common continuous vertical tubular pores and many very fine interstitial pores; thin patchy films of clay on ped surfaces and thin continuous films in tubular pores; medium acid; clear wavy boundary.

B23t—23 to 29 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; common very fine roots; few medium continuous vertical tubular pores and common very fine interstitial pores; thin patchy films of clay; strongly acid; clear wavy boundary.

B31t—29 to 42 inches; strong brown (7.5YR 5/8) loamy sand; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; common very fine roots; common very fine interstitial pores and few fine continuous vertical tubular pores; thin very patchy films of clay and sand grains coated and bridged with clay; few thin lenses of white uncoated sand; few stripped pale brown (10YR 6/3) bodies coated with thin strong brown (7.5YR 5/8) films of clay; strongly acid; gradual wavy boundary.

B32t & A'2—42 to 50 inches; reddish yellow (7.5YR 6/8) loamy sand (B32t); massive; very friable, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores and few fine continuous vertical tubular pores; sand grains coated and bridged with clay; few thin lenses of white uncoated sand; common stripped pale brown (10YR 6/3) bodies (A'2) coated with thin strong brown (7.5YR 5/8) films of clay; strongly acid; clear smooth boundary.

A'2 & B'24t—50 to 57 inches; pale brown (10YR 6/3) loamy sand (A'2); coarse distinct yellowish red (5YR

5/8) pockets of sandy loam (B'24t); massive; friable, compact in place, nonsticky, nonplastic; few very fine roots; many very fine interstitial pores and few fine continuous vertical tubular pores; few fine pebbles less than 1/4 inch in diameter; thin patchy films of clay on interface between 10YR 6/3 matrix and 5YR 5/8 mottles; thin continuous films of clay in pores; strongly acid; abrupt broken boundary.

B'25t—57 to 67 inches; red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common very fine interstitial pores; thin continuous films of clay; strongly acid.

The solum thickness ranges from 50 to 80 inches or more. A few ironstone fragments and pebbles, up to 10 percent of the volume, are in some pedons. Reaction in unlimed areas is strongly acid throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 1 through 4. It is sandy loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. It is sandy loam, fine sandy loam, sandy clay loam, and loam. The B3 horizon has value of 4 to 6 and chroma of 4 through 8. It is loamy sand, loamy fine sand, or sandy loam.

The A'2 horizon has hue of 7.5YR and 10YR, value of 5 or 6, and chroma of 3 through 8. It is sand, fine sand, or loamy sand.

The B't horizon has hue of 2.5YR or 5YR and value of 4 or 5. It is sandy loam or sandy clay loam.

Tetotum series

Soils of the Tetotum series are deep and moderately well drained. They formed in sandy and loamy marine sediments. The soils are on lowlands of the Coastal Plain. Slopes range from 0 to 15 percent.

Tetotum soils are commonly near Lenoir, Nansemond, Rumford, and State soils. Tetotum soils are not as well drained as Rumford or State soils, have more clay in the textural control section than Nansemond soils, and are better drained than Lenoir soils.

Typical pedon of Tetotum loam, 0 to 2 percent slopes, 100 yards east of VA-658 and 1,000 yards west of Dickson Point:

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

B21t—8 to 16 inches; yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; thin very patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

B22t—16 to 20 inches; light olive brown (2.5Y 5/4) sandy clay loam; few fine faint light yellowish brown (2.5Y 6/4) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; thin patchy clay films on faces of peds; 2 percent semirounded pebbles 1/2 inch or less in diameter; very strongly acid; clear wavy boundary.

B23t—20 to 26 inches; yellowish brown (10YR 5/4) sandy clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; 2 percent semirounded pebbles 1/2 inch or less in diameter; very strongly acid; gradual wavy boundary.

B24t—26 to 33 inches; yellowish brown (10YR 5/4), strong brown (7.5YR 5/6), and light gray (10YR 7/2) sandy clay loam; weak fine and medium angular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; 15 percent semirounded pebbles 3 inches or less in diameter; very strongly acid; clear wavy boundary.

B31tg—33 to 46 inches; light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/6), and light gray (10YR 7/1) sandy loam; pockets of sandy clay loam and loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable, slightly sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; 10 percent semirounded pebbles 1 inch or less in diameter; very strongly acid; gradual wavy boundary.

B32tg—46 to 62 inches; light brownish gray (2.5Y 6/2) sandy clay loam; pockets of loam and sandy loam; many fine prominent reddish brown (5YR 5/4) mottles; weak medium prismatic structure parting to moderate fine and medium angular blocky; friable, slightly sticky, slightly plastic; thin very patchy clay films; 2 percent semirounded pebbles 1/2 inch or less in diameter; very strongly acid.

The solum thickness ranges from 40 to 60 inches or more. The content of rounded quartz pebbles ranges from 0 to 15 percent throughout the soil. Reaction is very strongly acid or strongly acid throughout unless the soil is limed.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 and 5, and chroma of 2 through 4. It is loam or fine sandy loam.

The upper part of the Bt horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 4 through 6. The lower part has chroma of 1 through 6. Mottles with chroma of 2 or less are commonly at a depth of more than 12 inches. The B2t horizon is loam, sandy clay loam, or clay loam. The B3 horizon is sandy loam or sandy clay loam.

Some pedons have a C horizon that typically is gray stratified sand. A few pedons have a clayey IIC horizon.

Turbeville series

Soils of the Turbeville series are deep and well drained. They formed in old alluvial sediments of Piedmont origin. These soils are on Coastal Plain uplands bordering the Rappahannock River. Slopes range from 0 to 10 percent.

Turbeville soils are commonly near Kempsville, Rumford, and Tetotum soils. Turbeville soils have a thicker solum than Kempsville or Rumford soils and are better drained than Tetotum soils.

Typical pedon of Turbeville loam, 2 to 6 percent slopes, 33 yards south of VA-636 and 900 yards south-southeast of the junction of VA-636 and VA-634:

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) loam; moderate medium granular structure; friable, sticky, slightly plastic; common fine roots; 2 percent rounded pebbles up to 1/4 inch in diameter; strongly acid; abrupt smooth boundary.

B21t—10 to 14 inches; yellowish red (5YR 4/6) loam; many coarse distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable, sticky, slightly plastic; few fine roots; thin very patchy clay films on faces of peds; 2 percent rounded pebbles up to 1/2 inch in diameter; few dark yellowish brown mottles of Ap material; strongly acid; gradual smooth boundary.

B22t—14 to 24 inches; yellowish red (5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few fine roots; thin patchy clay films on faces of peds; 2 percent rounded pebbles up to 1/2 inch in diameter; strongly acid; gradual smooth boundary.

B23t—24 to 31 inches; yellowish red (5YR 4/6) clay loam; moderate fine subangular blocky structure; firm, very sticky, plastic; few fine roots; thin patchy clay films on faces of peds; 2 percent rounded pebbles up to 1/2 inch in diameter; very strongly acid; gradual smooth boundary.

B24t—31 to 40 inches; red (2.5YR 4/6) clay loam; common medium faint yellowish red (5YR 4/8) mottles; moderate fine subangular blocky structure; firm, very sticky, plastic; few fine roots; thin patchy clay films on faces of peds; 2 percent rounded pebbles up to 1/2 inch in diameter; very stongly acid; gradual smooth boundary.

