Series 1958, No. 24 Issued November 1962

SOIL SURVEY

Mathews County Virginia

OUR SOIL ★ OUR STRENGTH

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

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Mathews County will serve several groups of readers.

It will help farmers in planning the kind of management that will protect their soils and provide good yields. It will assist engineers in selecting sites for roads, buildings, ponds, and other structures; and it adds to our fund of knowledge about soils.

Soil scientists studied and described the soils and made a map that shows the kind of soil everywhere in the county. The base for the soil map is a set of photographs taken from an airplane. Fields, woods, roads, and many other landmarks can be seen on the photographs.

Locating the soils

Use the index to map sheets to locate areas on the large map in the back of the report. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located. When the correct sheet of the large map is found, it will be seen that boundaries of the soils are outlined and that there is a red symbol for each kind of soil, wherever it appears on the map. Suppose, for example, an area located on the map has the symbol KeA. The legend for the detailed map shows that this symbol identifies Kempsville fine sandy loam, 0 to 2 percent slopes. This soil and all others mapped in the county are described in the section "Descriptions of the Soils."

Finding information

The report has special sections for different groups of readers. The section "General Nature of the County," which discusses early history, climate, geology, water supply, agriculture, and other subjects, will be of interest mainly to those not familiar with the county.

Farmers and those who work with farmers can learn about the soils in the section "Descriptions of the Soils," and then go to the section "How to Use and Manage the Soils." In this way they first identify the soils on their farms and then learn how these soils can be managed and what yields can be expected. The soils are grouped by capability units; that is, groups of soils that need similar management and respond in about the same way. For example, Kempsville fine sandy loam, 0 to 2 percent slopes, is shown to be in capability unit I-1. The management needed for this soil will be found under the heading "Capability Unit I-1" in the section "How to Use and Manage the Soils." A list just ahead of the map sheets gives the name of each soil, the page where it is described, the symbol of the capability unit in which it has been placed, and the page where the capability unit is described.

Soil scientists and others interested in the nature of soils will find information about how the soils were formed and how they are classified in the section "Genesis, Classification, and Morphology of the Soils."

Engineers and builders will find information that will assist them in the section "Engineering Applications."

People who are interested in growing trees will find useful information in the section "Forests."

All users will find information about the soils and their management in various parts of the report, depending on their particular interest. Those interested in general soil areas will want to read the section "General Soil Areas." That section tells briefly about the principal patterns of soils, where they are located, and how they differ from each other.

This soil survey was made as a part of the technical assistance furnished by the Soil Conservation Service to the Tidewater Soil Conservation District, of which Mathews County is a part. Help in farm planning can be obtained from the staff of the Soil Conservation Service assisting the district. Original fieldwork for the survey was completed in 1943 and revisions were made in 1959. Unless otherwise indicated, all statements in the report refer to conditions in the county at the time the fieldwork was in progress.

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SOIL SURVEY OF MATHEWS COUNTY, VIRGINIA

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MATHEWS COUNTY lies along the Chesapeake Bay in the southeastern part of Virginia (fig. 1). It occupies low, nearly level marine terraces.

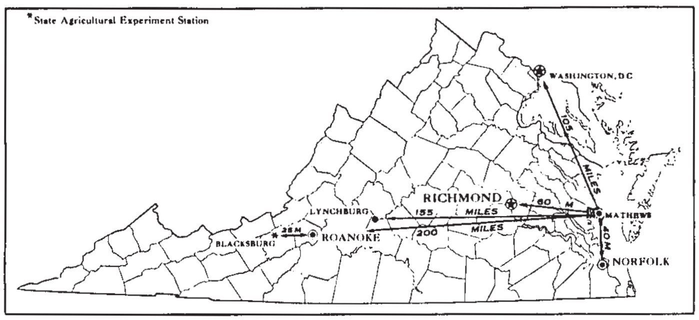

Figure 1.—**Location of Mathews County in Virginia.**

The county forms a peninsula that is dissected and nearly surrounded by tidal bays, rivers, and creeks. It is bounded by the Piankatank River on the north, Chesapeake Bay on the east, Mobjack Bay and the North River on the south and southwest, and Gloucester County on the west. Gwynn Island, at the mouth of the Piankatank River, is connected to the mainland by a highway bridge.

Mathews County has a total area of 105 square miles, or 67,200 acres. Of this, there are 46,742 acres of land area, 8,938 acres of inland water and 11,520 acres of open water. The town of Mathews is the county seat.

Elevations in the county range from sea level to about 70 feet. The average elevation is approximately 10 feet, but in a considerable area, the elevation is 5 feet or less.

The county is made up mostly of small farms, but there are a few large plantations. Most farming is done on a part-time basis; farmers supplement their incomes through employment in the seafood industry, maritime activities, or industries outside the county. Corn, soybeans, small grains, cut flowers, timber, poultry, and beef and dairy cattle are produced in the county. Oysters, crabs, and fish are obtained from the tidal waters.

The acreage in cultivated land is decreasing, whereas the acreage in woodland is increasing. Wet inland parts of the different peninsulas within the county are used to grow loblolly pine.

Mathews County has a mild climate; precipitation is generally adequate and well distributed through the year. Much waterfront property is being sold for homesites.

How Soils Are Mapped and Named

In most localities it is easy to see differences in the landscape as one travels from place to place. There are differences in steepness, length, and shape of the slopes; in the size and speed of the streams; in the kinds of native plants or the crops; and in the soils. Some differences in the soils are easily seen but others are hidden beneath the surface.

Scientists who made this soil survey studied and mapped the soils in detail. They dug or bored a great many holes to observe color, texture, and other properties of the natural layers, or horizons, in each kind of soil. The succession of soil horizons, from the surface to a depth where there has been little influence of soil-forming processes, is called the soil profile. Each kind of soil has a characteristic profile.

The soil scientist drew a line on the map wherever he determined a boundary between two soils. The base map for the survey was a set of aerial photographs of the entire county. The printed soil maps made from this base map show the photographic background, the soil boundaries and symbols, and the main streams, roads, and place names.

Soils that have many important features of their profiles in common are said to make up a soil series. All the soils of a series contain major horizons that are similar in characteristics, in thickness, and in arrangement, except for some differences in texture of the surface soil. Each soil series thus is a group of similar soils; it has been set up as a convenient unit of classification. Each soil series is given the name of a town or other geographic feature near the place where a soil that belongs to it was first described and mapped. Kempsville soils and Elkton soils are examples of soil series.

Within many soil series, there are soils that differ in the texture of their surface layer. Within a series, the bodies of soil that have surface soil of the same textural class make up a soil type. Kempsville fine sandy loam and Elkton silt loam are examples of soil types.

Some soil types range so widely in slope, degree of erosion, or some other feature that practical suggestions about their management could not be made if they were shown on the soil map as one unit. To obtain useful mapping units, such soil types are divided into phases. Names of the phases indicate their nature. For example, Kempsville fine sandy loam, 0 to 2 percent slopes, is one of two phases of Kempsville fine sandy loam, a soil type that ranges from nearly level to a slope of 5 percent. Soils of a series or of a broader classification group can also be divided into phases in the same way; that is, on the basis of some feature that affects their use, rather than their profile or their place in the natural landscape.

Some soil mapping units are land types, rather than soils; examples of these are Sloping sandy land or Mixed alluvial land. A description of each soil mapping unit in this survey is given in the section "Descriptions of the Soils" that follows.

Descriptions of the Soils

In this section each soil series and soil mapping unit in Mathews County are described. A detailed description, including a description of a profile, is given for the first mapping unit described for a series. If there are other mapping units in the series, they are compared with the one that contains the detailed description. Each profile described in this part of the report has three layers: The first is the surface soil, the second the subsoil, and the third the substratum. After the name of each mapping unit, there is a symbol that is used to identify the unit on the detailed map at the back of the report. The first capital letter in the symbol is the first letter of the series name. The small letter that follows completes the series designation. A second capital letter indicates the degree of slope; the letters "A" to "E" indicate progressively stronger slopes. No letter is given to show slope for nearly level soils, such as Elkton silt loam. Eroded soils have a final number, 2, in their symbol. If no erosion symbol is shown, erosion is none or slight.

Under each mapping unit, there is a reference to the capability unit to which it belongs. Use and management by capability units are described in the section "How to Use and Manage the Soils."

Technical terms used in the soil descriptions are defined in the Glossary at the back of the report. The approximate acreage and the proportionate extent of the soils are given in table 1. The location and distribution of the soils are shown on the detailed map at the back of the report.

Bertie Series

The Bertie series consists of nearly level, somewhat poorly drained, acid soils that have sandy material at a depth of about 36 inches. These soils are on low marine terraces. Their surface soil is predominantly grayish-brown very fine sandy loam. The subsoil is mottled strong-brown and gray clay loam.

The total acreage of these soils is small. The areas are on the west side of Morgans Branch north of State Route 14 and also 1 mile southeast of Port Haywood near Horn Harbor. The Bertie soils are associated with the Fallsington, Woodstown, Kempsville, and Dragston soils. They are finer (heavier) textured in both the surface layer and the subsoil than the associated soils. They are better drained than the Fallsington soils, have about the same drainage as the Dragston soils, and are not so well drained as the Woodstown and Kempsville soils.

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

Map symbol	Soil	Acres	Percent
Be	Bertie very fine sandy loam	115	0. 2
Cb	Coastal beach	399	. 7
Dr	Dragston fine sandy loam, shallow	5, 102	9. 2
Ek	Elkton silt loam	118	. 2
Fa	Fallsington fine sandy loam	27, 877	50. 1
KeA	Kempsville fine sandy loam, 0 to 2 percent slopes.	1, 387	2. 5
KeB	Kempsville fine sandy loam, 2 to 5 percent slopes.	230	. 4
KtA	Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes.	2, 792	5. 0
KyA	Keyport silt loam, 0 to 2 percent slopes.	85	. 2
KyD2	Keyport silt loam, 8 to 12 percent slopes, eroded.	116	. 2
Ma	Mixed alluvial land	135	. 3
SaA	Sassafras fine sandy loam, 0 to 2 percent slopes.	188	. 3
SaB2	Sassafras fine sandy loam, 2 to 5 percent slopes, eroded.	94	. 2
SdA	Sassafras loamy fine sand, 0 to 2 percent slopes.	192	. 3
SsD	Sloping sandy land	347	. 6
StE	Steep sandy land	295	. 5
Th	Tidal marsh, high	654	1. 2
To	Tidal marsh, low	2, 510	4. 5
Wo	Woodstown fine sandy loam	4, 088	7. 3
	Inland water	8, 938	16. 1
	Gravel pits	18	(1)
	Total land and inland water	55, 680	100. 0
	Open water	11, 520	
	Total area	67, 200	

[1] Less than 0.1 percent.

Bertie very fine sandy loam (0 to 2 percent slopes) (Be).—This is the only Bertie soil mapped in the county.

Profile (in a pit 1 mile southeast of Port Haywood near Horn Harbor):

0 to 10 inches, grayish-brown, friable, granular very fine sandy loam.
10 to 37 inches, mottled strong-brown and gray, firm, blocky clay loam.
37 to 64 inches, mottled yellowish-brown and gray, friable fine sandy loam and loamy fine sand.

The surface layer ranges from fine sandy loam to loam in texture and from 6 to 10 inches in thickness. The subsoil ranges from very fine sandy clay loam to silty clay loam in texture and from 20 to 32 inches in thickness. In a few places subsoil material extends to a depth of 48 inches. The sandy material underlying the subsoil generally is at a depth ranging from 30 to 42 inches, but in a few places it begins at a depth of 48 inches.

This soil is moderately permeable and has a medium supply of available moisture. Normally, the water table is below the subsoil, but, during the wetter parts of the year, it may be in the upper subsoil. The surface layer contains a medium amount of organic matter, and, under natural conditions, the entire profile is very strongly acid. The content of plant nutrients is medium. Tilth of the surface layer is fair, but the soil should not be worked when too wet.

Most of this soil is about equally divided between cropland and woodland. Artificial drainage is essential in areas that are to be cultivated. Under good management the soil is well suited to most crops commonly grown. (Capability unit IIw–1.)

Coastal Beach

Coastal beach (Cb).—This miscellaneous land type consists of long, narrow strips of beach sand at the edge of tidal water. Many parts are flooded daily by saline tides, and all of it is inundated during storms. Some areas have no vegetation, and others have sparse vegetation that consists mainly of salt-tolerant beachgrasses and shrubby pine and hardwoods. In a few places, there are persimmon, oak, and cedar trees and asparagus and sweetclover. Most of Coastal beach is along Chesapeake Bay and extends from New Point Comfort through Bethel and Haven Beaches to Gwynn Island. (Capability unit VIIIs–1.)

Dragston Series

The Dragston series consists of nearly level, somewhat poorly drained, acid soils that are moderately deep to sandy material. The soils are on low marine terraces. The surface soil is dark grayish-brown, fine sandy loam. The subsoil is mottled gray and yellowish-brown, friable fine sandy clay loam. In Mathews County the depth to the sandy material is generally about 25 inches, but it ranges from 20 to 30 inches. This is shallower than normal for the series as mapped in other parts of the Coastal Plain.

The Dragston soils are the second most extensive in the county. They are located geographically between Woodstown, Sassafras, and Kempsville soils, along the rivers, and Fallsington soils, in the inner parts of the many peninsulas. The Dragston soils are in the catena that includes the Sassafras, Kempsville, Woodstown, and Fallsington soils. They are better drained than Fallsington but not so well drained as the Woodstown, Sassafras, and Kempsville soils.

Dragston fine sandy loam, shallow (0 to 2 percent slopes) (Dr).—This is the only Dragston soil mapped in the county.

Profile (in a pit at the east end of the racetrack at Wards Corner):

0 to 8 inches, dark grayish-brown, friable, granular fine sandy loam.
8 to 25 inches, grayish-brown, friable, blocky fine sandy clay loam with mottles of strong brown and yellowish brown.
25 to 75 inches, gray, loose loamy sand and sand with mottles of yellowish brown.

The texture of the surface soil ranges from loamy fine sand to fine sandy loam, and the thickness, from 6 to 18 inches. The texture of the subsoil ranges from sandy loam to fine sandy clay loam, and the thickness, from 12 to 24 inches. The underlying material is loamy sand or sand. Strata of finer textured material commonly are at a depth of 54 to 60 inches.

In small areas of this soil along the North River, from Fort Nonsense to Mobjack, the surface layer is 18 to 30 inches thick. Also, in this part of the county, there are small areas in which the texture of the soil is no heavier (finer) than loamy sand and other areas in which the soil is moderately well drained.

The Dragston soil is moderately permeable and has a medium capacity for holding available moisture. The water table is normally below the subsoil, but it rises to the upper subsoil during wet seasons. The surface layer has a fairly large amount of organic matter, and, under natural conditions, the soil is strongly acid throughout the profile. The content of plant nutrients is low. Tilth of the surface layer is good, but the soil should not be disturbed when wet.

Most of this soil is used for crops. (Capability unit IIw–2.)

Elkton Series

The Elkton series consists of nearly level, poorly drained, acid soils that are deep to sandy material. These soils are on one of the lower marine terraces. Their surface soil is dark-gray, friable, granular silt loam. The subsoil is gray, mottled with brownish-yellow, heavy, plastic, sticky silty clay. The underlying material is light gray and yellowish brown, loose, stratified, and sandy.

Most of the acreage of these soils is about one-half mile northwest of Cobbs Creek. Elkton soils are associated with, and similar to, the moderately well drained Keyport soils. They differ primarily in having poorer drainage, as indicated by the drab colors and mottling in the surface layer and the subsoil. The Elkton soils have a higher content of clay than any of the soils in the county except the Keyport. They are similar to the Fallsington soils in drainage, but they contain much less sand throughout the surface layer and subsoil.

Elkton silt loam (0 to 2 percent slopes) (Ek).—This is the only Elkton soil in the county.

Profile (in a pit one-half mile northwest of Cobbs Creek):

0 to 8 inches, dark-gray to gray, friable, granular, smooth silt loam with mottles of yellowish brown.
8 to 47 inches, dark-gray to gray, heavy, plastic, sticky, blocky silty clay with mottles of brownish yellow and strong brown.
47 to 90 inches, stratified, light-gray and yellowish-brown, loose sand with plastic silty clay below 80 inches.

The texture of the surface layer ranges from very fine sandy loam to silt loam, the color from very dark gray to gray, and the thickness from 6 to 10 inches. The texture of the subsoil ranges from silty clay to clay, and the thickness, from 40 to 45 inches. Depth to sandy material ranges from 46 to 55 inches. The texture of the substratum ranges from fine sandy clay loam to sand.