B25t—40 to 70 inches; red (2.5YR 4/8) clay loam; moderate medium subangular blocky structure; firm, very sticky, plastic; thin continuous clay films on faces of peds; 2 percent rounded pebbles up to 1/2 inch in diameter; strongly acid.

The solum thickness ranges from 60 to 80 inches or more. The content of quartz pebbles ranges from 0 to 15 percent throughout the soil. Reaction is very strongly acid or strongly acid throughout unless the soil is limed.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have an A1 horizon with hue of 10YR, value of 4, and chroma of 3 and an A2 horizon with hue of 10YR, value of 5, and chroma of 4. The A horizon is fine sandy loam or loam.

The upper part of the B2 horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6 through 8. It is clay loam or loam. The lower part of the B2 horizon has hue of 10R through 5YR, value of 3 or 4, and chroma of 6 through 8. It is mainly clay loam but ranges to clay. A B3 horizon is in some pedons.

formation of the soils

This section describes the factors of soil formation as they relate to the soils of Westmoreland County and describes the important processes in the development of soil layers, or horizons.

factors of soil formation

Soils are formed through the interaction of five major factors: climate, plant and animal life, parent material, topography, and time. The relative influence of each factor generally varies from place to place. Local variations in soils are caused by differences in kind of parent material, in topography, and in drainage. In one place, one factor will be dominant in the formation of a soil and determine many of its properties; in another place, another factor will be dominant. Climate, however, is fairly consistent throughout the county.

climate

Westmoreland County has a warm, continental climate that is uniform throughout the county. The average annual rainfall is about 40 inches, and the average annual air temperature is about 58 degrees F. Rainfall is well distributed throughout the year; the maximum is in July and the minimum in February. The combination of more than 40 inches of annual rainfall and an average air temperature of 50 degrees or more causes removal of plant nutrients from the soil and oxidation of the organic matter in the surface layer of the soils. In farmed areas the soils are frozen only for short periods and to a shallow depth each winter, and in wooded areas they are rarely frozen. Consequently, weathering and translocation of leachable materials are accelerated.

plant and animal life

All living organisms are important to soil formation. These include vegetation, animals, macroscopic and microscopic bacteria, and fungi. Plants supply organic debris. Burrowing animals, earthworms, and insects keep the soil open and porous. Soil bacteria and other micro-organisms act to decompose plant material into organic matter that is incorporated into the soil. Man has also altered the surface layer of the soil by clearing woodland, plowing, adding farm chemicals, and mixing soil layers.

Organic matter does not accumulate in large quantities in the soils of Westmoreland County. The soils formed under a forest vegetation, which is generally low in organic matter content, and the present climate causes rapid decay of plant material, oxidation of organic matter, and leaching.

parent material

All of the parent material that has given rise to the soils of Westmoreland County is transported material that has been moved by marine and stream action. The transported material consists of sediments in three main landscape positions on the Coastal Plain: (1) upland terraces and side slopes, (2) lowland terraces, and (3) swamps and tidal marshes. These sediments are several hundred feet thick and are mostly of fluviomarine origin, but the river terrace on the Rappahannock River consists of fluvial sediments of Piedmont origin. All the soils of Westmoreland County are underlain by sand. The surface textures range from sand to clay. Among the soils formed on the upland terrace are Savannah, Emporia, Suffolk, and Kempsville soils. Among those of the lowland terraces are Leaf, Lenoir, Lumbee, Rumford, State, and Tetotum soils. The Bohicket, Rappahannock, Levy, and Bibb soils are dominant in the swamps and tidal marshes.

topography and time

Topography, or relief, modifies the effects of other soil-forming factors so that in many places more than one kind of soil forms from similar parent material. For example, adjacent Tetotum and Lumbee soils formed in similar parent material, but the slightly higher Tetotum soils are moderately well drained and the Lumbee soils are poorly drained.

The soils of Westmoreland County have a wide range in age. For example, the soils of the older upland ridges, such as Kempsville soils, are well developed, but other soils, such as Catpoint soils, have little or no development and are known as young soils. Time is one of the main factors for subsoil development.

major soil horizons

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface down to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, called A, B, and C. These major horizons may be further subdivided by the use of numbers and letters to indicate changes within one horizon. An example would be the B2t horizon, a B horizon that contains an accumulation of clay.

The A horizon is the surface layer. An A1 horizon is that part of the surface layer that has the largest accumulation of organic matter. The A horizon is also the layer of maximum leaching and eluviation of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, this horizon is called an A2 horizon.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. In some soils the B horizon has been formed by alteration in place rather than by illuviation. The alteration can be caused by oxidation and reduction of iron or by the weathering of clay minerals. The B horizon commonly has blocky or prismatic structure, and it generally is firmer and lighter in color than the A1 horizon but darker in color than the C horizon.

The C horizon is below the B horizon, or in some places below the A horizon. It consists of materials that are little altered by the soil-forming processes, but it can be modified by weathering.

processes of soil horizon differentiation

Several processes are involved in the formation of the soils of Westmoreland County. Among these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes are continually taking place, generally at the same time, throughout the profile. Such processes have been going on for thousands of years.

The accumulation and incorporation of organic matter take place with the decomposition of plant residue. The organic matter darkens the surface layer and helps to form the A1 horizon. Organic matter, once lost, normally takes a long time to replace. In Westmoreland County the organic matter content of the surface layer averages about 1 percent.

For soils to have distinct subsoil horizons, it is believed that some of the lime and soluble salts must be leached before the translocation of clay minerals takes place. Among the factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

Well drained and moderately well drained soils in Westmoreland County have a yellowish brown to yellowish red subsoil. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains, but in some soils the colors are inherited from the materials in which they formed. The structure is weak to moderate, subangular blocky, and the subsoil contains more clay than the overlying surface layer.

A fragipan has developed in the subsoil of one moderately well drained soil in the county. The fragipan is very firm and brittle when moist, and it is very hard when dry. Soil particles are tightly packed so that bulk density is high and pore space is low. Genesis of this horizon is not fully understood, but studies show that swelling and shrinking take place in alternating wet and dry periods. This may account for the packing of soil particles, and also for a gross polygonal pattern of cracks in the fragipan. Clay, silica, and oxides of aluminum are the most likely cementing agents causing brittleness and hardness.

The reduction and transfer of iron, called gleying, is associated mainly with the wet, more poorly drained soils. Moderately well drained to somewhat poorly drained soils have yellowish brown and strong brown mottles, which indicate the segregation of iron. In poorly drained soils, such as Leaf and Lumbee soils, the subsoil and underlying materials are grayish colored, which indicates reduction and transfer of iron by removal in solution.