The Elkton soil is slowly permeable and has a medium capacity for holding available moisture. The water table usually is in the lower subsoil, but it rises above the surface during wet seasons. The surface layer has a moderately high content of organic matter, and under natural conditions, the entire profile is very strongly acid. The content of plant nutrients is fairly high. Tilth of the surface layer is good in only a narrow range of moisture content. The soil tends to be cold and soggy in spring and warms slowly.

Most of this soil is wooded. (Capability unit IIIw–1.)

Fallsington Series

The Fallsington series consists of nearly level, poorly drained soils that are deep to sandy material. These soils are on low marine terraces. The surface soil is dark-gray to gray, friable, granular fine sandy loam. The subsoil is gray, mottled with yellowish-brown, friable, blocky fine sandy clay loam. Sandy material underlies the subsoil at a depth of about 36 inches.

The Fallsington soils are the most extensive in the county and occupy more than half the total land area. They lie on broad, flat areas slightly higher than the areas of the associated Dragston, Woodstown, Kempsville, and Sassafras soils. Fallsington soils lack the natural drainage pattern of these better drained soils, but they are similar in other characteristics. As mapped in Mathews County, Fallsington soils have a slightly darker surface layer than is normal for the series.

Fallsington fine sandy loam (0 to 2 percent slopes) (Fa).—This is the only Fallsington soil in the county.

Profile (0.8 mile south of Foster at the intersection of State Routes 660 and 625):

0 to 8 inches, dark-gray, friable, granular fine sandy loam.
8 to 37 inches, gray, friable, blocky fine sandy clay loam with mottles of yellowish brown.
37 to 93 inches, loose loamy fine sand with coarse mottles of strong brown and gray.

The surface soil ranges from dark gray to light gray in color and from 5 to 10 inches in thickness. The subsoil ranges from gray to light gray in color, from fine sandy loam to fine sandy clay loam in texture, and from 15 to 30 inches in thickness. The underlying material ranges from fine sandy loam to sand in texture. It is at a depth ranging from 20 to 40 inches.

Included with the Fallsington soil are small areas of a soil that has a very dark gray to black surface layer similar to that of Pocomoke soils (not mapped in Mathews County). These areas are just south of Port Haywood, west of Mobjack, and at Wards Corner. Also included are about 40 acres of poorly drained loamy fine sand and sand. In places this included soil has a black surface layer resembling that of Rutlege soils, and in other places it has a subsurface layer of brown-stained, compact loamy sand similar to that of St. Johns soils (St. Johns and Rutlege soils not mapped in this county). This area is in woods east of Soles on the south side of State Route 198.

The Fallsington soil has moderate permeability and medium capacity for holding available moisture. The water table is normally in the lower subsoil, but it rises above the surface during wet seasons. The organic-matter content of the surface layer is medium to high, and under natural conditions, the entire profile is extremely acid. The content of plant nutrients is low. Tilth of the surface layer is good when the water table is low and the soil is moist but not wet.

Most of this soil is wooded, but some of it is used for soybeans, corn, and other cultivated crops and for pasture. (Capability unit IIIw–2.)

Kempsville Series

The Kempsville series consists of well-drained, nearly level and gently sloping, acid soils that are deep to sandy material. These soils are on low marine terraces. The surface soil is dark grayish-brown, friable, granular fine sandy loam. The subsoil is yellowish-brown, friable, blocky fine sandy clay loam. It is underlain by sandy material below 30 to 40 inches.

The Kempsville soils are fairly extensive and are mapped along the rivers and creeks in most parts of the county. They are associated with the less well drained Woodstown and Dragston soils. Kempsville soils are similar to those soils in most characteristics but differ in drainage and in being slightly compact in the lower subsoil or upper substratum.

Kempsville fine sandy loam, 0 to 2 percent slopes (KeA).—This soil is nearly level and is well drained.

Profile (in a pit one-fourth mile south of Fort Nonsense):

0 to 11 inches, dark grayish-brown, friable, granular fine sandy loam.
11 to 40 inches, yellowish-brown, friable, blocky fine sandy clay loam.
40 to 90 inches +, yellowish-brown to yellow, friable fine sandy loam with mottles of light gray and reddish yellow; slightly compact in the upper part; sandy clay is present below 90 inches.

This soil has moderate permeability and medium capacity for holding available moisture. The water table is normally in the substratum and seldom rises into the subsoil. The organic-matter content of the surface soil is low, and, under natural conditions, the entire profile is strongly acid. The content of plant nutrients is low. When the content of moisture is normal, tilth of the surface layer is excellent.

Most of this soil is cultivated and is well suited to corn, soybeans, and small grains. (Capability unit I–1.)

Kempsville fine sandy loam, 2 to 5 percent slopes (KeB).—This soil is similar to the soil just described, but it is gently sloping instead of nearly level and has a thinner surface soil because of erosion. In addition, tilth is not quite so good because of the higher content of clay in the surface layer. This higher clay content was caused by the mixing of subsoil with the surface layer during tillage.

This soil is suited to corn, soybeans, and small grains. It is used mostly for these crops, but some of it is used successfully as woodland. Contour farming will help to prevent loss of soil, moisture, and plant nutrients through erosion. (Capability unit IIe–1.)

Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes (KtA).—This soil has a sandier and more open and porous surface soil than the Kempsville fine sandy loams. In addition, it differs from the Kempsville fine sandy loams as follows: (1) The surface layer is much deeper, or from 18 to 30 inches thick; (2) the subsoil is sandier and thinner; (3) the soil is more droughty; and (4) plant food leaches more rapidly. Depth to sandy material is about the same in this soil as in the Kempsville fine sandy loams.

Most of this soil is used for corn, soybeans, and small grains. Some of it is used as woodland, to which it is well suited. Deep-rooted crops are especially suitable. (Capability unit IIs–1.)

Keyport Series

The Keyport series consists of nearly level to strongly sloping, acid soils that are deep to sandy material.

These soils are on low marine terraces. The surface soil is brown, friable, granular silt loam. The subsoil is dark yellowish-brown, plastic, blocky silty clay that is mottled with gray in the lower part. The silty clay is underlain by sandy clay loam below a depth of 3 or 4 feet.

In Mathews County the only area of Keyport soils is about 0.6 mile north of Cobbs Creek. Keyport soils are associated with Elkton soils. They are similar to these soils in most characteristics except those relating to drainage. They are moderately well drained, whereas Elkton soils are poorly drained.

Keyport silt loam, 0 to 2 percent slopes (KyA).—This nearly level soil is moderately well drained.

Profile (in a pit about 0.6 mile north of Cobbs Creek):

0 to 8 inches, light olive-brown, friable, granular silt loam to very fine sandy loam.
8 to 37 inches, dark yellowish-brown, plastic, blocky silty clay that is mottled light gray and yellowish red in the lower part.
37 to 89 inches, light brownish-gray, friable, massive sandy clay loam streaked with reddish yellow.

Included with this soil are areas of a somewhat poorly drained soil that lies farthest from the natural drains. The included soil is similar to the Lenoir soils (not mapped in Mathews County).

The Keyport soil is slowly permeable and has medium capacity for supplying moisture to plants. The water table is normally below the subsoil, but it rises into the subsoil during wet seasons. The organic-matter content of the surface soil is medium, and the entire soil is very strongly acid. The content of plant nutrients is medium to low. If the soil is moist, tilth of the surface layer is fair in the uneroded areas, but it is poor in eroded areas where the surface soil is thin. This soil should not be tilled soon after rains. Extra care is needed to avoid puddling, compacting, and clodding caused by traveling over the soil or tilling when it is too wet.

Most of this soil is wooded, but some of it is used for soybeans and corn. (Capability unit IIw–3.)

Keyport silt loam, 8 to 12 percent slopes, eroded (KyD2).—This soil has steeper slopes than Keyport silt loam, 0 to 2 percent slopes, and much of the original surface soil has been lost through erosion.

The texture of the surface layer ranges from very fine sandy loam to heavy silt loam, the color from light gray to dark yellowish brown, and the thickness from 3 to 6 inches. The thickness of the silty clay to clay subsoil ranges from 28 to 48 inches, and the depth to mottling from 16 to 24 inches below the surface. Depth to the sandier material ranges from 28 to 56 inches. The soil ranges from nearly well drained to somewhat poorly drained.

Chiefly because of the steep slopes and shallower depth to the plastic silty clay subsoil, this soil is not well suited to cultivation. (Capability unit VIe–1.)

Mixed Alluvial Land

Mixed alluvial land (Ma).—This miscellaneous land type consists of poorly drained soils of mixed texture. It is on fresh-water stream bottoms that are flooded frequently. The areas are wet most of the year and are difficult to drain. Most of the Mixed alluvial land is along North End Branch between Fort Nonsense and Soles. It is dominantly under native hardwoods that are suited to wet land. (Capability unit Vw–1.)

Sandy Land

Sandy land consists of excessively drained, infertile areas. It occupies slopes between the nearly level marine terraces and the narrow bottoms of fresh-water streams in the western part of the county. It is made up dominantly of loamy sands and sands, but there are strata, lenses, and pockets of finer textured materials, as well as lenses of ferruginous sandstone and gravel.

Sloping sandy land (5 to 12 percent slopes) (SsD).—A small acreage of this miscellaneous land type is used for general crops, such as soybeans and corn. (Capability unit IVe–1.)

Steep sandy land (12 to 25 percent slopes) (StE).—Nearly all of this miscellaneous land type is wooded. It is best suited to this use. (Capability unit VIe–2.)

Sassafras Series

The Sassafras series consists of nearly level to gently sloping, well-drained, acid soils. These soils are on the higher marine terraces in the western part of the county. The surface soil is dark grayish-brown, friable, granular fine sandy loam to loamy fine sand. The subsoil is strong-brown, friable, blocky fine sandy clay loam. Sandy material underlies the subsoil at a depth of 36 inches.

The Sassafras soils are in the northwestern part of the county, near the Gloucester County line and also near the Piankatank River. They are well-drained soils of the drainage catena that consists of the Kempsville (well drained), Woodstown, Dragston, Fallsington, and Pocomoke soils and are chiefly associated with these soils. Compared to the Kempsville soils, the Sassafras soils have a browner surface soil and subsoil, lack the slightly compact layer (weak fragipan), and are free of mottles to a greater depth.

Sassafras fine sandy loam, 0 to 2 percent slopes (SaA).—This soil is nearly level and well drained.

Profile (in a pit on the Minter Farm near Dixie and the junction of State Routes 3 and 198):

0 to 8 inches, dark grayish-brown, friable, granular fine sandy loam.
8 to 36 inches, strong-brown, friable, blocky fine sandy clay loam.
36 to 70 inches, strong-brown to brown, loose loamy fine sand to sand.

The soil is moderately permeable and stores a medium amount of moisture. It is inherently medium in fertility but responds well to applications of fertilizer and lime. The water table is normally well below the subsoil, and it rarely rises into the subsoil, even in the wettest seasons. The surface soil is low in organic-matter content, and the entire profile is strongly acid. Tilth of the surface soil is excellent. Tillage can be carried on a few days after rains.

Most of this soil is used to grow corn, soybeans, and small grains. Some of it is wooded, mostly with loblolly pine. (Capability unit I–1.)

Sassafras fine sandy loam, 2 to 5 percent slopes, eroded (SaB2).—This soil is more sloping and, as a result of erosion, has a thinner surface layer than Sassafras fine sandy loam, 0 to 2 percent slopes. Because of these less favorable characteristics, the soil is good, rather than excellent, for cultivated crops. Most of it is used for corn, soybeans, and small grains. Some of it is wooded. Because of the erosion hazard, careful management is required if row crops are grown. (Capability unit IIe–1.)

Sassafras loamy fine sand, 0 to 2 percent slopes (SdA).—This soil is less favorable for farming than Sassafras fine sandy loam, 0 to 2 percent slopes, because the surface layer is sandier, more porous, and thicker. The subsoil is also sandier. These characteristics cause this soil to be somewhat droughty and subject to loss of plant food by leaching. Tilth, however, is excellent, and the soil is well suited to early truck crops and deep-rooted plants. (Capability unit IIs–1.)

Tidal Marsh

Tidal marsh is flooded very frequently by saline tides. The areas are covered with native marshgrasses. Much of the soil material consists of mineral soil of variable texture, mixed with organic matter in various stages of decomposition.

Tidal marsh, where firm enough, can be used to a very limited extent as pasture for hogs and cattle. It is not useful as woodland.

Tidal marsh, high (Th).—This miscellaneous land type can be used to a greater extent for pasture than Tidal marsh, low. It supports a few scattered shrubs and an occasional scrubby tree. (Capability unit VIIw–1.)

Tidal marsh, low (To).—This miscellaneous land type is even more limited for use as pasture than the high phase, and it supports no trees. (Capability unit VIIIw–1.)

Woodstown Series

The Woodstown series consists of nearly level, moderately well drained, acid soils that are deep to sandy material. The soils are on marine terraces. The surface soil is predominantly dark grayish-brown fine sandy loam. The subsoil is light olive-brown fine sandy clay loam that is mottled below a depth of about 20 inches. Sandy material begins at a depth of about 36 inches.

These soils are moderately extensive and occur mostly along creeks, rivers, and bays. They are associated with the well-drained Kempsville and Sassafras soils, which are on the points, and the somewhat poorly drained Dragston soils, which lie somewhat farther back from the waterways. The soils of these series are somewhat alike in texture but differ chiefly in characteristics related to differences in drainage.

Woodstown fine sandy loam (0 to 2 percent slopes) (Wo).—This is the only type of Woodstown soil in the county.

Profile (0.3 mile south of Retz):

0 to 9 inches, dark grayish-brown, friable, granular fine sandy loam.
9 to 35 inches, light olive-brown, friable, blocky fine sandy clay loam, mottled with yellowish brown and gray in the lower part.
35 to 88 inches, mottled strong-brown and gray, loose loamy fine sand with lenses of silty clay loam below 60 inches.

The surface layer ranges from sandy loam to fine sandy loam in texture. It is generally from 6 to 10 inches thick, but in a few places, it is as much as 24 inches thick. The subsoil ranges from fine sandy loam to fine sandy clay loam in texture and from 15 to 30 inches in thickness. In a few places, this material extends to a depth of 48 inches. The soil has a thicker solum than normal in those areas at the heads of North and East Rivers and near Fort Nonsense and Foster. Depth to mottling ranges from 16 to 24 inches. The substratum ranges from sandy loam to sand in texture and occurs at a depth ranging from 20 to 40 inches.

This soil is moderately permeable, and it has a medium capacity for holding available moisture. The water table normally is below the subsoil, but during wet seasons, it may rise to the lower subsoil. The surface layer has a medium content of organic matter, and under natural conditions, the entire profile is strongly acid. The content of plant nutrients is low. Tilth of the surface layer is good, but the soil should not be worked when too wet.

About two-thirds of this soil has been cleared and is used chiefly for corn, soybeans, and daffodils. (Capability unit IIw–4.)

General Soil Areas

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows the main patterns of soils. Such a map is the colored general soil map in the back of this report. The general soil areas are also called soil associations. Each kind of general soil area, or association, as a rule contains a few major soils and several other minor soils, in a pattern that is characteristic, although not strictly uniform.

The soils in any one association are likely to differ greatly among themselves in some properties; for example, slope, depth, or natural drainage. Thus, the general map does not show the kind of soil at any particular place, but a pattern that has in it several kinds of different soils.

The general soil areas are named for the major soil series in them, but as already noted, soils of other series may also be present. The major soil series of one general soil area may also be present in other areas, but in a pattern different enough to require a boundary.

The general map showing patterns of soils is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.

1. Sassafras-Kempsville-Sandy Land Association

This association of soils is in the northwestern part of the county, mainly between State Route 198 and the Piankatank River. It extends from west of Soles to Dixie, Iron Point, and Chapel Creek. It comprises well drained to excessively drained soils that predominantly have a friable, yellowish-brown subsoil over beds of sand.

The Sassafras and Kempsville soils are in the nearly level to gently sloping areas. Sandy land is in strongly sloping areas along streams. About half the acreage of

Sassafras soils has a surface layer of fine sandy loam. This layer is 10 to 12 inches thick, except in eroded areas west of Soles, where it is about 6 inches or less. The rest of the acreage of Sassafras soils has a surface layer of loamy fine sand that is 20 to 30 inches thick. Most of the acreage of Kempsville soils has a loamy fine sand surface layer that is 20 to 30 inches thick. Sandy land is made up of loamy fine sand, about 3 feet thick, underlain by sand. In addition, there are layers and pockets of sandy clay loam, clay, and iron sandstone.

Other soils included in this association are the Dragston, Woodstown, Mixed alluvial land, and Fallsington, which are moderately well drained to poorly drained.

This association makes up about 6 percent of the land area in the county. It includes some of the most productive soils. The soils do not require artificial drainage and are suited to most crops. They are especially well suited to early truck crops and poultry. Orchards would do well. Excellent building sites occur along the Piankatank River.

Most of the area is used for corn, soybeans, small grains, and poultry. Some of the area is wooded and consists mainly of somewhat poorly drained soils. On some wooded areas near Soles, however, the soils are well drained.

2. Keyport-Elkton Association

This association of soils is just north of the post office at Cobbs Creek. It occurs on both sides of State Highway 628 and along Cobbs Creek, which flows into the Piankatank River.

The moderately well drained Keyport soils make up about two-thirds of the association, and the poorly drained Elkton soils make up the remaining third. The surface layer of both is silt loam, and the subsoil is heavy, plastic silty clay that is underlain by sandy clay loam or sand below 3 to 4 feet. The poorly drained Elkton soils are in a nearly level depression, whereas the better drained Keyport soils are dissected by natural drainageways.

This association of soils, the smallest in the county, covers only about 0.5 percent of the land area. Although the soils are inherently the most fertile in the county, they are mostly in woodland. This is the result of poor drainage and the difficulty in tilling the fine-textured (heavy) soil material. Because of these unfavorable characteristics, the soils are suitable for only a narrow range of use. They can, however, be used to advantage for pasture. Loblolly pine grows better on these soils than on any others in the county.

3. Fallsington Association

This association consists only of the Fallsington soils. The areas occur throughout the county, generally in all places away from the rivers and Chesapeake Bay and beyond the influence of natural drains. Most of Gwynn Island, at the mouth of the Piankatank River, is included in this association.

The areas are nearly level and poorly drained. The surface layer of Fallsington soils is gray fine sandy loam; the subsoil is gray, friable, permeable sandy clay loam, mottled with brown. The subsoil is underlain by wet sand at a depth of about 3 feet.

This association, the largest in the county, comprises about 50 percent of the total land area. About 20 percent of the acreage is used for general crops, such as corn and soybeans. Approximately 1 percent is in pasture and 79 percent in woodland. This association is one of the best in the county for the production of loblolly pine. Where adequate drainage is provided, the soil is suited to corn, soybeans, and vegetables and very well suited to pasture. During the winter and rainy spells in summer, the water table is near the surface.

4. Dragston-Woodstown-Kempsville Association

This association of soils occurs along the rivers, Mobjack Bay, and Milford Haven. It also extends southward from Blakes along State Highway 626.

About half of this association is composed of the somewhat poorly drained Dragston soils, and the other half is about equally divided between the moderately well drained Woodstown and well drained Kempsville soils. Approximately half the acreage of the Kempsville soils has a fine sandy loam surface layer, about 10 inches thick. The rest of the acreage of Kempsville soils has a loamy fine sand surface layer, 20 to 30 inches thick.

The subsoil of the Dragston, Woodstown, and Kempsville soils is friable, permeable fine sandy clay loam that is underlain by sand at a depth of about 3 feet. The water table in these soils is lower than that in the soils of the Fallsington association. It is highest in the Dragston, next highest in Woodstown, and lowest in the Kempsville. Many points along the waterfront consist of Kempsville soils.

Included in this association of soils are small areas of Tidal marsh, Mixed alluvial land, Sandy land, and Fallsington and Bertie soils.

This association makes up approximately 35 percent of the land area in the county, and it has the largest acreage of cultivated land of any of the associations. About two-thirds of it is used for cultivation or building sites, and the other third is in woodland. This association is second to the Fallsington association in total acreage. A greater acreage is cultivated, however, as the soils have better drainage than the Fallsington soils.

Much of the area borders the waterfront, along which many homes have been built.

5. Tidal Marsh-Coastal Beach Association

The Tidal marsh-Coastal beach association occurs along the Chesapeake Bay. It extends from Gwynn Island to New Point Comfort. Haven and Bethel Beaches are in this area. Coastal beach, a strip of sand along the bay, ranges from a few feet to as much as 300 feet in width. Tidal marsh lies between the beach and the land bordering Whites, Stoakes, Garden, Dyer, and Deep Creeks and Winter and Horn Harbors.

The beach has a very sparse covering of beachgrasses, native bushy shrubs, asparagus, and sweetclover and a few pine, cedar, and persimmon trees.

Saline tides daily flood the lower parts of the beach and all of Tidal marsh except the high phase. Storm tides flood both the beach and all of Tidal marsh, including the high phase.

Included in this association are small areas of Fallsington, Dragston, and Woodstown soils and Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes.

The Tidal marsh-Coastal beach association, which occupies about 8 percent of the county, has great possibilities for recreational and wildlife uses. Beaches have not been developed commercially, but they could be used for public bathing. The marshes are used for hunting of wildfowl. Much sand has been hauled from Haven Beach for use in highway construction. The beaches and marshes are not very suitable for building sites because of frequent flooding and the unstable soil material.

***Figure 2.*—Corn growing on class I land—Sassafras fine sandy loam—near Dixie.**

How to Use and Manage the Soils

In this section the system used by the Soil Conservation Service in grouping soils according to their capability is explained. The soils are arranged in capability units, and management suggestions are given for the soils in each unit. In addition, estimated yields are given for principal crops grown under two levels of management.

Detailed information on the use and management of the soils for woodland is given in the section "Forests," and use of the soils for engineering is given in the section "Engineering Applications."

Capability Groups of Soils

The capability classification is a grouping of soils that shows, in a general way, how suitable they are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used (fig. 2). The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so sandy, wet, saline, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes, there can be up to four subclasses. The subclass is indicated 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* means that water in or on the soil will interfere 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, sandy, or droughty, and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it have little or no erosion hazard but have other limitations that limit their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping of soils for many statements about their management. Capability units are generally identified by numbers assigned locally, for example, IIw-1 or IIIw-2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I.—Soils that have few limitations that restrict their use.
- (No subclasses.)
  - Capability unit I-1.—Nearly level, well-drained soils that are deep to sand.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe.—Soils subject to moderate erosion if they are not protected.
  - Capability unit IIe-1.—Gently sloping, well-drained soils that are deep to sand.
- Subclass IIw.—Soils that have moderate limitations because of excess water.
  - Capability unit IIw-1.—Nearly level, somewhat poorly drained soils that are deep to sandy material.
  - Capability unit IIw-2.—Nearly level, somewhat poorly drained soils that are moderately deep to sand.
  - Capability unit IIw-3.—Nearly level, chiefly

moderately well drained soils that are deep to sand.

Capability unit IIw-4.—Nearly level, moderately well drained soils that are deep to sand.

Subclass IIs.—Soils that have limitations of moisture capacity.

Capability unit IIs-1.—Nearly level, well-drained to excessively drained soils that are deep to sand.

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

Subclass IIIw.—Soils that have severe limitations because of excess water.

Capability unit IIIw-1.—Nearly level, poorly drained soils that have silty clay subsoil and are deep to sand.

Capability unit IIIw-2.—Nearly level, poorly drained soils that are deep to sand.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVe.—Soils subject to very severe erosion if they are cultivated and not protected.

Capability unit IVe-1.—Excessively drained sandy soils.

Class V.—Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass Vw.—Soils too wet for cultivation; drainage or protection from overflow not feasible.

Capability unit Vw-1.—Flat, poorly drained, mixed sandy, loamy, and clayey soils on flood plains.

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

Subclass VIe.—Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.

Capability unit VIe-1.—Sloping, moderately well drained soils that are deep to sand.

Capability unit VIe-2.—Steep, excessively drained sandy soils that border flood plains.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation, and that restrict their use largely to wildlife.

Subclass VIIw.—Soils very severely limited by excess water.

Capability unit VIIw-1.—Flat, wet lowland frequently flooded by salt-water tides.

Class VIII.—Soils and landforms that have limitations that preclude their use, without major reclamation, for commercial production of plants; and restrict their use to recreation, wildlife, or esthetic purposes.

Subclass VIIIw.—Extremely wet and marshy land.

Capability unit VIIIw-1.—Flat, wet lowland very frequently flooded by salt-water tides.

Subclass VIIIs.—Rock or soil materials that have little potential for production of vegetation.

Capability unit VIIIs-1.—Sloping sand beach flooded frequently by salt-water tides.

Management by Capability Units

In this section use and management for each capability unit are discussed. The soils in each unit are listed. Part of the information in this section was obtained from "A Handbook of Agronomy" (*12*).[1]

Capability unit I-1

The soils of capability unit I-1 are nearly level, well drained, and deep to sand. They have a friable surface layer and a crumbly, loamy subsoil. The soils in this unit are:

Kempsville fine sandy loam, 0 to 2 percent slopes.
Sassafras fine sandy loam, 0 to 2 percent slopes.

These are the best agricultural soils in the county. They are moderately permeable and have a deep root zone. At a depth of 30 to 40 inches, they are underlain by a sandy substrata. These soils have medium capacity for holding moisture available to plants. Their content of organic matter is moderately low. The soils are strongly acid. They are low in natural fertility, but crops respond well to lime and to fertilizer that contains nitrogen, phosphorus, and potassium. Some crops respond well to boron. The surface soil has a fine sandy loam texture and is easily tilled. Because the soils have favorable infiltration and percolation, most of the rainfall is absorbed and runoff is not a problem.

About half the acreage of these soils is under cultivation, and the other half is in woodland. The chief crops are corn, soybeans, and small grains.

These soils are suited to many kinds of crops and to pasture. They are among the few soils in the county that are well suited to alfalfa. Orchards should do well. Vegetables grow very satisfactorily. Flowers, such as daffodils, do well and can be grown commercially.

Productivity of the soils can be maintained under continuous row crops if adequate fertilization and other good cultural practices are followed. Winter cover crops should be grown to reduce leaching, to improve tilth, and to increase the rate of moisture absorption. The soils respond well to irrigation. Where an economical supply of water is available, irrigation of high-value crops is practical.

Suitable 1-year cropping systems are as follows: (1) A small grain followed by lespedeza as a cover crop; (2) corn followed by crimson clover as a cover crop.

The return of crop residues to the soils helps to maintain good tilth and soil structure, to reduce leaching of plant nutrients, and to promote beneficial activity by bacteria.

Capability unit IIe-1

The soils of capability unit IIe-1 are gently sloping, well drained, slightly to moderately eroded, and deep to sand. They have a crumbly subsoil. The soils of this unit are:

Kempsville fine sandy loam, 2 to 5 percent slopes.
Sassafras fine sandy loam, 2 to 5 percent slopes, eroded.

These soils are among the best in the county. Their chief limitations are gentle slopes and moderate erosion.

[1] Italic numbers in parentheses refer to Literature Cited, page 42.

They are moderately permeable and have a deep root zone that is underlain by sandy substrata at a depth ranging from 30 to 40 inches. The soils have a medium capacity for holding available moisture. The content of organic matter is moderately low, and the reaction is strongly acid. The soils are low in natural fertility but respond well to proper applications of lime and of fertilizer that contains nitrogen, phosphorus, and potassium. Some crops respond well to boron. The surface soil is fine sandy loam and is easily tilled. Because of the gentle slopes, some water and soil are lost during intensive rainfall.

About half the acreage of these soils is under cultivation, and the other half is woodland. Most crops grown are well suited to the soils. The chief crops are corn, soybeans, and small grains. Alfalfa, vegetables, and daffodils are not quite so well suited on the soils of this unit as on those of capability unit I–1.

Contour tillage will help to reduce losses of soil, water, and fertility caused by runoff.

Suitable 2-year cropping systems are as follows: (1) 1 year of corn and 1 year of a small grain with lespedeza and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

The return of crop residues to the soils helps maintain good tilth and structure, reduces leaching of plant nutrients, and promotes beneficial activity by bacteria.

As the result of erosion, the soils have a thin surface soil, and they absorb and store less moisture than the soils of capability unit I–1. Also, the mixing of surface soil and subsoil by cultivation has made these soils less suitable for tilling, seed germination, and growth of crops.

Capability unit IIw–1

The soils of capability unit IIw–1 are nearly level, somewhat poorly drained, and deep to sandy material. They have a fairly heavy, firm subsoil. The only soil in this unit is:

Bertie very fine sandy loam.

This soil is moderately permeable. It is limited chiefly by a seasonally high water table. A drainage system is required for the satisfactory growing of crops. After drainage, roots can develop throughout the subsoil, which is underlain by sandy material at a depth of about 3 feet. The soil has medium capacity for holding moisture available to plants, has a medium amount of organic matter, and is very strongly acid. It is medium in natural fertility, and, if properly drained, should respond well to applications of lime and complete fertilizer. The surface layer, which ranges from fine sandy loam to loam, is fairly easy to work.

About half of the acreage is cultivated, nearly half is wooded, and a small part is in pasture. The soil is best suited to pasture and woods. If properly drained, it is well suited to corn, soybeans, and small grains. Daffodils do well. Alfalfa is poorly suited to the soil because of the high water table.

A complete drainage system is needed for this soil. The following 2-year cropping systems are suitable: (1) 1 year of corn and 1 year of a small grain, lespedeza, and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

The return of crop residues to the soil helps to maintain good tilth and structure and to promote beneficial activity by bacteria.

Figure 3.—Drainage ditch in field north of Cobbs Creek.

Capability unit IIw–2

The soils of capability unit IIw–2 are nearly level, somewhat poorly drained, and moderately deep to sand. They have a friable loamy subsoil. The only soil in this unit is:

Dragston fine sandy loam, shallow.

This soil is extensive and widely distributed throughout the county. It is limited chiefly by imperfect drainage. When properly drained, it is well suited to many kinds of crops (fig. 3). The soil is moderately permeable and has a moderately deep root zone that is underlain by sand at a depth of 20 to 30 inches. The shallowness to sand makes the installation of tile drains difficult when the soil is wet. Tile should be installed when the water table is low. This soil has a medium capacity for holding moisture available to plants and a medium amount of organic matter. It is strongly acid. It is inherently low in fertility but responds well to complete fertilizer and lime. The surface soil, which ranges from loamy fine sand to fine sandy loam, is easily worked.

About two-thirds of the acreage is cultivated, and most of the rest is in woodland. A little is in pasture. Corn, soybeans, and small grains are the chief crops. Daffodils grow well. Alfalfa is poorly suited to the soil because of the high water table and unfavorable aeration.

A complete drainage system is needed on this soil. The following 2-year cropping systems are suitable: (1) 1 year of corn and 1 year of a small grain with lespedeza and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

The return of crop residues to the soil helps to maintain good tilth and structure and to promote beneficial activity of bacteria.

Capability unit IIw–3

The soils of capability unit IIw–3 are nearly level, chiefly moderately well drained, and deep to sand. They have a heavy clay subsoil that is underlain by friable loamy material at a depth of 3 to 4 feet. The only soil in this unit is:

Keyport silt loam, 0 to 2 percent slopes.

This soil is limited in crop suitability by its heavy clay subsoil and by restricted drainage. It is slowly permeable and has a medium capacity for holding moisture available to plants. It has a medium amount of organic matter and is strongly acid. The soil is medium in natural fertility; it responds somewhat slowly to fertilizer and lime but retains these amendments longer than most soils in the county. Because of heavy texture, this soil is difficult to till and can be tilled satisfactorily only within a narrow range of moisture content. The soil warms slowly in spring.

Most of the acreage is in woodland, but some is used for corn, soybeans, and small grains. The soil is well suited to these crops and is equally well suited to pasture and woodland. It is poorly suited to alfalfa, vegetables, and daffodils.

A simple drainage system is needed for this soil. The following cropping systems are suitable: (1) 1 year of corn and 1 year of a small grain with lespedeza and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

Deep plowing is needed. The return of all crop residues to the soil improves drainage, aeration, and tilth. The return of crop residues also helps to maintain good structure and to promote beneficial activity of bacteria.

Capability unit IIw–4

The soils of capability unit IIw–4 are nearly level, moderately well drained, and deep to sand. They have a friable loamy subsoil. The only soil in this unit is:

Woodstown fine sandy loam.

This soil is extensive and is widely distributed throughout most of the county. It is limited to a minor degree by a slight imperfection in drainage. It is moderately permeable and has a deep root zone. No drainage improvement is required for the growing of general crops, such as corn, soybeans, and small grains. Alfalfa and some special crops benefit from drainage. The soil has a medium capacity for moisture available to plants. It has a medium amount of organic matter and is strongly acid. Though low in natural fertility, the soil responds well to complete fertilizer and lime. The surface soil, which ranges from loamy fine sand to fine sandy loam, is easily worked.

About two-thirds of the acreage is cultivated, and about one-third is in woodland. Woodstown fine sandy loam is suited to many kinds of crops, including soybeans, corn, small grains, vegetables, and daffodils. If properly drained, it is fairly well suited to alfalfa. Pasture and woodland do well.

The soil of this unit needs a simple drainage system, a complete fertilizer, and lime. The following 2-year cropping systems are suitable: (1) 1 year of corn and 1 year of a small grain with lespedeza and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

The return of crop residues to the soil helps to maintain good tilth and structure and to promote beneficial activity of bacteria.