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glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

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 water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1963-78 at Colonial Beach, Va.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	45.3	25.7	35.5	72	2	81	3.24	1.91	4.42	6	1.9
February---	49.7	27.7	38.8	74	6	105	2.71	1.10	4.06	6	.7
March------	57.4	35.3	46.4	81	14	231	3.50	2.04	4.80	8	.2
April------	68.5	43.9	56.2	89	25	486	2.66	1.18	3.91	6	.0
May--------	77.9	55.1	66.4	94	37	818	4.09	1.96	5.93	8	.0
June-------	85.1	63.6	74.5	96	45	1,035	3.59	1.91	5.05	6	.0
July-------	88.7	68.3	78.6	98	55	1,197	4.12	2.58	5.50	8	.0
August-----	88.0	66.3	77.3	96	54	1,156	3.48	1.54	5.13	6	.0
September--	81.8	61.2	71.6	95	44	948	3.64	1.38	5.52	5	.0
October----	69.9	49.1	59.5	86	31	605	2.73	1.09	4.10	5	.0
November---	60.2	39.7	50.0	81	20	300	2.79	1.01	4.27	5	.0
December---	50.9	31.2	41.0	73	12	159	3.69	1.79	5.33	7	1.4
Yearly:											
Average--	68.6	47.3	58.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	199	-1	---	---	---	---	---	---
Total----	---	---	---	---	---	7,121	40.24	32.30	48.02	76	4.2

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1963-78 at Colonial Beach, Va.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 5	April 21	April 29
2 years in 10 later than--	March 29	April 14	April 22
5 years in 10 later than--	March 16	March 30	April 9
First freezing temperature in fall:			
1 year in 10 earlier than--	November 11	October 28	October 20
2 years in 10 earlier than--	November 16	November 3	October 26
5 years in 10 earlier than--	November 25	November 14	November 8

TABLE 3.--GROWING SEASON

[Recorded in the period 1963-78 at Colonial Beach, Va.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	227	199	181
8 years in 10	236	209	192
5 years in 10	253	228	212
2 years in 10	271	247	233
1 year in 10	280	257	244

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1A	Ackwater silt loam, 0 to 2 percent slopes	673	0.4
1B	Ackwater silt loam, 2 to 6 percent slopes	419	0.3
2	Bibb and Levy soils	4,476	2.7
3	Bohicket silty clay loam	1,640	1.0
4	Bojac loamy sand	1,452	0.9
5B	Catpoint loamy sand, 0 to 6 percent slopes	947	0.6
6B	Emporia loam, 2 to 6 percent slopes	5,536	3.4
7A	Kempsville loam, 0 to 2 percent slopes	6,061	3.7
7B	Kempsville loam, 2 to 6 percent slopes	11,737	7.1
8	Leaf silt loam	6,691	4.1
9	Lenoir silt loam	2,445	1.5
10	Lumbee loam	9,531	5.8
11A	Montross silt loam, 0 to 2 percent slopes	3,376	2.1
11B	Montross silt loam, 2 to 6 percent slopes	1,636	1.0
12	Nansemond fine sandy loam	5,339	3.2
13	Pamunkey fine sandy loam, wet substratum	1,073	0.7
14	Pits, sand and gravel	329	0.2
15	Rappahannock muck	757	0.5
16B	Rumford fine sandy loam, 0 to 6 percent slopes	4,531	2.8
17E	Rumford soils, 15 to 50 percent slopes	38,094	23.0
18D	Rumford and Tetotum soils, 6 to 15 percent slopes	10,010	6.1
19A	Savannah loam, 0 to 2 percent slopes	881	0.5
19B	Savannah loam, 2 to 6 percent slopes	1,224	0.7
20A	State fine sandy loam, 0 to 2 percent slopes	3,496	2.1
20B	State fine sandy loam, 2 to 6 percent slopes	1,476	0.9
21A	Suffolk sandy loam, 0 to 2 percent slopes	4,899	3.0
21B	Suffolk sandy loam, 2 to 6 percent slopes	12,197	7.4
22A	Tetotum loam, 0 to 2 percent slopes	5,643	3.4
22B	Tetotum loam, 2 to 6 percent slopes	2,593	1.6
23A	Turbeville loam, 0 to 2 percent slopes	292	0.2
23B	Turbeville loam, 2 to 6 percent slopes	1,219	0.7
23C	Turbeville loam, 6 to 10 percent slopes	367	0.2
W	Water	13,633	8.2
	Total	164,673	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Soybeans	Barley	Wheat	Tall fescue	Grass-legume hay
	Bu	Ton	Bu	Bu	Bu	AUM*	Ton
1A---------------------- Ackwater	90	18	30	50	30	7.0	3.5
1B---------------------- Ackwater	80	16	25	50	30	6.5	3.5
2----------------------- Bibb and Levy	---	---	---	---	---	---	---
3----------------------- Bohicket	---	---	---	---	---	---	---
4----------------------- Bojac	90	18	35	65	40	7.5	2.8
5B---------------------- Catpoint	60	14	20	50	20	6.0	2.0
6B---------------------- Emporia	100	20	30	75	50	8.5	5.0
7A---------------------- Kempsville	150	30	40	75	50	9.5	5.0
7B---------------------- Kempsville	145	29	40	70	50	9.5	5.0
8----------------------- Leaf	90	18	35	50	30	8.0	4.5
9----------------------- Lenoir	100	20	40	50	30	10.0	4.5
10---------------------- Lumbee	110	22	45	50	30	9.0	5.0
11A--------------------- Montross	110	22	30	50	30	8.5	3.5
11B--------------------- Montross	105	21	25	45	25	7.5	3.5
12---------------------- Nansemond	130	26	40	70	45	8.5	5.0
13---------------------- Pamunkey	160	32	45	80	50	10.0	5.0
14**. Pits							
15---------------------- Rappahannock	---	---	---	---	---	---	---
16B--------------------- Rumford	100	20	20	65	25	7.5	2.8
17E--------------------- Rumford	---	---	---	---	---	5.5	---
18D--------------------- Rumford and Tetotum	---	---	---	---	---	6.5	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Soybeans	Barley	Wheat	Tall fescue	Grass-legume hay
	Bu	Ton	Bu	Bu	Bu	AUM*	Ton
19A----------------------- Savannah	110	22	35	60	45	8.0	3.0
19B----------------------- Savannah	100	20	35	60	45	8.0	3.0
20A----------------------- State	130	26	45	75	60	8.5	5.1
20B----------------------- State	120	24	40	70	60	8.0	5.1
21A, 21B------------------ Suffolk	120	24	40	70	45	7.5	4.5
22A----------------------- Tetotum	150	30	40	75	45	9.5	5.0
22B----------------------- Tetotum	145	29	35	70	35	9.0	5.0
23A----------------------- Turbeville	130	26	45	75	50	9.0	4.5
23B----------------------- Turbeville	120	24	40	75	50	8.5	4.0
23C----------------------- Turbeville	110	22	35	60	50	8.0	3.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
1A, 1B: Ackwater	3w	Slight	Moderate	Slight	Slight	Loblolly pine	77	Loblolly pine, sweetgum.
						Southern red oak	70	
						White oak	70	
						Sweetgum	77	
2*:								
Bibb	2w	Slight	Severe	Severe	---------	Loblolly pine	90	Eastern cottonwood, loblolly pine, sweetgum, yellow-poplar.
						Sweetgum	90	
						Water oak	90	
Levy	3w	Slight	Severe	Severe	Slight	Water tupelo	---	Baldcypress.
						Sweetgum	---	
						Red maple	---	
						Baldcypress	---	
4: Bojac	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Loblolly pine, sweetgum.
						Virginia pine	75	
						Loblolly pine	80	
						Sweetgum	80	
5B: Catpoint	3s	Slight	Moderate	Moderate	Slight	Loblolly pine	80	Loblolly pine.
						Longleaf pine	80	
						Sweetgum	80	
6B: Emporia	3o	Slight	Slight	Slight	Slight	Loblolly pine	75	Loblolly pine, sweetgum.
						Southern red oak	70	
7A, 7B: Kempsville	3o	Slight	Slight	Slight	Slight	Southern red oak	75	Loblolly pine.
						Loblolly pine	82	
						Virginia pine	75	
						Sweetgum	85	
						Yellow-poplar	85	
8: Leaf	2w	Slight	Severe	Severe	Slight	Loblolly pine	90	Loblolly pine, Shumard oak, sweetgum.
						Sweetgum	90	
9: Lenoir	2w	Slight	Moderate	Moderate	---------	Loblolly pine	90	Loblolly pine, longleaf pine, sweetgum, American sycamore.
10: Lumbee	2w	Slight	Severe	Severe	---------	Loblolly pine	94	Loblolly pine, water tupelo, sweetgum.
						Pond pine	---	
						Water tupelo	---	
						Sweetgum	---	
						White oak	---	
11A: Montross	3w	Slight	Moderate	Slight	Moderate	Loblolly pine	75	Loblolly pine.
						Virginia pine	70	
						Northern red oak	70	
						Chestnut oak	70	
11B: Montross	3w	Moderate	Moderate	Slight	Moderate	Loblolly pine	75	Loblolly pine.
						Virginia pine	70	
						Northern red oak	70	
						Chestnut oak	70	
12: Nansemond	2w	Slight	Moderate	Slight	Moderate	Loblolly pine	88	Loblolly pine, yellow-poplar, black walnut, sweetgum.
						Sweetgum	84	
						Shortleaf pine	77	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
13----------------- Pamunkey	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Loblolly pine-------	80 90 90	Loblolly pine, yellow-poplar.
16B---------------- Rumford	3o	Slight	Slight	Slight	Slight	Southern red oak---- Virginia pine------- Loblolly pine-------	65 70 80	Loblolly pine, Virginia pine.
17E*--------------- Rumford	3r	Slight	Moderate	Slight	Slight	Southern red oak---- Virginia pine------- Loblolly pine-------	65 70 80	Loblolly pine, Virginia pine.
18D*:								
Rumford-----------	3o	Slight	Slight	Slight	Slight	Southern red oak---- Virginia pine------- Loblolly pine-------	65 70 80	Loblolly pine, Virginia pine.
Tetotum-----------	3w	Slight	Moderate	Slight	Slight	Loblolly pine------- Sweetgum------------ Southern red oak----	84 80 70	Loblolly pine.
19A, 19B----------- Savannah	2o	Slight	Slight	Slight	Moderate	Loblolly pine------- Longleaf pine------- Sweetgum------------	88 78 85	Loblolly pine, sweetgum, American sycamore, yellow-poplar.
20A, 20B----------- State	1o	Slight	Slight	Slight	Slight	Southern red oak---- Yellow-poplar------- Virginia pine------- Loblolly pine-------	75 95 80 85	Black walnut, yellow-poplar, loblolly pine.
21A, 21B----------- Suffolk	3o	Slight	Slight	Slight	Slight	Loblolly pine------- Shortleaf pine------	83 70	Loblolly pine, shortleaf pine.
22A, 22B----------- Tetotum	3w	Slight	Moderate	Slight	Slight	Loblolly pine------- Sweetgum------------ Southern red oak----	84 80 70	Loblolly pine.
23A, 23B, 23C------ Turbeville	3o	Slight	Slight	Slight	Slight	Loblolly pine------- Yellow-poplar------- Virginia pine------- Shortleaf pine------ Southern red oak----	80 85 70 70 70	Loblolly pine, yellow-poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

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

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1A, 1B: Ackwater	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
2*:					
Bibb	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Levy	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
3: Bohicket	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess salt.	Severe: ponding, flooding.	Severe: ponding.	Severe: excess salt, excess sulfur, ponding.
4: Bojac	Slight	Slight	Slight	Slight	Moderate: droughty.
5B: Catpoint	Slight	Slight	Moderate: slope, small stones.	Slight	Severe: droughty.
6B: Emporia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
7A: Kempsville	Slight	Slight	Slight	Slight	Slight.
7B: Kempsville	Slight	Slight	Moderate: slope.	Slight	Slight.
8: Leaf	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
9: Lenoir	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
10: Lumbee	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
11A, 11B: Montross	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
12: Nansemond	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
13: Pamunkey	Slight	Slight	Slight	Slight	Slight.
14*. Pits					
15: Rappahannock	Severe: flooding, excess salt, excess humus.	Severe: wetness, excess humus, excess salt.	Severe: excess humus, excess salt, flooding.	Severe: wetness, excess humus, flooding.	Severe: excess salt, excess sulfur, flooding.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
16B------------------- Rumford	Slight----------	Slight----------	Moderate: slope, small stones.	Slight------------	Slight.
17E*------------------ Rumford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18D*:					
Rumford--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: droughty, slope.
Tetotum--------------	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope.
19A------------------ Savannah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
19B------------------ Savannah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
20A------------------ State	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
20B------------------ State	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
21A------------------ Suffolk	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
21B------------------ Suffolk	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
22A------------------ Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Moderate: wetness.	Moderate: wetness.
22B------------------ Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: wetness.
23A------------------ Turbeville	Slight----------	Slight----------	Moderate: small stones.	Slight------------	Moderate: large stones.
23B------------------ Turbeville	Slight----------	Slight----------	Moderate: slope, small stones.	Slight------------	Moderate: small stones.
23C------------------ Turbeville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1A, 1B------------- Ackwater	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Poor.
2*:										
Bibb--------------	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Levy--------------	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Good	Good	Very poor.	Very poor.	Good.
3----------------- Bohicket	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
4----------------- Bojac	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
5B---------------- Catpoint	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
6B---------------- Emporia	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
7A, 7B------------ Kempsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8----------------- Leaf	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
9----------------- Lenoir	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
10---------------- Lumbee	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
11A--------------- Montross	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
11B--------------- Montross	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12---------------- Nansemond	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
13---------------- Pamunkey	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
14*. Pits										
15---------------- Rappahannock	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
16B--------------- Rumford	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17E*-------------- Rumford	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18D*:										
Rumford-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
18D*:										
Tetotum	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
19A, 19B Savannah	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
20A, 20B State	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
21A, 21B Suffolk	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
22A Tetotum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
22B Tetotum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
23A, 23B Turbeville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
23C Turbeville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