Capability unit IIs–1

The soils of capability unit IIs–1 are nearly level, well drained to excesively drained, and deep to sand. They have a light-textured, thick sandy surface layer and a friable loamy subsoil. The soils in this unit are:

Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes.
Sassafras loamy fine sand, 0 to 2 percent slopes.

These soils are limited chiefly by a droughty surface layer, which ranges from 18 to 30 inches in thickness. The root zone is deep, and permeability is rapid. Sand underlies the subsoil at a depth of 30 to 40 inches. The soils have a medium capacity for holding moisture available to plants and a medium amount of organic matter. They can be easily worked within a wide range of moisture content. They are low in natural fertility but should respond well to complete fertilizer and lime. Fertilizer should be applied frequently, as a sidedressing or a topdressing, to minimize excessive losses of plant nutrients through leaching. Although strongly acid, the soils require less lime than most of the soils of the county.

Most of the acreage of these soils is used for corn, soybeans, and small grains. The soils are fairly well suited to these crops and to alfalfa and are especially suitable for early vegetables. Strawberries are grown to some extent. Irrigation will substantially increase yields of crops. The soils are not well suited to pasture, but woodland does well.

Sidedressings and topdressings with complete fertilizer and the application of small to moderate amounts of lime are needed on these soils. In addition, the following 2-year cropping systems are suitable: (1) 1 year of corn and 1 year of a small grain with lespedeza and tall fescue; (2) 1 year of corn followed by a winter cover crop and 1 year of soybeans followed by a winter cover crop.

It is especially important to grow cover crops and to return all crop residues, such as cornstalks, straw, and bean pug, to the soils. The organic matter that is provided serves to reduce excessive aeration, to reduce leaching, and to conserve moisture.

Capability unit IIIw–1

The soils of capability unit IIIw–1 are nearly level, poorly drained, and deep to sand. They have a heavy, plastic silty clay subsoil. The only soil in this unit is:

Elkton silt loam.

This soil is limited chiefly by slow permeability and by the heavy subsoil that is not easily penetrated by roots. It has a medium capacity for holding moisture available to plants, has a medium amount of organic matter, and is strongly acid. The soil is cold and soggy and warms slowly in spring. It is difficult to work and is suitable for tillage only within a narrow range of moisture content. Natural fertility is high, and fertility is easily maintained. Complete fertilizer and large amounts of lime are needed. The soil retains plant nutrients very well.

Figure 4.—**Pasture of tall fescue and ladino clover on Fallsington fine sandy loam.**

All of the acreage is in woodland. The soil needs a complete drainage system for profitable farming. When properly drained, it can be used for general crops, such as soybeans, corn, and hay. It is poorly suited to alfalfa and truck crops but well suited to pasture and woodland.

If the soil is cleared, the following 3-year cropping systems are suitable: (1) 1 year of corn, 1 year of a small grain and grass or legume grown for hay or seed, and 1 year of soybeans followed by a winter cover crop; (2) 1 year of corn followed by a winter cover crop, 1 year of lespedeza and a winter cover crop (grass), and 1 year of soybeans.

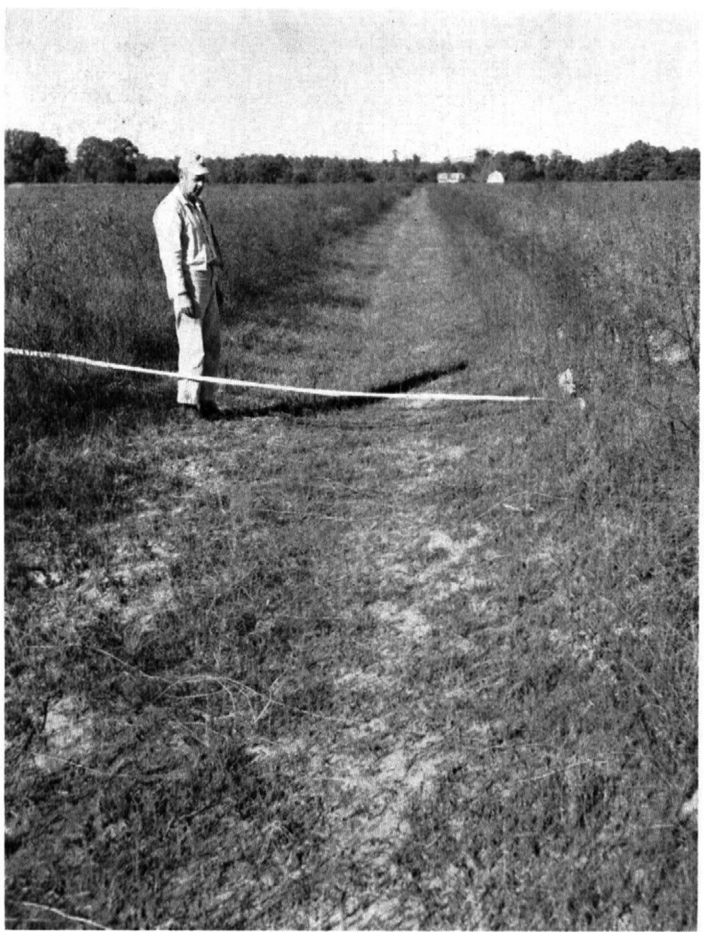

Figure 5.—**A V-type ditch that drains a field in soybeans on Fallsington fine sandy loam.**

The return of crop residues to the soil helps to maintain good tilth and structure and to promote beneficial activity of bacteria.

Capability unit IIIw-2

The soils of capability unit IIIw-2 are nearly level, poorly drained, and deep to sand. They have a crumbly loamy subsoil. The only soil in this unit is:

Fallsington fine sandy loam.

This soil is limited chiefly by poor drainage and a high water table. It is moderately permeable, has a deep root zone, and is underlain by sand at a depth of about 3 feet. It has a medium capacity for holding moisture available to plants and a medium amount of organic matter. It is extremely acid. Although inherently low in fertility, this soil, if properly drained, responds well to complete fertilizer and lime. The surface layer is generally fine sandy loam, but in small areas, it is sandy loam and loam. It is easily worked when the water table is below the subsoil.

Most of the acreage of this soil is in woodland, but about 5,000 acres are used for such crops as corn and soybeans. A small acreage is in pasture (fig. 4). If properly drained, the soil is well suited to corn and soybeans (fig. 5). It is also well suited to pasture but poorly suited to alfalfa and early vegetables. Woodland does well but would do better if drainage were improved.

The following 3-year cropping systems are suitable for this soil: (1) 1 year of corn, 1 year of wheat or oats followed by a winter cover crop, and 1 year of soybeans followed by a grass or legume grown for seed or hay; (2) 1 year of corn, 1 year of wheat or oats followed by a grass or legume grown for seed, and 1 year of soybeans followed by a winter cover crop.

The return of crop residues to the soil helps to maintain good tilth and structure and to promote beneficial activity of bacteria.

Capability unit IVe-1

Capability unit IVe-1 is made up of excessively drained, sloping sandy soils. The areas border stream bottoms. The only mapping unit is:

Sloping sandy land.

This miscellaneous land type is limited chiefly by deep, droughty sand and by strong slopes. The soil material has rapid permeability. It has a medium capacity for holding moisture available to plants and a medium amount of organic matter. It is strongly acid. Natural fertility is low, and leaching of plant nutrients is excessive. The sandy surface and subsurface soil is very easily worked within a wide range of moisture content.

Little of this land type is cultivated or pastured. Nearly all of it is in woodland, which is its best use. If Sloping sandy land is cultivated, a cropping system consisting of a small grain and hay is more suitable than one that includes row crops. Close-growing vegetation is needed for protection against erosion, especially gully erosion. If row crops are grown, strip-cropping should be practiced. Alfalfa is poorly suited.

The following 4-year cropping systems are suitable: (1) 1 year of a small grain and 3 years of grasses and legumes; (2) 1 year of a small grain and 3 years of sericea lespedeza. Sericea lespedeza can be grown continuously.

The return of crop residues to the soil is especially important; it reduces leaching of plant nutrients, improves moisture-holding capacity, and promotes beneficial activity of bacteria.

Capabiltiy unit Vw-1

Capability unit Vw-1 consists of a mixture of sandy, loamy, and clayey soils on flat, poorly drained bottom land that is flooded frequently. The only mapping unit is:

Mixed alluvial land.

This wet bottom land is limited by poor drainage, mixed texture, flooding, and difficult drainage problems. The soil material varies in many characteristics. It has a high content of organic matter and is extremely acid. It may be slightly saline as the result of tidal flooding during storms.

Mixed alluvial land includes areas of swamp, which are indicated by symbols on the detailed map.

Mixed alluvial land is entirely in woodland, which is its best use. If suitably drained, it may provide pasture. It is very poorly suited to cultivated crops.

A diversion ditch can be built at the foot of slopes above this land type to provide suitable drainage for pasture. In addition, back furrows can be plowed so that the field slopes toward the channels and water flows freely into them.

Capability unit VIe-1

The soils of capability unit VIe-1 are sloping, moderately well drained, and deep to sand. They have little or no surface soil and a heavy clay subsoil that is underlain by friable loamy material. The only soil in this unit is:

Keyport silt loam, 8 to 12 percent slopes, eroded.

This soil is slowly permeable. The heavy clay subsoil restricts the development of roots to some extent. Sandier material underlies the subsoil, 3 to 4½ feet below the surface. The soil has a medium to low capacity for holding moisture available to plants. It has a medium to low content of organic matter and is very strongly acid. Natural fertility is medium to low. Fertility can be maintained through the use of complete fertilizer and lime, provided erosion is controlled by a dense covering of vegetation.

This soil is suited to pasture and woodland. Nearly all of it is in woodland.

Capability unit VIe-2

Capability unit VIe-2 consists of steep, excessively drained, droughty soils that border flood plains. The only mapping unit is:

Steep sandy land.

This miscellaneous land type is limited chiefly by its light sandy texture and steep slopes. The soil is rapidly

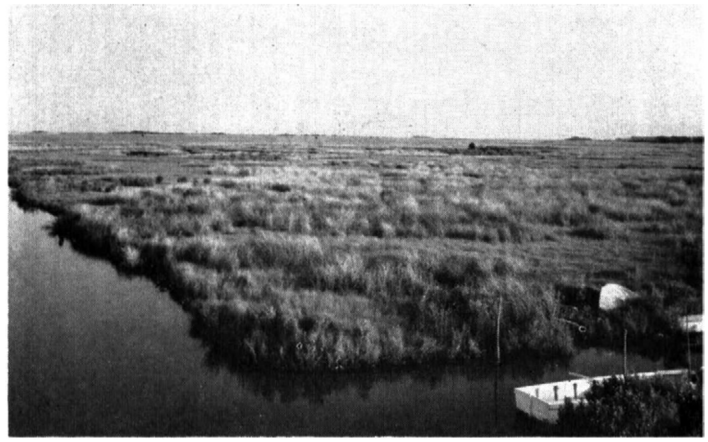

Figure 6.—**Area of Tidal marsh, low, between Onemo and Bethel Beach.**

permeable, and the root zone is deep. It has a low capacity for holding moisture available to plants and a small amount of organic matter. It is strongly acid. Natural fertility is low.

This land type is not suited to cultivation. Its best use is for woodland, but fair pasture can be developed. Most of the acreage is in woodland.

Capability unit VIIw-1

Capability unit VIIIw-1 is made up of flat, wet lowland that is frequently flooded by salt-water tides. It consists of:

Tidal marsh, high.

This miscellaneous land type consists essentially of mineral soil material that contains various amounts of organic matter. It is not suited to agriculture because of high salinity, a continuously high water table, and frequent flooding.

The marshes are covered with marsh grasses, widely scattered shrubs, and scrubby trees. They can be used to a very limited extent for grazing. They are used chiefly for wildlife habitats and are suitable for hunting preserves.

Capability unit VIIIw-1

Capability unit VIIIw-1 is made up of flat, wet, low land that is flooded very frequently by salty tidewater (fig. 6). It consists of:

Tidal marsh, low.

This miscellaneous land type consists essentially of mineral soil material that contains various amounts of organic matter. It is not suited to agriculture because of high salinity, a continuously high water table, and very frequent flooding by salt-water tides.

The land is covered with marsh grasses. It is used chiefly for wildlife habitats and is suitable for hunting preserves.

Capability unit VIIIs-1

Capability unit VIIIs-1 is made up of sloping sand beach that is flooded frequently by salt-water tides. It consists of:

Coastal beach.

This miscellaneous land type is not suitable for agriculture because the saline sand is flooded frequently and often covered with salt-water spray. The scattered vegetation consists of beach grasses and shrubby plants. Coastal beach is suitable for wildlife habitats and for fishing and bathing areas.

Estimated Yields

Estimated average acre yields that can be expected for the principal crops in the county are given in table 2. Yields are given for each soil under two levels of management. In columns A are estimates of yields obtained under the prevailing management. These estimates are based on the results of interviews with a number of farmers and the county agent. The yields in columns B are those to be expected under improved management.

TABLE 2.—*Estimated average acre yields of principal crops on the arable soils*

[Yields in columns A are those to be expected under prevailing management; yields in columns B are those to be expected under improved management; no estimates are given for soils that are unsuited to cultivation]

Map symbol	Soil	Corn		Soybeans		Wheat	
		A	B	A	B	A	B
Be	Bertie very fine sandy loam	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
	(Undrained)	40	50	15	20	15	20
	(Drained)	55	85	20	30	20	30
Dr	Dragston fine sandy loam, shallow:						
	(Undrained)	45	50	15	20	15	20
	(Drained)	55	85	20	30	20	30
Ek	Elkton silt loam:						
	(Undrained)	10	20	10	15	10	15
	(Drained)	50	60	20	20	15	20
Fa	Fallsington fine sandy loam:						
	(Undrained)	20	30	15	17	10	15
	(Drained)	40	80	20	25	15	20
KeA	Kempsville fine sandy loam, 0 to 2 percent slopes	65	100	30	40	35	40
KeB	Kempsville fine sandy loam, 2 to 5 percent slopes	60	90	28	35	32	37
KtA	Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes	50	75	20	30	25	35
KyA	Keyport silt loam, 0 to 2 percent slopes	50	80	20	25	30	35
SaA	Sassafras fine sandy loam, 0 to 2 percent slopes	65	100	30	40	35	40
SaB2	Sassafras fine sandy loam, 2 to 5 percent slopes, eroded	55	70	24	30	25	30
SdA	Sassafras loamy fine sand, 0 to 2 percent slopes	50	75	20	30	25	35
SsD	Sloping sandy land	30	50	15	20	20	25
Wo	Woodstown fine sandy loam	55	80	25	35	30	40

To obtain the yields shown in columns A, the average farmer follows a 2-year cropping system consisting of corn the first year and a small grain followed by soybeans the second year; no winter cover crop is grown. On corn from 200 to 300 pounds per acre of 5–10–10[2] fertilizer are applied in the row, and 300 to 400 pounds of 14–0–14 are applied as a side dressing when the corn is 6 to 12 inches high. For small grains, 300 pounds of 2–12–12 fertilizer are broadcast at seeding time and 30 to 50 pounds of nitrogen are applied as a topdressing in spring. For soybeans about 250 pounds of 0–10–20 are applied in bands below and to the side of the seed.

In general, farmers in the county are not using high rates of fertilization. It is thought, however, that crop yields can be economically increased to equal the estimates shown in columns B of table 2 if farmers use improved practices, as follows:

A 3-year cropping system is used: First year, corn (a small grain is seeded in the fall); second year, small grain and tall fescue; third year, soybeans followed by a winter cover crop. Corn is fertilized with 100 pounds of nitrogen (N), 80 pounds of phosphoric acid (P_2O_5), and 80 pounds of potash (K_2O) per acre. Before seeding time, some of the phosphoric acid and potash is broadcast and worked into the soil. At seeding time 100 to 300 pounds of complete fertilizer are applied in bands below and to the side of the seed. Some nitrogen is used as a side dressing when the corn is knee high. Small grains receive 25 pounds of nitrogen, 80 pounds of phosphoric acid, and 50 pounds of potash at seeding time and 30 pounds of nitrogen as a topdressing in February. At seeding time soybeans receive 40 pounds of phosphoric acid and 70 pounds of potash, applied in bands below and to the side of the seed.

Minor elements, such as boron and manganese may be deficient, especially in light sandy soils, and may be needed for some crops.

Lime is applied in amounts determined by soil tests. A pH of 6.0 to 6.5 should be maintained. It is best to use dolomitic limestone because it supplies magnesium, which is often deficient in the soils of the county.

Winter cover is maintained to reduce leaching of plant food and to increase the moisture intake of the soils. All crop residues are returned to the soils. Contour tillage or stripcropping are practiced on sloping fields. Adequate drainage is provided where necessary.