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

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1A, 1B----------- Ackwater	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
2*:						
Bibb------------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Levy------------	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
3---------------- Bohicket	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
4---------------- Bojac	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
5B--------------- Catpoint	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Severe: droughty.
6B--------------- Emporia	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength.	Slight.
7A--------------- Kempsville	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
7B--------------- Kempsville	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
8---------------- Leaf	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness.
9---------------- Lenoir	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
10--------------- Lumbee	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.
11A, 11B--------- Montross	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
12--------------- Nansemond	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
13--------------- Pamunkey	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: low strength.	Slight.
14*. Pits						
15--------------- Rappahannock	Severe: excess humus, ponding, flooding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: excess salt, excess sulfur, flooding.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
16B: Rumford	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
17E*: Rumford	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18D*:						
Rumford	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: low strength, wetness, slope.	Moderate: wetness, slope.
19A: Savannah	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
19B: Savannah	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness.
20A: State	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: low strength.	Slight.
20B: State	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: low strength.	Slight.
21A, 21B: Suffolk	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
22A: Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
22B: Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Moderate: wetness.
23A: Turbeville	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: small stones.
23B: Turbeville	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: small stones.
23C: Turbeville	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1A, 1B: Ackwater	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
2*:					
Bibb	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Levy	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
3: Bohicket	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
4: Bojac	Moderate: wetness.	Severe: seepage.	Severe: wetness, seepage.	Severe: seepage.	Fair: thin layer.
5B: Catpoint	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Severe: seepage, too sandy.
6B: Emporia	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.
7A: Kempsville	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too clayey.
7B: Kempsville	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: too clayey.
8: Leaf	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
9: Lenoir	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
10: Lumbee	Severe: wetness.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
11A: Montross	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
11B: Montross	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12------------------ Nansemond	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
13------------------ Pamunkey	Moderate: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
14*. Pits					
15------------------ Rappahannock	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
16B----------------- Rumford	Slight-----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
17E*---------------- Rumford	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
18D*:					
Rumford------------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Tetotum------------	Severe: wetness.	Severe: wetness, seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, small stones, slope.
19A, 19B------------ Savannah	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
20A, 20B------------ State	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
21A, 21B------------ Suffolk	Moderate: percs slowly.	Severe: seepage.	Slight-----------	Severe: seepage.	Good.
22A, 22B------------ Tetotum	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
23A----------------- Turbeville	Moderate: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
23B----------------- Turbeville	Moderate: percs slowly.	Moderate: slope, large stones.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
23C----------------- Turbeville	Moderate: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1A, 1B: Ackwater	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
2*:				
Bibb	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Levy	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3: Bohicket	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
4: Bojac	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: thin layer.
5B: Catpoint	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, area reclaim.
6B: Emporia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
7A, 7B: Kempsville	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
8: Leaf	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness, too clayey.
9: Lenoir	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
10: Lumbee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
11A, 11B: Montross	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
12: Nansemond	Fair: wetness.	Improbable: thin layer.	Improbable: excess fines.	Fair: thin layer.
13: Pamunkey	Fair: low strength.	Improbable: thin layer.	Improbable: thin layer, too sandy.	Fair: small stones, area reclaim.
14*. Pits				
15: Rappahannock	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, excess salt, wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
16B: Rumford	Good	Improbable: thin layer.	Probable	Fair: small stones, area reclaim.
17E*: Rumford	Poor: slope.	Improbable: thin layer.	Probable	Poor: slope.
18D*:				
Rumford	Good	Improbable: thin layer.	Probable	Fair: small stones, area reclaim, slope.
Tetotum	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
19A, 19B: Savannah	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
20A, 20B: State	Fair: low strength.	Improbable: thin layer.	Improbable: thin layer.	Fair: too clayey.
21A, 21B: Suffolk	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
22A, 22B: Tetotum	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
23A, 23B: Turbeville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
23C: Turbeville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
1A: Ackwater	Slight	Severe: hard to pack.	Severe: no water.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, percs slowly.
1B: Ackwater	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, erodes easily, slope.	Erodes easily, percs slowly.
2*:						
Bibb	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding	Wetness, flooding.	Wetness.
Levy	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Wetness, percs slowly.
3: Bohicket	Slight	Severe: hard to pack, ponding, excess salt.	Severe: slow refill, salty water.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Wetness, excess salt, percs slowly.
4: Bojac	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Fast intake, soil blowing.	Droughty.
5B: Catpoint	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
6B: Emporia	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Percs slowly.
7A: Kempsville	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Soil blowing	Favorable.
7B: Kempsville	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Soil blowing, slope.	Favorable.
8: Leaf	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.
9: Lenoir	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
10: Lumbee	Severe: seepage.	Severe: wetness.	Slight	Cutbanks cave	Wetness	Wetness.
11A: Montross	Slight	Moderate: piping, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
11B: Montross	Moderate: slope.	Moderate: piping, wetness.	Severe: slow refill.	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Wetness, erodes easily, percs slowly.
12: Nansemond	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Favorable.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
13----------------- Pamunkey	Severe: seepage.	Moderate: thin layer, piping.	Moderate: deep to water, slow refill.	Deep to water	Soil blowing---	Favorable.
14*. Pits						
15----------------- Rappahannock	Slight---------	Severe: excess humus, ponding.	Moderate: salty water.	Flooding, excess salt, excess sulfur.	Ponding, flooding, excess salt.	Wetness, excess salt.
16B---------------- Rumford	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Favorable.
17E*--------------- Rumford	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
18D*:						
Rumford----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
Tetotum----------	Severe: slope.	Severe: wetness.	Moderate: slow refill.	Slope----------	Slope, wetness.	Slope.
19A---------------- Savannah	Moderate: seepage.	Severe: piping.	Severe: no water.	Favorable------	Wetness, rooting depth.	Erodes easily, rooting depth.
19B---------------- Savannah	Moderate: seepage.	Severe: piping.	Severe: no water.	Slope----------	Wetness, rooting depth, slope.	Erodes easily, rooting depth.
20A---------------- State	Severe: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Soil blowing---	Favorable.
20B---------------- State	Severe: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Soil blowing, slope.	Favorable.
21A, 21B---------- Suffolk	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
22A---------------- Tetotum	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Favorable------	Wetness--------	Favorable.
22B---------------- Tetotum	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Slope----------	Slope, wetness.	Favorable.
23A---------------- Turbeville	Moderate: seepage.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
23B---------------- Turbeville	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Favorable.
23C---------------- Turbeville	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1A, 1B----------- Ackwater	0-10	Silt loam--------	SM, SC, CL-ML	A-4	0	95-100	95-100	65-95	45-90	<25	NP-8
	10-70	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	95-100	85-100	75-95	40-75	15-45
2*:											
Bibb------------	0-31	Sandy loam-------	SM, SM-SC, ML, CL-ML	A-2, A-4	0-5	95-100	90-100	60-90	30-60	<25	NP-7
	31-60	Sandy loam, loam, silt loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0-10	60-100	50-100	40-100	30-90	<30	NP-7
Levy------------	0-3	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	98-100	85-100	30-65	12-35
	3-54	Silty clay, clay, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	98-100	85-100	35-65	15-35
	54-60	Variable---------	---	---	---	---	---	---	---	---	---
3---------------- Bohicket	0-8	Silty clay loam	CH	A-7	0	100	99-100	98-100	90-100	60-100	30-60
	8-60	Silty clay, clay, sandy clay.	CH, MH	A-7	0	100	99-100	90-100	70-95	50-100	19-60
	60-80	Variable---------	---	---	---	---	---	---	---	---	---
4---------------- Bojac	0-10	Loamy sand-------	SM	A-2	0	95-100	95-100	50-100	15-30	<20	NP
	10-54	Fine sandy loam, loam, sandy loam.	ML, SM	A-2, A-4	0	95-100	95-100	55-100	20-60	<35	NP-10
	54-70	Stratified loamy fine sand to coarse sand.	SM, SP, SW-SM	A-2, A-1, A-3	0	80-100	75-100	12-100	2-35	<20	NP
5B--------------- Catpoint	0-9	Loamy sand-------	SM, SW-SM	A-1, A-2	0	85-100	75-100	40-70	10-35	<10	NP-5
	9-45	Sand, loamy fine sand, gravelly sand.	SM, SW, SW-SM	A-1, A-2, A-3	0	65-100	60-100	30-70	4-35	<10	NP-5
	45-68	Fine sand, very gravelly sand, loamy sand.	GM, SM, GW-GM, SW-SM	A-1, A-2, A-3	0-5	25-100	15-100	8-65	4-35	<10	NP-5
6B--------------- Emporia	0-14	Loam-------------	CL, SC, SM, ML	A-2, A-4	0-3	90-100	80-100	50-95	25-65	<25	NP-15
	14-20	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-2, A-4, A-6, A-7	0-2	90-100	80-100	45-95	25-70	20-50	8-30
	20-44	Sandy clay loam, clay loam, sandy clay.	SC, CL	A-2, A-4, A-6, A-7	0-2	90-100	80-100	45-95	30-80	25-50	8-30
	44-65	Stratified sandy loam to clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	30-90	20-60	<40	NP-25
7A, 7B----------- Kempsville	0-8	Loam-------------	SM, SM-SC, ML, CL-ML	A-2, A-4	0-2	90-100	75-100	45-85	25-65	<18	NP-7
	8-23	Sandy loam, fine sandy loam, loam.	SM, SC, ML, CL	A-2, A-4	0-2	90-100	75-100	50-90	30-70	<22	NP-10
	23-32	Sandy clay loam, clay loam, loam.	SC, CL	A-2, A-6	0-2	90-100	75-100	55-95	30-75	25-40	10-20
	32-64	Stratified loamy sand to sandy clay loam.	SC, SM	A-1, A-2, A-4, A-6	0-5	85-100	75-100	35-85	15-50	<30	NP-15
8---------------- Leaf	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	95-100	70-100	50-90	30-40	5-15
	7-70	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	95-100	90-100	75-95	42-65	20-38