Engineering Applications

Interpretation of soils for engineering uses are made in this section of the report. Soil engineering and structural engineering are closely related. Many structures rest upon the soil and some are made of soil. Soils are natural materials that vary considerably in engineering properties. In many places the differences are great within a few feet. Determination of the significant engineering properties of soils, correlation of the various properties with the requirements of the particular job, and selection of the best available material for the job are important requirements in sound engineering practices.

This report contains soil information that will be helpful to engineers. It is extremely important, however, to understand the limitations as well as the benefits

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

that can be derived from the use of this information. It is not possible on a soil survey map to show all the important local variations in soils, especially some of the differences that occur within a few feet. Furthermore, thickness of soil horizons or layers, depth to sand, and other characteristics may vary significantly within a short distance. *It is not intended that this report will eliminate the need for sampling and testing for design and construction of specific engineering works.* It does, however, serve as a valuable guide in the preliminary planning for construction.

Engineers can use the soil information in this report to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and dikes.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed investigations of the selected locations.
4. Locate probable sources of sand, gravel, and other construction materials.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Some of the terms used by the soil scientist may not be familiar to the engineer. Consult the Glossary at the back of the report for definitions of special terms.

Soil Data and Engineering Classification Systems

Some of the information that engineers need to know about the soils of Mathews County is given in table 3. This table gives brief descriptions of the soils and estimates of their physical properties.

Two systems for classification of soils are in general use among engineers. The Unified classification system (*13*) of the Corps of Engineers, U.S. Army, is used by some engineers. In this system identification of the soil is based on its characteristics and how it behaves as an engineering construction material. The following soil properties have been found most useful in this system of classification: (1) Percentages of gravel, sand, and fines (fraction passing No. 200 sieve); (2) shape of the grain-size distribution curve; (3) plasticity and compressibility. In the Unified system, soil materials are classified as coarse grained (8 classes), fine grained (6 classes), and highly organic (1 class). The Unified classification of the soils of Mathews County is indicated by symbols in table 3, as well as in table 4.

600035—62——3

Most highway engineers classify soils in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clay soils having low strength when wet. Within each group the relative engineering value of the soil materials is indicated by a group index number. Group index numbers range from 0, for the best materials, to 20, for the poorest. The group index number is shown in parentheses, following the soil group symbol. (See tables 3 and 4.) In the symbol A–4(4), the soil group symbol is A–4, which represents nonplastic to moderately plastic silty soils, and the group index number is (4), which represents soil materials of average quality within soil group A–4.

Depths to the seasonally high water table, as shown in table 3, are estimates based on observation. Normally the water table is highest during winter, when evaporation and transpiration are low.

The reaction of the soils, shown in pH values in table 3, are estimates based on soil tests made by the Virginia Department of Agriculture and Immigration.

Shrink-swell potential refers to the capacity of the soil to shrink upon drying and to swell upon wetting. Estimates for shrink-swell potential given in table 3 are based on field experience.

The estimates of soil properties in table 3 are based in part on tests of soil samples by the Virginia Department of Highways. The results of tests made on soil samples taken from nine profiles are given in table 4.

The horizon designation commonly used by soil scientists, as shown on table 4, are as follows: A—surface layer and subsurface layer; B—subsoil; C—substratum, or material underlying the subsoil; subscript p—plow layer; subscript g—gleyed horizon (gray and poorly drained); subscript numbers 1, 2, and 3—subdivisions of the A, B, and C horizons; subscript numbers 21 and 22—further subdivision of the A, B, and C horizons.

Maximum dry density refers to the volume weight of compacted soil, expressed in pounds per cubic foot, at optimum moisture content. It represents the greatest density obtained in the test under the entire range of soil moisture.

The optimum moisture content indicates the percentage of moisture when the soil is at its maximum density for a given compactive effort.

The mechanical analyses, shown in table 4, were made with sieves of various sizes and a hydrometer. Soil passing the No. 200 sieve was tested with a hydrometer to determine the percentage of particles of various size fractions 0.05 millimeter and smaller.

Liquid limit is the percentage of moisture in the soil when it passes from a plastic to a liquid state.

The plasticity index is the difference in percentage of moisture between the liquid limit and the plastic limit. (Plastic limit is the percentage of moisture in the soil when it changes from a solid or nonplastic state to a plastic state.)

TABLE 3.—*Brief descriptions of the soils*

Soils	Depth to seasonally high water table	Brief site and soil description	Depth from surface	Classification	
				Unified	AASHO
	Inches		*Inches*		
Bertie very fine sandy loam	10	Somewhat poorly drained loamy soils underlain by sandy loam and sand below 36 inches.	0–10 10–37 37–64+	SM, ML CL SM	A–4 A–4 A–2, A–4
Coastal beach		Sand that is flooded by tides			
Dragston fine sandy loam, shallow	6	Somewhat poorly drained loamy soils underlain by sand below 30 inches.	0–8 8–25 25–42+	SM–ML ML–CL SM	A–4 A–4 A–2
Elkton silt loam	0	Poorly drained clay soils underlain by sandy clay loam below 48 inches.	0–8 8–47 47–97	ML CH SM	A–4 A–7 A–2
Fallsington fine sandy loam	0	Poorly drained loamy soils underlain by sand below 36 inches.	0–8 8–37 37–57+	SM ML–CL SM	A–4 A–4 A–2
Kempsville fine sandy loam, 0 to 2 percent slopes. Kempsville fine sandy loam, 2 to 5 percent slopes.	72	Well-drained loamy soils underlain by sandy loam and sand below 36 inches.	0–11 11–40 40–70+	SM SC–CL SM	A–4 A–4 A–2, A–4
Kempsville loamy fine sand, thick surface, 0 to 2 percent slopes.	72	Well-drained to excessively drained sandy and loamy soils underlain by sand below 36 inches.	0–22 22–32 32–74+	SM SC–CL SM	A–2 A–4 A–2
Keyport silt loam, 0 to 2 percent slopes. Keyport silt loam, 8 to 12 percent slopes, eroded.	20	Moderately well drained clay soils underlain by sandy clay loam at 48 inches.	0–8 8–37 37–65+	ML CH SC	A–4 A–7 A–2
Mixed alluvial land	24+	Poorly drained stream bottoms of variable textures; flooded frequently.			
Sassafras fine sandy loam, 0 to 2 percent slopes. Sassafras fine sandy loam, 2 to 5 percent slopes, eroded.	72	Well-drained loamy soils underlain by sand at 36 inches.	0–8 8–36 36–68+	SM SC, CL SM	A–2, A–4 A–4 A–2
Sassafras loamy fine sand, 0 to 2 percent slopes.	72	Well-drained to excessively drained sandy and loamy soils underlain by sand at 36 inches.	0–23 23–36 36–72+	SM SC SM	A–2 A–4 A–2
Sloping sandy land. Steep sandy land.	42	Excessively drained loamy sand and sand with strata and pockets of finer textured materials.	0–45+		
Tidal marsh, low	48+	Wet saline soils flooded daily by tides.			
Tidal marsh, high	42+	Wet saline soils flooded frequently by tides.			
Woodstown fine sandy loam	20	Moderately well drained loamy soils underlain by sand at 36 inches.	0–9 9–35 35–53+	SM ML–CL SM	A–2, A–4 A–4 A–2

and their estimated physical properties

Percentage passing sieve—			Reaction	Shrink-swell potential	Percolation rate	Available water
No. 10	No. 40	No. 200				
			pH		*Inches per hour*	*Inches per foot of depth*
100	95–100	45–65	4.5 to 5.0	Low		
100	95–100	60–70	4.5 to 5.0	Medium	0.8 to 2.5	1. 1
100	95–100	20–45	4.5 to 5.0	Low	2.5 to 5.0	
			(1)	Very low	More than 10.0	
100	95–100	40–55	5.1 to 5.5	Low		
100	95–100	50–60	5.1 to 5.5	Low	3.8 to 2.5	1. 2
100	95–100	15–25	5.1 to 5.5	Low	2.5 to 5.0	
100	95–100	80–95	Below 4.5	Low		
100	95–100	85–95	Below 4.5	High	.05 to 0.2	1. 3
100	95–100	15–25	Below 4.5	Low	Less than 0.05	
100	95–100	35–45	Below 4.5	Low		
100	100	50–65	Below 4.5	Low	0.8 to 2.5	1. 1
100	100	20–30	Below 4.5	Low	2.5 to 5.0	
100	90–100	35–45	5.1 to 5.5	Low		
100	95–100	45–55	5.1 to 5.5	Low	2.5 to 5.0	1. 2
100	95–100	20–40	5.1 to 5.5	Low	More than 10.0	
100	90–100	15–30	5.1 to 5.5	Low		
100	90–100	40–55	5.1 to 5.5	Low	2.5 to 5.0	. 7
100	90–100	15–35	5.1 to 5.5	Low	More than 10.0	
100	90–100	70–90	4.5 to 5.0	Low		
100	90–100	80–95	4.5 to 5.0	High	0.2 to 0.8	1. 3
100	60–85	20–30	4.5 to 5.0	Medium	0.2 to 0.8	
					(2)	(2)
100	85–100	20–45	5.1 to 5.5	Low		
100	85–100	45–55	5.1 to 5.5	Low	5.0 to 10.0	1. 2
100	80–100	15–30	5.1 to 5.5	Low	More than 10.0	
100	90–100	15–30	5.1 to 5.5	Low		
100	90–100	40–50	5.1 to 5.5	Low	2.5 to 5.0	. 7
100	90–100	15–30	5.1 to 5.5	Low	More than 10.0	
			5.1 to 5.5	Low	5. 0 to 10. 0	. 5
			(1)		(2)	(2)
			(1)		(2)	(2)
100	95–100	30–40	4.5 to 5.0	Low		
100	100	50–65	4.5 to 5.0	Low	2.5 to 5.0	1. 2
100	100	15–25	4.5 to 5.0	Low	More than 10.0	

[1] Saline. [2] Variable.

TABLE 4.—*Engineering test data* [1] *for*

Soil name and location [2]	Virginia report No.	Depth	Horizon	Moisture-density [3]: Maximum dry density	Moisture-density [3]: Optimum moisture content	Mechanical analyses [4]: Percentage passing sieve— No. 10 (2.0 mm.)	Mechanical analyses [4]: Percentage passing sieve— No. 40 (0.42 mm.)
Dragston fine sandy loam:		*Inches*		*Lb. per cu. ft.*	*Percent*		
0.25 mile E. of Wards Corner	SO 38875	0–8	A_p	114	13	100	98
	SO 38876	14–22	B_{22}	123	12	100	98
	SO 38877	25–45	C	116	13	100	95
0.75 mile N. of Cardinal	SO 38878	0–6	A_p	111	15	100	99
	SO 38879	12–24	B_{22}	120	12	100	100
	SO 38880	27–40	C	100	15	100	100
Fallsington fine sandy loam:							
0.8 mile SE. of Foster	SO 38884	0–8	A_p	105	17	100	98
	SO 38885	8–23	B_{2g}	119	13	100	100
	SO 38886	37–57	C_g	113	14	100	100
Kempsville fine sandy loam:							
0.25 mile S. of Fort Nonsense	SO 38881	0–8	A_p	118	11	100	96
	SO 38882	16–34	B_2	117	14	100	97
	SO 38883	50–70	C_2	115	13	100	97
Keyport silt loam:							
0.6 mile N. of Cobbs Creek	SO 38787	0–4	A_2	105	17	100	99
	SO 38788	8–19	B_{21}	97	20	100	99
	SO 38789	29–50	B_3	100	17	100	98
	SO 38790	50–75+	C	119	12	100	80
Keyport very fine sandy loam:							
0.7 mile N. of Cobbs Creek	SO 38791	0–8	A_p	118	11	100	90
	SO 38792	8–18	B_{21}	101	22	100	97
	SO 38793	27–37	B_3	105	17	100	97
	SO 38794	37–55	C	120	12	100	63
Sassafras fine sandy loam:							
0.5 mile S. of Dixie	SO 38781	0–8	A_p	117	10	100	96
	SO 38782	14–25	B_2	117	13	100	98
	SO 38783	36–51	C_1	112	10	100	97
0.6 mile SW. of Soles	SO 38784	0–9	A_p	125	10	100	85
	SO 38785	16–32	B_2	123	11	100	87
	SO 38786	39–85	C	130	9	100	80
Woodstown fine sandy loam:							
0.3 mile S. of Retz	SO 38887	0–9	A_p	117	12	100	99
	SO 38888	19–27	B_{22}	121	12	100	100
	SO 38889	35–53	C	106	13	100	100

[1] Tests performed by Virginia Department of Highways in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*).

[2] The parent materials of all the soils are stratified marine sediments.

[3] Based on the Moisture-density Relations of Soils Using a 5.5-lb. Rammer and a 12-in. Drop, AASHO Designation: T 99–57, Method A (*1*).

[4] Mechanical analyses according to the AASHO Designation: T 88 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diam-

soil samples taken from nine soil profiles

Mechanical analyses[4]					Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued	Percentage smaller than—						AASHO[5]	Unified[6]
No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
51	46	28	12	8	18	[7]	A-4(4)	ML.
54	49	39	23	17	21	6	A-4(4)	ML-CL.
20	15	13	12	10	18	[7]	A-2-4(0)	SM.
40	32	21	10	6	20	[7]	A-4(2)	SM.
51	46	37	22	16	19	3	A-4(4)	ML.
15	11	9	7	6	21	[7]	A-2-4(0)	SM.
37	28	18	8	6	22	[7]	A-4(1)	SM.
52	49	39	27	20	22	6	A-4(4)	ML-CL.
23	21	16	12	9	19	[7]	A-2-4(0)	SM.
39	30	19	9	5	16	[7]	A-4(1)	SM.
50	41	34	25	21	26	8	A-4(3)	SC.
40	22	15	13	11	21	[7]	A-4(1)	SM.
92	85	61	25	15	26	3	A-4(8)	ML.
95	90	77	56	39	52	24	A-7-6(16)	MH-CH.
87	77	67	52	46	64	37	A-7-6(20)	CH.
27	26	25	23	21	26	[7]	A-2-4(0)	SM.
64	49	33	14	9	19	[7]	A-4(6)	ML.
88	76	66	51	44	52	28	A-7-6(18)	CH.
83	74	67	43	23	61	36	A-7-6(20)	CH.
23	23	22	20	19	32	15	A-2-6(0)	SC.
23	19	12	7	5	14	[7]	A-2-4(0)	SM.
50	47	38	27	22	25	9	A-4(3)	SC.
16	13	12	11	10	19	[7]	A-2-4(0)	SM.
42	36	26	12	7	16	[7]	A-4(2)	SM.
48	44	36	25	20	26	8	A-4(3)	SC.
29	26	18	11	10	15	[7]	A-2-4(0)	SM.
35	30	20	9	5	18	[7]	A-2-4(0)	SM.
55	49	39	26	20	23	6	A-4(4)	ML-CL.
17	13	12	10	8	19	[7]	A-2-4(0)	SM.

eter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes of soils.

[5] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (pt. 1, ed. 7): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145-49 (*1*).

[6] Based on the Unified Soil Classification System, Technical Memorandum No. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953 (*13*).

[7] Nonplastic.

TABLE 5.—*Interpretation of*

Soils and map symbols	Susceptibility to frost action	Suitability for— Winter grading	Road subgrade	Road fill	Suitability as source of— Topsoil	Sand	Suitable type of pond
Bertie very fine sandy loam (Be).	Moderate	Not suitable	Not suitable	Fair	Fair	Not suitable	None
Coastal beach (Cb)	Not susceptible.	Suitable	Not suitable	Not suitable	Not suitable	Fair	None
Dragston fine sandy loam, shallow (Dr).	Low	Not suitable	Fair	Good	Good	Not suitable	None
Elkton silt loam (Ek)	High	Not suitable	Not suitable	Not suitable	Poor	Not suitable	Excavated
Fallsington fine sandy loam (Fa).	Moderate	Not suitable	Fair	Good	Fair	Not suitable	Excavated
Kempsville fine sandy loam (KeA, KeB).	Moderate	Suitable	Good	Good	Good	Not suitable	Impounded
Kempsville loamy fine sand, thick surface (KtA).	Moderate	Suitable	Good	Good	Good	Not suitable	Impounded
Keyport silt loam (KyA, KyD2).	High	Not suitable	Not suitable	Not suitable	Fair	Not suitable	None
Mixed alluvial land (Ma)	Low	Not suitable	Not suitable	Not suitable	Fair	Not suitable	Excavated or impounded.
Sassafras fine sandy loam (SaA, SaB2).	Moderate	Suitable	Good	Good	Good	Not suitable	Impounded
Sassafras loamy fine sand (SdA).	Moderate	Suitable	Good	Good	Good	Not suitable	Impounded
Sloping sandy land (SsD) Steep sandy land (StE)	Low	Suitable	Good	Good	Fair	Fair	Impounded (requires site investigation).
Tidal marsh, high (Th)	Low	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	None
Tidal marsh, low (To)	Low	Not suitable	Not suitable	Not suitable	Not suitable	Not suitable	None
Woodstown fine sandy loam (Wo).	Moderate	Not suitable	Good	Good	Good	Not suitable	None

Interpretation of Engineering Properties of the Soils

Some engineering information can be obtained directly from the soil map at the back of the report. Additional information can be had from other sections of the report, particularly the introduction and the sections entitled "General Nature of the County" and "Descriptions of the Soils."