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
9---------------- Lenoir	0-5	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-95	60-85	<35	<10
	5-65	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-95	55-95	30-55	11-35
10---------------- Lumbee	0-7	Loam-------------	SM, SM-SC	A-2, A-4	0	100	85-100	65-98	15-45	<20	NP-7
	7-27	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-4, A-6, A-7	0	100	90-100	65-98	36-60	19-45	7-25
	27-60	Loamy sand, sand, fine sand.	SP, SM, SP-SM	A-2, A-3	0	90-100	85-100	50-90	4-25	---	NP
11A, 11B--------- Montross	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	75-90	55-80	15-30	2-15
	11-21	Silt loam, silty clay loam, clay loam.	ML, CL	A-6, A-7	0	95-100	90-100	80-90	65-90	25-45	10-25
	21-75	Silty clay loam, clay loam, clay.	ML, CL	A-6, A-7	0	95-100	90-100	80-90	65-90	35-50	15-25
12---------------- Nansemond	0-11	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	95-100	60-80	30-50	<25	NP-10
	11-32	Fine sandy loam, sandy loam.	SM, SM-SC, SC	A-2, A-4, A-6	0	100	95-100	60-85	30-50	<25	NP-15
	32-48	Loamy fine sand, loamy sand.	SM, SM-SC	A-2, A-4	0	100	95-100	45-95	15-50	<25	NP-10
	48-65	Sand, loamy fine sand, loamy sand.	SM, SM-SC, SP-SM	A-2, A-3, A-4, A-1	0	95-100	75-100	40-95	5-50	<25	NP-7
13---------------- Pamunkey	0-11	Fine sandy loam	SM, ML, SP-SM, SM-SC	A-2, A-4	0	95-100	90-100	50-85	12-55	<20	NP-7
	11-43	Sandy clay loam, clay loam, loam.	CL, SC	A-2, A-6	0-5	80-100	75-100	70-95	30-75	30-40	10-20
	43-64	Stratified sandy loam to sand.	SW, SM, SW-SM, SM-SC	A-1, A-2, A-3	0-10	60-100	50-95	25-70	2-35	<20	NP-6
14*. Pits											
15---------------- Rappahannock	0-16	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	16-32	Stratified silt loam to clay.	CL, SC, ML, SM	A-6, A-4, A-2	---	100	100	95-100	15-95	<40	NP-20
	32-70	Variable---------	---	---	---	---	---	---	---	---	---
16B--------------- Rumford	0-8	Fine sandy loam	SM, SM-SC	A-2, A-4	0	90-100	85-100	55-85	30-50	<25	NP-6
	8-31	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	55-85	30-50	<34	NP-12
	31-60	Stratified sandy loam to gravelly sand.	SM, SP, GP, GM	A-1, A-2, A-3, A-4	0	50-100	35-100	20-85	2-40	<25	NP-6
17E*-------------- Rumford	0-8	Loamy sand-------	SM	A-2, A-1	0	90-100	85-100	45-75	15-30	<20	NP
	8-31	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	55-85	30-50	<34	NP-12
	31-60	Stratified sandy loam to gravelly sand.	SM, SP, GP, GM	A-1, A-2, A-3, A-4	0	50-100	35-100	20-85	2-40	<25	NP-6
18D*: Rumford---------	0-8	Sandy loam-------	SM	A-2, A-1	0	90-100	85-100	45-75	15-30	<20	NP
	8-31	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	55-85	30-50	<34	NP-12
	31-60	Stratified sandy loam to gravelly sand.	SM, SP, GP, GM	A-1, A-2, A-3, A-4	0	50-100	35-100	20-85	2-40	<25	NP-6