In table 5, the soils are evaluated for engineering use and soil features that affect engineering work are pointed out. Interpretations were made on the basis of estimated data from table 3, actual test data from table 4, and field experience and performance.

Permeability, which is measured by the rate of percolation of water down through the soil, is important in designing drainage systems. The percolation rate is governed largely by the texture, structure, and compaction of the soil. Layers of heavy clay and plowpans restrict percolation.

The suitability of the soils as a source of topsoil is evaluated in table 5. Topsoil is frequently spread on embankments, on cut slopes, in ditches, and on highway shoulders to promote vegetation. Sandy loams or loamy sands are preferred for shoulders that are to support limited traffic.

The Keyport and Elkton are the only soils in the county that change greatly in volume upon wetting and drying. The acreage of these soils is small and is mostly north of Cobbs Creek. All other soils in the county are low to medium in shrink-swell capacity, as shown in table 3.

engineering properties of the soils

Soil features affecting engineering work with—					
Vertical alinement for highways		Farm ponds		Agriculture drainage	Irrigation
Materials	Drainage	Reservoir area	Embankment		*Water-supplying capacity*
Clay loam and fluid sand horizons.	Seasonally high water table.	Highly permeable strata below 36 inches.	Adequate strength; moderate permeability.	Clay loam underlain by sand below 36 inches.	Medium.
Sand	Flooded by tides	Excessive seepage	Unstable; excessive seepage.	Unsuitable	Low.
Sandy clay loam and sand horizons.	Seasonally high water table.	Highly permeable strata below 30 inches.	Adequate strength; moderate permeability.	Sandy clay loam underlain by fluid sand below 30 inches.	Medium.
Plastic clay	Seasonally high water table.	Recharge through permeable strata below 48 inches.	Stable banks for excavated pond.	Plastic clay underlain by fluid sand below 48 inches.	High.
Sandy clay loam and sand horizons.	Seasonally high water table.	Recharge through permeable strata below 36 inches.	Some bank caving below 3 feet because of sand.	Sandy clay loam underlain by fluid sand below 36 inches.	Medium.
Sandy clay loam and sand horizons.	Low water table	Highly permeable substrata; excessive seepage.	Adequate strength; moderate permeability.	Well drained; artificial drainage not needed.	Medium.
Sandy clay loam and sand horizons.	Low water table	Highly permeable substrata; excessive seepage.	Adequate strength; slow permeability.	Well drained to excessively drained; artificial drainage not needed.	Low.
Plastic clay underlain by sand at 48 inches.	Seasonally high water table.	Excessive seepage; sand below 48 inches.	Unstable clay	Plastic clay underlain by sand at 48 inches.	Medium.
Variable sands, silts, and clays.	Flood plains with constantly high water table.	Excessive seepage	Unstable strata and pockets of sand.	Fluid sand in strata and pockets.	High.
Sandy clay loam underlain by sand at 36 inches.	Low water table	Excessive seepage; sand below 36 inches.	Adequate strength; moderate permeability.	Well drained; artificial drainage not needed.	Medium.
Sandy clay loam underlain by sand at 36 inches.	Low water table	Excessive seepage; sand below 36 inches.	Adequate strength; moderate permeability.	Well drained to excessively drained; artificial drainage not needed.	Low.
Loamy sand overlying sand.	Low water table	Excessive seepage	Highly permeable sand	Excessively drained; artificial drainage not needed.	Low.
Variable sands, silts, and clays.	Flooded frequently by tides.	Saline	Saline	Not suitable	High.
Variable sands, silts, and clays.	Flooded daily by tides.	Saline	Saline	Not suitable	High.
Sandy clay loam overlying sand.	Seasonally high water table.	Excessive seepage; sand below 36 inches.	Adequate strength; moderate permeability.	Sand below 36 inches	Medium.

Some of the problems in highway work are due to the kind of soil materials and particularly to drainage. In Mathews County bedrock is at a great depth. In places some shell marl and coquina occur at a depth exceeding 5 feet. Some of this material can be seen along the Piankatank River between Ginny Point and Dixie.

Drainage characteristics of the soils are given in table 5. The soil ratings for suitability for different kinds of earthwork are based on internal drainage and workability of soils at a high moisture content. Drainage ditches will make soils with a high water table more suitable for borrow material. Underdrains help make such soils more stable.

Because of the low elevation, nearly level topography, high water table, and lack of natural drains in Mathews County, fills are needed in most roads for satisfactory results. The minimum elevation of the pavement surface above the seasonally high water table should be 3 feet for rigid pavement and 4 feet for flexible pavement. Since bottom lands along streams are flooded frequently, roadbeds in these areas should be constructed on an embankment that is at least 3 to 4 feet above the high water level.

Fine sands exposed in road cuts are subject to wind and water erosion in areas where the water table is deep. When roads are built along coastal beaches or along shorelines, they must be protected from erosion by wave action. Riprap can be used to advantage in these locations.

If the standard requirements for soil compaction are met, earthwork can usually be done in the winter in

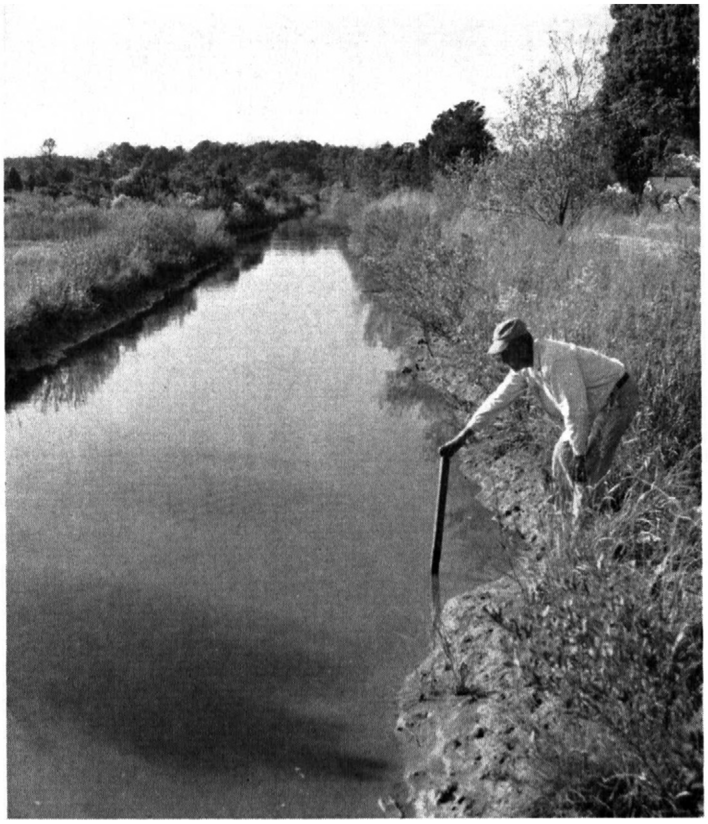

Figure 7.—**Drainage canal at Onemo serves as an outlet for water draining from Fallsington and Dragston soils.**

the excessively drained, well drained, and moderately well drained sandy soils that are at elevations above 10 feet.

There are extensive areas of poorly drained soils at low elevations in the county. Tidal marsh and Mixed alluvial land are generally at an elevation of less than 2 feet. Roadways across parts of Tidal marsh where heavy traffic is expected require special treatment.

Most of the soils do not contain enough gravel for use in base courses of flexible pavements. A limited source of gravel is the substratum of the Sassafras and Kempsville soils, along State Highway No. 626 between Foster and Blakes. Some of the soils are fairly well suited to limited use for subbase material. The best material can be obtained from Sloping sandy land and Steep sandy land and from the substratum of all of the soils except the Keyport and Elkton.

Repeated movements of heavy-axle-load trucks on a rigid pavement constructed on a subgrade composed of soil material more than 35 percent of which passes through the No. 200 sieve (0.074 millimeter) will cause the forceful ejection of the subgrade soil and water. Consequently, a base course will be needed for rigid pavements that are to have a great volume of truck traffic.

Some of the most important factors that affect the suitability of soils for irrigation are as follows:

1. If water is to be distributed by surface spreading from ditches, the topography must be suitable for distribution of the water. This means that the lay of the land must be such that leveling can be done without exposing the subsoil.
2. The soil profile should be permeable enough that drainage will not be impeded.
3. The soil should have good water-holding capacity yet permit aeration and unrestricted development of roots.
4. The soil should be largely free of salts.
5. The structure and other physical properties of the soil should enable it to resist erosion.

The suitability of the soils for irrigation is based on the texture and structure of the various horizons, or layers, and their relative water-holding capacity, permeability, and suitability for drainage.

The permeability of the soil is important in planning and designing drainage systems. Tile drainage systems may not be practical if the permeability of the soil is slow. Because of the very low elevations in many places in the county, especially along the Chesapeake Bay, tile drainage may not be practical in fields that lack an outlet. Open ditches, used along with dikes and tide floodgates, may be satisfactory in such places.

Problems associated with caving and flowing sand generally occur in drainage systems in most soils in the county. Drainage systems can best be installed in summer when the water table is lowest. In tile systems, butt the tile to a tight fit and cover the joints to exclude sand. Take necessary precautions to insure proper alinement of the tile. In open-ditch drainage systems, it is best to limit the depth of the cut into the sand to 6 inches or less to avoid excessive caving of the ditchbank. Increased capacity can be obtained by increasing the width of the ditches. Where natural outlets are not available, provide adequate outlets by the installation of large main ditches (fig. 7). Accumulation ditches and prepared outlets into main ditches can be used to avoid outlet erosion and the creation of bars.

Dug or excavated ponds, such as those on farms along Blackwater Creek, can be constructed with a dragline in poorly drained soils. The spoil should be placed far enough away from the pond to prevent its being moved by erosion back into the pond and to relieve banks of the added weight. Adequate vegetation should be established on the spoil to control erosion.

Forests [3]

When the first settlers arrived, the forests of this area probably consisted predominantly of hardwoods, including some chestnut, and only a few scattered pine trees. The original forest was cut long ago, and it is therefore impossible to determine the exact composition. However, in the less accessible interior of the county, which has not been cultivated for at least 100 years, present-day stands give some indication of the makeup of the original forest. These stands consist predominantly of white and red oaks but contain a considerable amount of gums, maples, and other hardwoods, and occasional pines.

[3] By T. A. Dierauf, W. C. Stanley, L. D. Woodson, and A. M. Morgan, Virginia Division of Forestry, and J. W. Clay, U.S. Soil Conservation Service.

Forest History and Succession

Most of the county was cleared for cultivation, and an extensive system of ditches and canals was established to drain the predominantly wet soils. Much of the land that was cleared was later abandoned, and it seeded naturally to loblolly pine. The abandoned fields provided an ideal seedbed, and windborne seed from scattered pines in the surrounding forest established pure stands of pine known as old-field stands.

When an old-field stand is cut, the second crop of timber usually contains some sweetgum, maple, oak, and other hardwoods, along with pine. The shade-tolerant hardwoods gradually become established in the understory of old-field pine. After the pine is cut, the hardwoods survive and occupy part of the overstory in the second stand. Either pine or hardwoods may predominate in the second stand. The third crop of timber contains even more hardwoods, and by this time hardwoods usually predominate. Thus, on abandoned farmland, there is a succession of forest types from pure pine, through mixed pines and hardwoods, to nearly pure hardwoods. Selective cutting of scattered pines from stands of cutover origin is a common practice that speeds the trend, or succession, to pure stands of hardwoods. The final, or "climax," forest of hardwoods perpetuates itself because the hardwoods become established and grow in the shade of the forest, whereas the pines require full sunlight.

The succession from pine to hardwoods may be delayed or interrupted by fire. Fire kills back much of the hardwood growth and also reduces the depth of the litter so that pine seed has a better chance to germinate. Many of the excellent pine stands on cutover land became established after fires.

Present Forests

In 1956 about 30,000 acres, or 65 percent of the total land area of the county, was forested (*2*). Area measurements of the soil survey map, made by the U.S. Soil Conservation Service in 1943, showed that there were about 24,000 acres of forest land in the county. This indicates that 6,000 acres of cultivated land was abandoned or put back in forests between 1943 and 1956. This trend has apparently slowed, but there is still some increase in forest acreage each year. Most of the forests are on private holdings of less than 50 acres.

At present about half of the forested area is of the loblolly pine type; that is, loblolly pine, the chief commercial tree, comprises 50 percent or more of the stand. The other half is in either the mixed loblolly pine-oak type or the oak type.

During the past 20 years or so, as the old-field stands of pine have been clear cut with no provisions for getting pine back, the trend has been toward less pine and more hardwood. In the past 2 or 3 years, however, there has been more interest in good forest management and the planting, scarification (to destroy brush and expose mineral soil), and control of hardwoods have increased.

Stands of sawtimber size are seriously decreasing in area. Many landowners sell their timber as soon as it will make small sawtimber. It would be much more profitable, however, for them to permit the timber to grow another 10 to 20 years. A stand of pine is generally starting the period of most rapid increase in value when it is just large enough to cut for sawtimber. Stands that are 25 to 30 years old will usually more than double in value during the next 10 years.

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Forest Species

The predominant tree and understory species on any site are determined primarily by the stage of succession from old-field pine to hardwood, and, to a lesser degree, by drainage. Loblolly pine (*Pinus taeda*) predominates in the old-field stands. Virginia, or spruce, pine (*P. virginiana*) and shortleaf pine (*P. echinata*) are occasionally found. Virginia and shortleaf pines are mainly on the better drained Woodstown and Kempsville soils and are uncommon on the poorly drained Fallsington soil. Throughout the county, scattered sweetgum (*Liquidambar styraciflua*) occurs in the upper canopy, and on the better drained soils scattered yellow-poplar (*Liriodendron tulipifera*) is sometimes found.

The understory in old fields is dominated by sweetgum, red maple (*Acer rubrum*), and waxmyrtle (*Myrica cerifera*). Holly (*Ilex opaca*), blackgum (*Nyssa sylvatica*), and wild cherry (*Prunus serotina*) are very common. Dogwood (*Cornus florida*) and sassafras (*Sassafras albidum*) occur in most places, especially on the better drained Woodstown and Kempsville soils. Small oak seedlings and saplings are common, and sourwood (*Oxydendrum arboreum*) occurs in many places. Many areas have a ground cover of honeysuckle, trumpet creeper, and poison-ivy.

After stands of old-field pine are cut, the amount and variety of hardwoods in the overstory of the succeeding stand increases. Redgum, red maple, blackgum, and oaks that were saplings and poles in the previous old-field stands grow up rapidly after logging and occupy part of the overstory. The understory also changes. There is considerably less waxmyrtle. Sweetgum and red maple still predominate, but not so much as in old-field stands. Oak and other hardwoods are more abundant. Various kinds of blueberries (*Vaccinium* spp.), huckleberries (*Gaylussacia* spp.), pepperbush (*Clethra alnifolia*), and greenbrier (*Smilax* spp.) make up the low ground cover.

After an area has been cut over two or three times, hardwoods usually predominate unless fire has interrupted the trend or succession. White oak (*Quercus alba*) is usually the most abundant tree in the hardwood stands.

Old stands of hardwoods on Fallsington soil in the poorly drained interior of the county are composed for the most part of white oak, southern red oak (*Q. falcata*), swamp chestnut oak (*Q. michauxii*), water oak (*Q. nigra*), willow oak (*Q. phellos*), sweetgum, blackgum, and red maple. American elm (*Ulmus americana*), white ash (*Fraxinus americana*), sycamore (*Platanus occidentalis*), and river birch (*Betula nigra*) are found occasionally. Also growing on Fallsington soil are scarlet oak (*Q. coccinea*), northern red oak (*Q. rubra*), post oak (*Q. stellata*), black oak (*Q. velutina*), hickory (*Carya* spp.), beech (*Fagus grandifolia*), and yellow-poplar. These trees, however, are more common on the better drained Woodstown and Kempsville soils. A fairly heavy understory, mostly blueberries, huckleberries, pepperbush, and holly, occurs in old hardwood stands on the poorly drained Fallsington soil.