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
18D*:											
Tetotum	0-16	Sandy loam	SM, ML	A-2, A-4	0	85-100	75-100	45-85	25-55	<30	NP-7
	16-33	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-6, A-7	0-2	85-100	75-100	60-95	35-85	30-45	10-20
	33-62	Stratified clay loam to loamy fine sand.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
19A, 19B Savannah	0-7	Loam	ML, CL-ML	A-4	0	100	100	80-100	60-90	<25	NP-7
	7-19	Sandy clay loam, clay loam, loam.	CL, SC, CL-ML	A-4, A-6	0	100	100	80-100	40-80	23-40	7-19
	19-56	Loam, clay loam, sandy clay loam.	CL, SC, CL-ML	A-4, A-6, A-7	0	100	100	80-100	40-80	23-43	7-19
20A, 20B State	0-9	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	95-100	95-100	65-100	40-85	<35	NP-7
	9-37	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	75-100	35-80	24-40	8-25
	37-64	Stratified sand to fine sandy loam.	SM, SM-SC, SP-SM	A-2, A-3, A-4	0	85-100	75-100	40-90	5-50	<25	NP-7
21A, 21B Suffolk	0-10	Sandy loam	SM	A-4	0	90-100	90-100	70-85	36-45	<30	NP-4
	10-29	Sandy loam, fine sandy loam.	SM, SC, SM-SC	A-4	0	90-100	90-100	85-95	36-45	<30	NP-10
	29-57	Loamy fine sand	SM	A-2	0	90-100	90-100	50-75	15-30	<20	NP-4
	57-67	Sandy loam, sandy clay loam, loam.	SC, ML, CL, SM	A-4, A-6	0	90-100	90-100	70-80	36-55	30-40	6-15
22A, 22B Tetotum	0-16	Loam	SM, SC, ML, CL	A-4, A-6	0	85-100	75-100	65-95	45-85	<30	NP-15
	16-33	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-6, A-7	0-2	85-100	75-100	60-95	35-85	30-45	10-20
	33-62	Stratified clay loam to loamy fine sand.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
23A, 23B, 23C Turbeville	0-14	Loam	ML, SM, CL-ML	A-2, A-4	0-20	80-100	75-100	50-90	30-75	<28	NP-7
	14-70	Clay, clay loam, sandy clay.	CL, MH, CH	A-7	0-20	70-100	65-100	60-100	55-95	45-65	16-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
1A, 1B----------- Ackwater	0-10	8-15	1.20-1.30	0.6-2.0	0.10-0.17	3.6-5.5	<2	Low----------	0.43	2	.5-2
	10-70	35-60	1.30-1.50	<0.06	0.12-0.16	3.6-5.5	<2	High---------	0.32		
2*:											
Bibb------------	0-31	2-18	1.20-1.40	0.6-2.0	0.12-0.18	4.5-5.5	<2	Low----------	0.20	5	.5-2
	31-60	2-18	1.30-1.40	0.6-2.0	0.12-0.20	4.5-5.5	<2	Low----------	0.37		
Levy------------	0-3	27-50	0.06-1.20	0.06-0.2	0.16-0.22	3.6-5.5	<2	High---------	0.32	5	3-15
	3-54	35-60	0.05-1.10	0.06-0.2	0.16-0.22	3.6-5.5	<2	High---------	0.32		
	54-60	---	---	---	---	---	---	-------------	----		
3---------------- Bohicket	0-8	30-60	1.2-1.4	0.06-0.2	0.14-0.18	6.1-8.4	>8	High---------	0.32	5	---
	8-60	35-60	1.3-1.6	<0.06	0.12-0.16	6.1-8.4	>8	High---------	0.24		
4---------------- Bojac	0-10	3-8	1.20-1.50	6.0-20	0.05-0.08	4.5-6.5	<2	Low----------	0.28	3	.5-1
	10-54	11-16	1.35-1.55	2.0-6.0	0.08-0.17	4.5-6.5	<2	Low----------	0.28		
	54-70	1-8	1.30-1.50	>6.0	0.02-0.08	4.5-6.0	<2	Low----------	0.28		
5B--------------- Catpoint	0-9	0-10	1.20-1.50	6.0-20	0.06-0.10	4.5-6.5	<2	Low----------	0.10	5	.5-1
	9-45	0-10	1.45-1.65	6.0-20	0.02-0.10	4.5-6.5	<2	Low----------	0.10		
	45-68	0-10	1.45-1.65	6.0-20	0.01-0.08	4.5-6.5	<2	Low----------	0.10		
6B--------------- Emporia	0-14	7-18	1.30-1.40	2.0-6.0	0.10-0.17	4.5-5.5	<2	Low----------	0.28	4	<3
	14-20	18-35	1.35-1.45	0.2-2.0	0.10-0.18	4.5-5.5	<2	Low----------	0.28		
	20-44	21-40	1.45-1.60	0.06-0.6	0.10-0.16	4.5-5.5	<2	Moderate-----	0.20		
	44-65	5-34	1.45-1.60	0.06-2.0	0.08-0.18	4.5-5.5	<2	Moderate-----	0.20		
7A, 7B----------- Kempsville	0-8	5-18	1.30-1.40	2.0-6.0	0.10-0.16	4.5-5.5	<2	Low----------	0.32	3	.5-2
	8-23	12-24	1.30-1.45	2.0-6.0	0.12-0.18	4.5-5.5	<2	Low----------	0.24		
	23-32	18-40	1.35-1.65	0.6-2.0	0.12-0.18	4.5-5.5	<2	Low----------	0.24		
	32-64	5-30	1.30-1.60	<2.0	0.08-0.15	4.5-5.5	<2	Low----------	0.24		
8---------------- Leaf	0-7	12-25	1.30-1.50	0.06-0.2	0.20-0.22	3.6-5.5	<2	Low----------	0.32	4	1-3
	7-70	35-60	1.50-1.60	<0.06	0.18-0.21	3.6-5.5	<2	High---------	0.32		
9---------------- Lenoir	0-5	6-20	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	<2	Low----------	0.37	4	2-4
	5-65	35-60	1.20-1.35	0.06-0.2	0.13-0.15	4.5-5.5	<2	Moderate-----	0.32		
10--------------- Lumbee	0-7	4-18	1.55-1.70	2.0-6.0	0.08-0.12	4.5-5.5	<2	Low----------	0.24	5	2-4
	7-27	18-35	1.30-1.45	0.6-2.0	0.12-0.16	4.5-5.5	<2	Low----------	0.32		
	27-60	1-10	1.60-1.75	6.0-20	0.03-0.06	4.5-5.5	<2	Low----------	0.10		
11A, 11B--------- Montross	0-11	5-15	1.10-1.30	0.6-2.0	0.14-0.20	3.6-5.5	<2	Low----------	0.49	5	1-3
	11-21	20-35	1.20-1.50	0.6-2.0	0.16-0.20	3.6-5.5	<2	Low----------	0.55		
	21-75	27-45	1.45-1.75	0.06-0.6	0.10-0.16	3.6-5.5	<2	Moderate-----	0.37		
12--------------- Nansemond	0-11	6-15	1.20-1.50	2.0-6.0	0.08-0.13	4.5-5.5	<2	Low----------	0.20	3	1-2
	11-32	10-20	1.25-1.45	2.0-6.0	0.09-0.14	4.5-5.5	<2	Low----------	0.17		
	32-48	4-12	1.30-1.55	2.0-6.0	0.05-0.10	3.6-5.5	<2	Low----------	0.15		
	48-65	2-12	1.35-1.55	6.0-20	0.02-0.10	3.6-5.5	<2	Low----------	0.15		
13--------------- Pamunkey	0-11	3-10	1.35-1.55	2.0-20	0.06-0.15	5.6-7.3	<2	Low----------	0.28	4	0-2
	11-43	20-35	1.35-1.65	0.6-2.0	0.13-0.19	5.6-7.3	<2	Low----------	0.28		
	43-64	4-18	1.40-1.65	2.0-20	0.04-0.12	5.1-7.3	<2	Low----------	0.28		
14*. Pits											
15--------------- Rappahannock	0-16	---	0.10-1.00	0.6-2.0	0.22-0.26	5.1-8.4	<16	Low----------	----	---	20-65
	16-32	5-40	1.20-1.50	0.6-2.0	0.08-0.20	5.1-8.4	<16	Low----------	0.17		