Old hardwood stands are rare on the better drained soils, because these soils were more suitable for cultivation and were not abandoned so quickly as the poorly drained soils. White oak, southern red oak, scarlet oak, sweetgum, blackgum, red maple, and hickory are the most common hardwoods. Yellow-poplar, post oak, chestnut oak (*Q. prinus*), and black oak are also fairly common. Swamp chestnut oak, water oak, willow oak, American elm, river birch, and sycamore are sometimes found but are more common on wetter soils. The understory on better drained soils is often not so heavy as on poorly drained soils and generally contains a greater variety of species.

***Figure 8.*—Loblolly pine, on Fallsington fine sandy loam, after two thinnings.**

Management of Commercially Important Trees

This section consists of a discussion of the management of loblolly pine and, to a lesser extent, other trees in Mathews County.

Loblolly pine

Loblolly pine is the most important tree grown for commercial purposes. It is valuable for sawtimber, pulpwood, poles, piling, pound stakes, and other products. It grows rapidly and is relatively easy to manage.

Proper stocking.—Loblolly pine grows best in even-aged stands. Natural, even-aged stands vary considerably in stocking (number of trees per acre). They usually start out with a large number of trees per acre, and in many places there are thousands of seedlings. As the stands grow older and become overcrowded, the number of trees is constantly reduced by natural thinning. As stands become overcrowded and mortality begins, diameter growth of the trees slows. In managed stands, stocking should be reduced by thinning so that a satisfactory rate of diameter growth is maintained. In general, the best stocking is the smallest number of trees that will fully utilize the growth capacity of the site without producing excessively rough and limby trees. A certain amount of crowding is necessary to encourage natural pruning and good form, but overcrowding reduces diameter growth below acceptable levels.

Thinning is not economically practical until the trees that should be removed are large enough to be sold. Many natural stands seed so densely that overcrowding and mortality begin before a thinning can profitably be made. Consequently, tree growth is lost. Planted seedlings can be spaced so that this problem is avoided. A spacing of 7 feet by 8 feet (800 trees per acre) will permit individual trees to grow at a satisfactory rate, without being overcrowded, until they are large enough to be thinned for pulpwood.

As an even-aged stand develops, whether it is naturally seeded or planted, proper spacing should be maintained by periodically removing the slower growing and otherwise less desirable trees (crooked, diseased, rough, and forked trees). Thus, the better trees are provided with more room to grow. The first thinning should be made when the stand is 20 to 25 years old, and the trees removed will usually be sold for pulpwood. This thinning should reduce the stocking to 200 to 400 trees per acre. Subsequent thinnings, for pulpwood or sawtimber, should be made at 5- to 8-year intervals (fig. 8). After the final thinning, about 100 to 150 crop trees per acre will remain. When the crop trees are mature, at 40 or 50 years of age, they should be clear cut. Enough seed trees should be left, however, to reseed the next crop.

Methods of encouraging reseeding of loblolly pine.—Because of the abundant moisture in most of the soils in the county during spring, germination and survival of loblolly pine seed is generally high. This favors natural seeding as a means of establishing a new crop of loblolly pine. Reseeding is almost assured where there are enough seed trees and where mineral soil is exposed by some form of scarification. In many areas where the litter and undergrowth are fairly light, good stands of pine often become established after logging, without scarification, especially if logging is done after the seeds fall. Prelogging scarification, however, improves the chances of successful reseeding. Where heavy undergrowth and deep litter are present, prelogging scarification is necessary to insure adequate germination and survival of seedlings. Scarification is often done with a heavy bush-and-bog disk. Where feasible, disking is the most desirable method for preparing a mineral seedbed and for controlling brush.

Bulldozing is another method commonly used to encourage the reseeding of loblolly pine (fig. 9). In some areas it is the only practical method. No more bulldozing should be done than necessary to remove hardwoods, to control brush, and to provide a satisfactory seedbed. Bulldozing of the poorly drained Fallsington soil when it is wet generally causes puddling and compaction, both of which are harmful to the physical condition of the soil. When this soil is very dry, a large amount of topsoil attached to tree roots is removed. It is best to bulldoze when the soil is moist but not wet.

In the past, wildfires have had the same effect as disking and bulldozing in reducing litter and destroying hardwoods. Many of the stands of pine in the county originated from natural seeding on burned areas. Some good pine stands can be found on the large, inaccessible, wet areas in the interior. Locally, these areas are called swamps, and they have not been cultivated for more than 100 years. Many of the areas have been cut over several times since they were abandoned for agriculture. Ordi-

Figure 9.—**Forest in which hardwoods were bulldozed and loblolly pine was left for reseeding.**

narily, hardwoods would be expected to completely take over these sites over such a long period. The presence of good stands of pine suggests that they originated after fires. Although wildfires have encouraged many good stands of pine, they have also destroyed many young stands. Overall, wildfires have been harmful. Controlled fire may some day be useful in the management of loblolly pine, but at present it is too dangerous to be used by the individual landowner until more is known about its behavior and effect.

The killing of undesirable hardwoods that interfere with the growth of pine seedlings is perhaps the greatest need in forests of the county. More or less unmerchantable hardwood, with little potential value, is left on practically every tract after logging. There are many tracts that reseeded well after logging on which poor hardwoods should be killed to release pine seedlings (fig. 10). Pine seedlings cannot grow satisfactorily under hardwoods. At present the most economical method of killing undesirable hardwoods is by belting (girdling) and treating them with 2,4,5–T. No other type of forestry work will pay off so well for the small investment usually needed to kill leftover, undesirable hardwoods.

A certain amount of hardwood poisoning is usually necessary along with bulldozing and disking. Generally, it is most economical to destroy only the brush and smaller hardwoods with a bulldozer and to poison all the larger hardwoods.

Other Important Trees

Besides loblolly pine, several other trees are important in Mathews County. Virginia pine often occurs in mixture with loblolly pine on the better drained soils, mostly in the higher, northern part of the county. It has the same value as loblolly pine and is used for the same products. Virginia pine, however, grows more slowly and is more susceptible to windthrow; therefore, thinning of the trees is risky. Also, it is more susceptible to damage by fire and becomes excessively limby unless grown in very dense stands. Consequently, loblolly pine should be favored.

Hardwood management has little promise in view of present day market conditions. Quality hardwoods, which are scarce in the county, bring a good price but are considerably less profitable to grow than pine because (1) hardwoods require more space for satisfactory growth than pine, and the per acre growth of pine is therefore greater; (2) there is no market for hardwood pulpwood in Mathews County, so thinning is not practical in hardwood stands; and (3) pine sawtimber has a higher stumpage value than hardwood sawtimber in the Tidewater area. If new markets and higher prices for hardwoods should develop in the future, the growing of sweetgum, red oak, and perhaps other hardwoods might be profitable. Yellow-poplar is the most valuable hardwood in surrounding areas. It is of little importance in Mathews County, however, because it occurs only as scattered trees on the better drained sites.

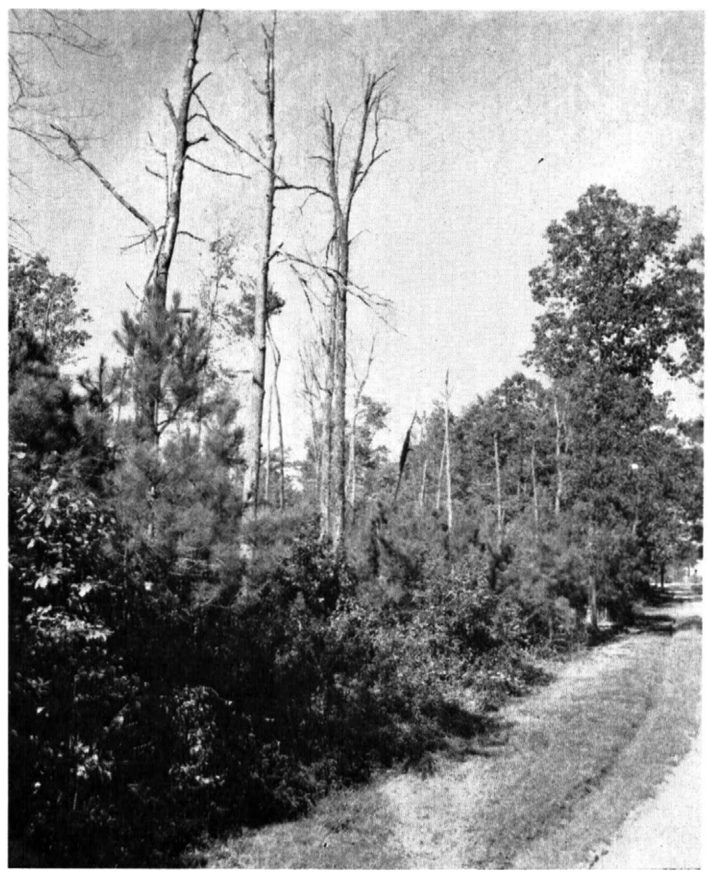

Figure 10.—**Loblolly pine released by the poisoning of hardwoods.**

Site Quality

The term *site quality* (site index) refers to the capacity of a site for growing trees or to how good a particular soil is for growing trees. The best expression of site quality is height growth. The better the soil (or the site), the taller the tree will grow. Site quality, or site index, is expressed as the average height that the dominant and codominant trees will attain on a particular site at 50 years of age. For example, if a soil has a site index rating of 80 for loblolly pine, the dominant and codominant loblolly pine growing on such a soil would be expected to average 80 feet in height when the stand is 50 years old. Volume growth in well-stocked stands is closely related to height growth and site index. Yields of fully stocked stands of loblolly pine according to site index are given in table 6.

TABLE 6.—*Yields of fully stocked stands of loblolly pine according to site index (10)*

Age of trees (in years)	Board feet per acre (international ⅛-inch rule)				
	Site index 60	Site index 70	Site index 80	Site index 90	Site index 100
30	4, 500	8, 500	12, 500	17, 000	22, 000
40	10, 000	16, 000	22, 000	28, 500	35, 500
50	15, 000	22, 000	29, 500	37, 500	45, 500
60	19, 000	26, 500	34, 500	43, 000	52, 500

Differences in height growth alone do not account for differences in volume growth on soils of different site quality. Diameter growth of trees is also important. Trees grow faster in diameter on better sites—those with a higher site index. The site index in relation to diameter growth and number of trees per acre is given in table 7.

TABLE 7.—*Site index in relation to diameter growth and number of trees (10)*

Site index	Age in years at which trees in fully stocked stands will average 10 inches in diameter at breast height	Number of trees per acre
60	64	262
70	48	264
80	40	270
90	35	275
100	31	279

The data in table 7 are for fully stocked, unmanaged, natural stands. Properly managed stands are thinned to remove the smaller trees and to increase the growth of the larger and better trees. Consequently, an average diameter breast high of 10 inches can be attained in considerably less time in well-managed stands.

The combination of more rapid height growth and diameter growth accounts for greater volume production on soils of better site quality. Data in tables 6 and 7 indicate that a landowner can make three or four times as much profit growing pine on soils of site index 100 as on soils of site index 60. In Mathews County the site index for loblolly pine ranges from about 70 to 100.

Figure 11.—**Area in which loblolly pine is dying back because of the encroachment of salty tidewater.**

Soil characteristics that affect growing of trees

Many soil characteristics determine site quality. Apparently the most important are those that determine the amount of water and air available to tree roots; these are principally the depth, texture, consistence, structure, and topographic position of the soil.

Topographic position seems to be especially important in Mathews County. The Princess Anne Terrace, with elevations of up to 15 feet, comprises about 80 percent of the county. The water table in this terrace does not fall below a depth of about 5 feet, except in years of drought. The Dismal Swamp Terrace, which has elevations of from 10 to 25 feet, and the Chowan Terrace, which has elevations of from 30 to 45 feet, occupy about equal areas and make up practically all of the rest of the county. The water table seldom falls below 15 feet on the Dismal Swamp Terrace or below 20 feet on the Chowan Terrace.

Tree roots can penetrate to a great depth in the coarse- and medium-textured soils, which make up most of Mathews County. As a result, in most areas of the county, trees can probably draw on the water table during all or most of the growing season. This fact evidently lessens the importance of the moisture-storage capacity (in the solum), which is largely determined by texture, consistence, structure, and organic-matter content. For example, in Mathews County, loblolly pine makes excellent growth on the thick-surface phase of Kempsville loamy fine sand. In contrast, similar soils on higher terraces of counties farther inland are generally only fair sites because of the low moisture-storage capacity and the lack of a water table within reach of tree roots.

Loblolly pine grows very poorly in areas below an elevation of about 3 feet. A study made of loblolly pine growing on two plots, at an elevation estimated to be 3 feet above mean tide level, showed that the site quality held up well. Below this elevation, however, it is not practical or profitable to grow loblolly pine, because of the harmful effect of occasional, extremely high, saline tides (fig. 11).

Little is known of the nutrient requirements of trees. Soil fertility undoubtedly plays a part in determining site quality. Research to date, however, indicates that lack of fertility is not a limiting factor for tree growth on most soils. Physical properties that determine available water and aeration seem to be the main limiting factors for tree growth on most soils.

Site quality of important soils

In Mathews County the soils of four series comprise 96 percent of the total area (excluding Coastal beach and Tidal marsh) that is capable of growing trees. The Fallsington soil makes up 65 percent of the area, the Dragston 12 percent, the Woodstown 10 percent, and the Kempsville 10 percent. Sample plots on these soils were used to determine tentative ratings of site quality of loblolly pine. A summary of data obtained in this study is given in table 8.

A total of 47 plots, all dominated by loblolly pine, were measured. Thirty plots were taken on the Princess Anne Terrace, 14 on the Dismal Swamp Terrace, and 3 on the Chowan Terrace. A total of 28 plots were in old-field stands and 19 were on cutover land. Five trees from the dominant and codominant crown classes were measured for total height and age on each plot. For determining height measurements, distances from bases of trees were measured with a tape. In computing total age, 3 years was added to the age at breast height. Coile and Schumacher adjusted site curves (*5*) were used for all stands less than 50 years of age, and the site curves given in Miscellaneous Publication No. 50 of the U.S. Department of Agriculture (*10*) were used for stands more than 50 years of age. All plots were located by number on aerial photographs, and the records were preserved.

TABLE 8.—*Summary of data on plots dominated by loblolly pine*

Soil	Plot number	Average total height	Average total age	Average site index	Origin	Elevation	Remarks
		Feet	*Years*			*Feet*	
Kempsville fine sandy loam	44	99	85	86	Cutover land	14	
Kempsville fine sandy loam (thick surface and heavy subsoil).	16	86	42	92	Old field	5	Same stand as on plot 15.
Kempsville loamy fine sand, thick surface	20	76	40	83	Old field	10	Same stand as on plot 19.
	33	74	36	87	Old field	6	Same stand as on plots 31 and 32.
Woodstown fine sandy loam (heavy substratum).	46	99	74	88	Cutover land	6	
Woodstown fine sandy loam (thick surface).	48	80	41	86	Cutover land	3	
Woodstown fine sandy loam (shallow)	17	80	39	88	Old field	10	Same stand as on plot 18.
Woodstown fine sandy loam	19	77	39	85	Old field	10	Same stand as on plot 20.
	22	78	38	87	Old field	6	
	31	68	33	82	Old field	5	Same stand as on plots 32 and 33.
	50	101	76	88	Old field	8	
	51	108	92	93	Old field	38	
Woodstown fine sandy loam (heavy substratum; grading toward Mattapex).	15	86	43	91	Old field	5	Same stand as on plot 16.
Woodstown fine sandy loam (thick surface; grading toward a Regosol).	49	73	39	80	Old field	4	
Woodstown fine sandy loam (thick surface; grading toward Klej).	9	69	37	79	Old field	40	
	11	84	57	80	Old field	10	
	12	84	43	83	Old field	10	
	13	80	39	88	Old field	10	
Dragston fine sandy loam	8	78	45	81	Cutover land	12	
	34	68	38	77	Old field	6	
	32	68	34	83	Old field	5	Same stand as on plots 31 and 33.
Dragston fine sandy loam (heavy substratum).	45	105	70	93	Cutover land	6	Same stand as on plot 46.
Dragston fine sandy loam, shallow	23	80	45	83	Old field	6	
	38	79	37	91	Old field	17	
Dragston fine sandy loam, shallow (grading toward Klej).	10	82	42	88	Old field	20	
	18	79	38	89	Old field	10	Same stand as on plot 17.