	32-70	---	---	---	---	---	<2	-------------	----		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
16B-------------- Rumford	0-8	6-15	1.25-1.45	2.0-6.0	0.08-0.14	3.6-5.5	<2	Low----------	0.17	4	.5-2
	8-31	8-18	1.25-1.45	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low----------	0.17		
	31-60	2-18	1.25-1.50	>2.0	0.04-0.10	3.6-6.5	<2	Low----------	0.17		
17E*------------- Rumford	0-8	2-12	1.25-1.45	>6.0	0.06-0.10	3.6-5.5	<2	Low----------	0.24	4	.5-2
	8-31	8-18	1.25-1.45	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low----------	0.17		
	31-60	2-18	1.25-1.50	>2.0	0.04-0.10	3.6-6.5	<2	Low----------	0.17		
18D*:											
Rumford---------	0-8	2-12	1.25-1.45	>6.0	0.06-0.10	3.6-5.5	<2	Low----------	0.24	4	.5-2
	8-31	8-18	1.25-1.45	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low----------	0.17		
	31-60	2-18	1.25-1.50	>2.0	0.04-0.10	3.6-6.5	<2	Low----------	0.17		
Tetotum---------	0-16	5-15	1.20-1.40	2.0-6.0	0.08-0.15	3.6-5.5	<2	Low----------	0.32	4	.5-2
	16-33	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	33-62	5-30	1.25-1.45	0.6-20	0.06-0.15	3.6-5.5	<2	Low----------	0.24		
19A, 19B--------- Savannah	0-7	3-16	1.45-1.65	0.6-2.0	0.16-0.20	4.5-5.5	<2	Low----------	0.37	3	.5-3
	7-19	18-32	1.55-1.75	0.6-2.0	0.13-0.20	4.5-5.5	<2	Low----------	0.28		
	19-56	18-32	1.60-1.80	0.2-0.6	0.05-0.10	4.5-5.5	<2	Low----------	0.24		
20A, 20B--------- State	0-9	5-15	1.25-1.40	0.6-6.0	0.10-0.20	4.5-5.5	<2	Low----------	0.28	4	<2
	9-37	18-34	1.35-1.50	0.6-2.0	0.14-0.19	4.5-5.5	<2	Low----------	0.28		
	37-64	2-15	1.35-1.50	>2.0	0.02-0.10	4.5-6.0	<2	Low----------	0.17		
21A, 21B--------- Suffolk	0-10	5-10	1.40-1.60	0.6-2.0	0.12-0.15	4.5-5.5	<2	Low----------	0.20	5	.5-2
	10-29	10-18	1.40-1.60	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low----------	0.20		
	29-57	5-15	1.30-1.70	2.0-6.0	0.05-0.10	4.5-5.5	<2	Very low----	0.20		
	57-67	5-27	1.40-1.60	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low----------	0.20		
22A, 22B--------- Tetotum	0-16	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32	4	.5-2
	16-33	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	33-62	5-30	1.25-1.45	0.6-20	0.06-0.15	3.6-5.5	<2	Low----------	0.24		
23A, 23B, 23C---- Turbeville	0-14	10-25	1.20-1.55	2.0-6.0	0.10-0.17	4.5-5.5	<2	Low----------	0.32	5	.5-2
	14-70	30-60	1.30-1.50	0.6-2.0	0.13-0.16	4.5-5.5	<2	Moderate----	0.24		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
1A, 1B: Ackwater	D	None	---	---	1.5-3.0	Perched	Nov-Mar	High	High.
2*:									
Bibb	C	Frequent	Brief	Dec-May	0.5-1.5	Apparent	Dec-Apr	High	Moderate.
Levy	D	Frequent	Very long	Jan-Dec	+2-+1	Apparent	Jan-Dec	High	High.
3: Bohicket	D	Frequent	Very brief	Jan-Dec	+3-0	Apparent	Jan-Dec	High	High.
4: Bojac	B	None	---	---	>4.0	Apparent	Sep-Jul	Low	High.
5B: Catpoint	A	None	---	---	>4.0	Apparent	Feb-Apr	Low	Moderate.
6B: Emporia	C	None	---	---	3.0-4.5	Perched	Nov-Apr	Moderate	High.
7A, 7B: Kempsville	B	None	---	---	>6.0	---	---	Low	Moderate.
8: Leaf	D	Rare	---	---	0.5-1.5	Apparent	Jan-Apr	High	Moderate.
9: Lenoir	D	None	---	---	1.0-2.5	Apparent	Dec-May	High	High.
10: Lumbee	D	Rare	Brief	Dec-May	0-1.5	Apparent	Nov-Apr	High	High.
11A, 11B: Montross	C	None	---	---	1.0-2.5	Perched	Dec-Apr	High	High.
12: Nansemond	C	None	---	---	1.5-2.5	Apparent	Dec-Apr	Moderate	High.
13: Pamunkey	B	None	---	---	3.0-4.0	Apparent	Dec-Mar	Moderate	Moderate.
14*. Pits									
15: Rappahannock	D	Frequent	Very brief	Jan-Dec	+2.-0.5	Apparent	Jan-Dec	High	High.
16B, 17E*: Rumford	A	None	---	---	>6.0	---	---	Low	High.
18D*:									
Rumford	A	None	---	---	>6.0	---	---	Low	High.
Tetotum	C	None	---	---	1.5-2.5	Apparent	Dec-Apr	High	High.
19A, 19B: Savannah	C	None	---	---	1.5-3.0	Perched	Jan-Mar	Moderate	High.
20A, 20B: State	B	None	---	---	4.0-6.0	Apparent	Dec-Jun	Moderate	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
21A, 21B---------- Suffolk	B	None--------	---	---	>6.0	---	---	Low------	Moderate.
22A, 22B---------- Tetotum	C	None--------	---	---	1.5-2.5	Apparent	Dec-Apr	High-----	High.
23A, 23B, 23C----- Turbeville	C	None--------	---	---	>6.0	---	---	High-----	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
*Ackwater	Clayey, mixed, thermic Aquic Paleudults
Bibb	Coarse-loamy, siliceous, acid, thermic Typic Fluvaquents
Bohicket	Fine, mixed, nonacid, thermic Typic Sulfaquents
Bojac	Coarse-loamy, mixed, thermic Typic Hapludults
Catpoint	Siliceous, thermic Ultic Udipsamments
Emporia	Fine-loamy, siliceous, thermic Typic Hapludults
Kempsville	Fine-loamy, siliceous, thermic Typic Hapludults
Leaf	Clayey, mixed, thermic Typic Albaquults
Lenoir	Clayey, mixed, thermic Aeric Paleaquults
Levy	Fine, mixed, acid, thermic Typic Hydraquents
Lumbee	Fine-loamy over sandy or sandy-skeletal, siliceous, thermic Typic Ochraquults
Montross	Fine-silty, siliceous, thermic Fragiaquic Paleudults
Nansemond	Coarse-loamy, siliceous, thermic Aquic Hapludults
Pamunkey	Fine-loamy, mixed, thermic Ultic Hapludalfs
Rappahannock	Loamy, mixed, euic, thermic Terric Sulfihemists
Rumford	Coarse-loamy, siliceous, thermic Typic Hapludults
Savannah	Fine-loamy, siliceous, thermic Typic Fragiudults
State	Fine-loamy, mixed, thermic Typic Hapludults
*Suffolk	Fine-loamy, siliceous, thermic Typic Hapludults
Tetotum	Fine-loamy, mixed, thermic Aquic Hapludults
Turbeville	Clayey, mixed, thermic Typic Paleudults

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