TABLE 8.—*Summary of data on plots dominated by loblolly pine*—Continued

Soil	Plot number	Average total height	Average total age	Average site index	Origin	Elevation	Remarks
		Feet				*Feet*	
Dragston fine sandy loam (heavy substratum; grading toward Bertie).	14	69	28	91	Old field	10	
Fallsington fine sandy loam	1	82	41	90	Cutover land	11	
	7	100	53	98	Cutover land	22	
	24	67	36	79	Cutover land	7	
	27	73	41	80	Cutover land	6	
	28	81	48	82	Cutover land	10	
	29	84	51	83	Cutover land	10	
	30	71	51	71	Cutover land	10	
	36	75	40	82	Cutover land	15	
	37	71	37	82	Cutover land	15	
	40	77	46	79	Cutover land	20	
	41	72	44	76	Cutover land	14	
	42	68	41	73	Cutover land	14	
	43	64	38	72	Cutover land	14	
	52	104	62	96	Cutover land	38	
	2	81	46	84	Old field	3	
	3	86	49	87	Old field	5	
	21	77	35	88	Old field	7	
	35	87	47	89	Old field	15	
	39	88	40	96	Old field	17	
	47	76	40	83	Old field	5	

This study shows no significant difference in average site quality of the four soils. The average site index for all plots was 85, which is an excellent rating for loblolly pine. Average site indexes for each of the four soils (table 9) are within a few points of the overall average.

TABLE 9.—*Average site indexes for loblolly pine on four soils*

Soil	Average site index for old fields	Plots	Average site index for cutover land	Plots	Average site index for all plots	Plots
		Number		*Number*		*Number*
Kempsville	87. 3	3	86. 0	1	87. 0	4
Woodstown	85. 3	12	87. 0	2	85. 6	14
Dragston	86. 0	7	87. 0	2	86. 2	9
Fallsington	87. 8	6	81. 6	14	83. 5	20

Nevertheless, there was a considerable variation in site index, as shown in table 8. The site index for the different plots ranged from 71 to 98. The full range of highest to lowest site indexes occurred on Fallsington fine sandy loam. Much of the variation in site quality must be due to factors other than observable profile characteristics. Such factors as nutrient relationships, differences in drainage between recently abandoned soils and long abandoned soils (as discussed in the paragraphs that follow), past land use, differences in stand history, differences in competing vegetation, and genetic differences may contribute to this considerable variation in site quality on soils of the same type.

It was expected that the wetter soils would be better sites than the better drained soils because, in general, they supply more water. This relationship has been determined in other areas. Perhaps the generally high water table throughout Mathews County, even under the well-drained soils, accounts for the lack of relationship between site quality and drainage. The four plots on Kempsville soils are all at elevations of less than 15 feet, and, except during extreme droughts, the water table is probably within 5 or 10 feet of the surface. Consequently, availability of water is not so limiting as for well-drained soils at higher elevations, where the water table is below the reach of tree roots during the growing season.

It was also thought that there might be a difference in site quality between the higher and lower terraces because the water tables are lower on the higher terraces. The study does not indicate this, however. Averaging all four soils together, the site index for the three plots on the highest terrace (Chowan) averaged 89.3; the site index for the 14 plots on the intermediate terrace (Dismal Swamp) averaged 84.5; and the site index for the 30 plots of the lowest terrace (Princess Anne) averaged 84.7 (in computing these averages, elevations from 0 through 10 feet were considered Princess Anne, from 11 through 25 feet, Dismal Swamp, and over 30 feet, Chowan).

The data for Fallsington soil indicates a difference in site quality between old-field stands and stands of cutover origin. The 6 plots in old-field stands averaged about 6 points higher than the 14 plots in stands of cutover origin (see table 9). This difference was not statistically significant, perhaps because of the limited number of plots measured. It is believed that a considerable difference really does exist, however.

The most likely explanation of a decrease in site quality between old-field stands and succeeding stands of cutover origin is a gradual decrease in drainage as ditches clog after long abandonment. In some areas of Fallsington soil, drainage gradually decreases until water is ponded in low spots during the early growing season. In such places, poor aeration may limit tree growth and cause site quality to fall off.

Ponding commonly occurs in the interior of poorly drained areas. Five plots were taken in stands of cutover origin on Fallsington soil in a large, uninhabited interior area known as Poplar Grove Swamp. Ponding is common in this area. The site index of the five sites ranged from 72 to 82 and averaged 77.

Not all cutover stands on Fallsington soil have a lower site index than stands on recently abandoned soils. The highest site index in this study was 98, and it occurred on a cutover Fallsington site. Two other plots on cutover Fallsington sites measured 96 and 90. These three stands, however, were fairly close to natural drains. They occurred toward the edge of poorly drained areas where water was not ponded.

The better drained Kempsville, Woodstown, and Dragston soils do not become ponded. These soils are better suited to cultivation than the poorly drained Fallsington soil and, therefore, were the last to be abandoned. Consequently, stands of cutover origin that are suitable for measuring sight index are scarce. The five cutover stands that could be located on Kempsville, Woodstown, and Dragston soils were measured to see if cutover sites were as good as the old-field sites. On the five plots measured in these stands, the site index ranged from 81 to 93 and averaged 87; whereas on 22 plots measured in old-field stands, on the same soils, the site indexes ranged from 77 to 93 and averaged 86.

Future of Forests

The soils of Mathews County are very well suited to growing loblolly pine. The four soils that comprise practically all of the agricultural and forest land are remarkably similar in site quality. For practical forestry purposes, all four soils may be considered to have an average site index of 85 and a possible range of 70 to 100.

The only notable difference in site quality seems to be between old-field and cutover sites on Fallsington soil, and the most reasonable explanation of this difference is inadequate drainage and aeration. Further study on the effect of drainage and aeration may be needed. If poor drainage and aeration do lower site quality in extensive areas of Fallsington soil, the possibility of reopening drainage ditches might be considered. But before any drainage work is started, it should be definitely established that site quality does fall off and that poor drainage and aeration, and not some other factor, are the cause of a decrease in site quality.

Genesis, Classification, and Morphology of the Soils

Factors of Soil Formation

Soil is a product of the interaction of the five factors —parent material, climate, living organisms, topography (drainage), and time. The genesis and nature of the soils in Mathews County depend upon the combination of these important factors. The relative influence of each factor varies from place to place. In some places one factor is more important, and in other places, another.

Parent material

The parent material, composed of unconsolidated marine sediments of gravel, sand, silt, and clay, probably has influenced soil formation in the county more than any single factor. This material is of young geologic age; it consists of acid Pleistocene sediments of the later Columbia formation. The terraces in the county that have formed from marine sediments are the Princess Anne, Dismal Swamp, Chowan, and a vestige of the Wicomico. The coarseness or fineness of the soils is related to the texture of the parent material, which in turn is related to the velocity of the water current that deposited the soil material. Shell marl is generally below a depth of 10 to 40 feet but has had little or no influence upon the soils.

Climate

The oceanic, temperate, humid climate in Mathews County affects the physical, chemical, and biological makeup of the soils. The climate permits biological activity during much of the year.

The soils freeze to shallow depths for short periods during winter. Abundant rainfall causes considerable leaching of plant nutrients from the permeable, acid soils, which are dominant in the county.

The humidity, which is high during most of the year, encourages a lush growth of vegetation. The average temperature in January is about 40° F., and that in July is 78°. The average annual precipitation, which is almost entirely rain, is about 46 inches. The average length of the growing season is 222 days. (See the section "General Nature of the County" for detailed information on climate.)

Living organisms

Plant and animal life greatly influence soil development in Mathews County. Biological activity has a pronounced effect on the soil by regulating the supply, distribution, and decomposition of organic matter. It also affects the porosity, permeability, and moisture supply of the soil. Important in soil development are pine, gum, oak, and maple trees; waxmyrtle and other shrubs; annual crops and weeds; and the less conspicuous mosses, fungi, lichens, and bacteria. Animal life on and in the soil also has an effect on soil development.

The temperature of the soil is controlled to a considerable extent by plant and animal life. Plant nutrients are brought from a depth of several feet to the surface soil and made available to plants both by transportation and transformation, or conversion, from insoluble to soluble forms.

Topography

Topography is one of the most significant factors that influence soil formation and development in Mathews County. Nearly all of the county has a slope of less than than 2 percent, and most of it is at an elevation of less than 10 feet. In general, the land is fairly well dissected by rivers and creeks with low banks. More than half of the county is poorly drained, and little of it is well drained. The best-drained soils are along the streams or estuaries. Drainage becomes progressively poorer farther back from the natural drains. The interiors of the many peninsulas are poorly drained. The high water table in the soils results in poor soil aeration, low soil temperature, and slow decomposition of organic matter. The intrusion of saline tidal waters has retarded development of the soils by restricting plant growth in some areas, especially along the Chesapeake Bay.

Time

Long periods are required for complete development of distinct horizons in a soil. The soils in the county have formed on materials that are comparatively young in terms of geologic time. Because drainage has developed slowly and still needs to progress much further, and because the soils are young, mature profiles have not developed. The high content of sand, abundant rainfall, temperate climate, high humidity, and lush vegetation in the county favor soil development. However, the low elevation, high water table, and poor drainage retard soil development.

Over the centuries, percolating waters have moved much of the clay and silt fractions and the iron from the surface soil downward to form the sandy clay loam subsoil. This process has resulted in A horizons of sandy loam. Soils on Princess Anne Terrace, the lowest marine terrace, are slightly more immature than those on the progressively higher Dismal Swamp, Chowan, and Wicomico Terraces. Natural drainage is better developed on the older, higher terraces, which have a greater slope and a more mature drainage pattern.

Classification of Soils by Higher Categories

Classification consists of an orderly grouping of defined kinds of soils into classes in a system designed to make it easier to remember soils, including their characteristics and interrelationships, and to organize and apply the results of experience and research to areas ranging in size from plots of several acres to large bodies of millions of square miles. The defined kinds of soils are placed in narrow classes for use in detailed soil surveys and in the application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories so that information can be applied to large geographic areas.

The system of soil classification now being used in the United States consists of six categories, one above the other. Each successively higher category consists of a smaller total number of classes, and each of those classes has a broader range of characteristics. Thus, there are thousands of classes in the lowest category and no more than three in the highest category. The intermediate categories are also intermediate in number of classes and in permissible span or breadth of each class. Beginning at the top, the six categories in the system of soil classification are the order, suborder, great soil group, family, series, and type.

Four of the six categories have been widely used, and two have been used very little. The two highest categories, the order and great soil group, have been widely used. Similarly, the two lowest categories, the soil series and soil type, have been widely used. On the other hand, the categories of the suborder and family have never been fully developed and are therefore of little value now. In soil classification and mapping, attention has been largely given to the recognition of soil types and series within counties or comparable areas and to the subsequent grouping of the series into great soil groups and orders. The two lowest categories have been used primarily for study of soils of small geographic areas, whereas the categories of the order and great soil group have been used for the study of soils of large geographic areas.

The highest category in the present system of soil classification consists of three classes, known as the zonal, intrazonal, and azonal orders. The zonal order comprises soils with evident, genetically related horizons that reflect the dominant influence of climate and living organisms in their formation. The intrazonal order comprises soils with evident, genetically related horizons that reflect the dominant influence of one or more local factors of parent materials or topography over the effects of climate and living organisms. The azonal order comprises soils that lack distinct, genetically related horizons because of one or more of the following: Youth of parent materials, resistance of parent materials to change, and steep topography. There are no azonal soils in Mathews County.

The great soil group is the next lower category beneath the order that has been widely used in this country. Classes in that category have been used to a very great extent because they indicate a number of relationships in the soil genesis and also indicate something of the fertility status, suitability for crops or trees, and the like.

Each great soil group consists of a large number of soil series with many internal features in common. Thus, all members of a single great soil group in either of the zonal and intrazonal orders have the same number and kind of definitive horizons in their profiles. These definitive horizons need not be expressed to the same degree, nor do they need to be of the same thickness in all soils within one great soil group. Specific horizons must be recognizable, however, in every soil profile of a soil series representing a given great soil group.

A discussion of the classification of soil series in Mathews County into great soil groups and orders follows. Each series recognized in the county has been classified on the basis of the current understanding of the soils and their formation. The classification of the soil series by great soil groups and characteristics of the soil series are given in table 10.

Zonal order

In Mathews County the zonal order is represented by the Red-Yellow Podzolic and Gray-Brown Podzolic great soil groups. Following is a discussion of these great soil groups and of the soil series in each.

RED-YELLOW PODZOLIC SOILS

The Red-Yellow Podzolic great soil group consists of well-developed, well-drained, acid soils that have thin organic (A_0) and organic-mineral (A_1) horizons over a light-colored, bleached (A_2) horizon. Below this is a red, yellowish-red, or yellow and more clayey (B) hori-

TABLE 10.—*Classification of soil series by great soil groups, and genetic relationships of the soil series*

Great soil group and soil series	Brief profile description	Topographic position	Soil drainage	Slope range	Parent material	Degree of profile[1] development
Red-Yellow Podzolic: Grading toward Gray-Brown Podzolic—						
Kempsville	Grayish-brown fine sandy loam over yellowish-brown fine sandy clay loam that is underlain at 40 to 50 inches by yellowish-brown, slightly compact fine sandy loam.	Marine terraces in the uplands.	Good	*Percent* 0 to 5	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Keyport	Light olive-brown very fine sandy loam to silt loam over dark yellowish-brown, plastic silty clay; below this is light olive-brown, plastic silty clay that is mottled with gray and reddish yellow; at 37 to 89 inches there is mottled gray and yellow sandy clay loam.	Marine terraces in the uplands.	Moderately good.	0 to 12	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Gray-Brown Podzolic: Grading toward Red-Yellow Podzolic—						
Sassafras	Dark grayish-brown fine sandy loam over strong-brown fine sandy clay loam underlain at 36 to 51 inches by strong-brown, loose loamy fine sand.	Marine terraces in the uplands.	Good	0 to 5	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Woodstown	Dark grayish-brown fine sandy loam over light olive-brown fine sandy clay loam; below this is light olive-brown fine sandy clay loam that is mottled with yellowish brown and gray; at 35 to 88 inches there is mottled strong-brown and gray, loose loamy fine sand.	Marine terraces in the uplands.	Moderately good.	0 to 2	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Low-Humic Gley: Modal—						
Fallsington	Dark-gray to gray fine sandy loam over gray fine sandy clay loam that is mottled with yellowish brown; underlain by mottled strong-brown and gray, loose loamy fine sand.	Marine terraces in the uplands.	Poor	0 to 2	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Elkton	Dark-gray silt loam over dark-gray, very plastic silty clay that is mottled with brownish yellow; underlain at 47 to 80 inches by stratified, light-gray and yellowish-brown, loose sand.	Marine terraces in the uplands.	Poor	0 to 2	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Grading toward Red-Yellow Podzolic—						
Bertie	Grayish-brown very fine sandy loam over mottled strong-brown and gray, slightly plastic silty clay loam underlain at 37 to 64 inches or more by mottled yellowish-brown and gray fine sandy loam.	Marine terraces in the uplands.	Somewhat poor.	0 to 2	Sand, silt, and clay sediments of the Coastal Plain.	Medium.
Dragston	Dark grayish-brown fine sandy loam over mottled gray and yellowish-brown fine sandy clay loam underlain at 25 to 75 inches or more by gray, loose loamy sand that is mottled with yellowish brown.	Marine terraces in the uplands.	Somewhat poor.	0 to 2	Sand, silt, and clay sediments of the Coastal Plain.	Medium.

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zon. Parent materials are all more or less siliceous. Coarse reticulate streaks or mottles of red, yellow, brown, and light gray are characteristic of deep horizons of Red-Yellow Podzolic soils where parent materials are thick (*8*).

Red-Yellow Podzolic soils, which make up 8.3 percent of the county, are some of the most fully developed soils. They have developed under forest vegetation in a temperate, humid climate. The soils of the Kempsville and Keyport series belong to the Red-Yellow Podzolic great soil group. Because they appear to be somewhat less strongly weathered and are less red than typical of Red-Yellow Podzolic soils, these two series are considered to grade toward the Gray-Brown Podzolic great soil group.

Profile of Kempsville fine sandy loam (one-fourth mile south of Fort Nonsense):

A_p 0 to 8 inches, dark grayish-brown (10YR 4/2) [4] fine sandy loam that contains partly decomposed soybean stubble; weak, medium and fine, granular structure; very friable; many fine roots; abrupt, smooth boundary.

A_2 8 to 11 inches, yellowish-brown (10YR 5/4) fine sandy loam; considerable material from the A_p horizon mixed throughout and fills root channels; weak, medium to fine, granular structure; friable; many fine roots and few medium roots; clear, smooth boundary.

B_1 11 to 16 inches, yellowish-brown (10YR 5/8), light sandy clay loam; some material from the A_p horizon fills root channels; weak, medium to coarse, angular blocky structure; friable; few medium roots and many fine roots; gradual, smooth boundary.

B_2 16 to 34 inches, yellowish-brown (10YR 5/8) fine sandy clay loam; moderate to weak, medium to coarse, subangular blocky structure; ped faces are strong brown (7.5YR 5/6); friable; few medium and fine pores; few medium roots and many fine roots; gradual, smooth boundary.

B_3 34 to 40 inches, yellowish-brown (10YR 5/8), light fine sandy clay loam; weak, coarse, subangular blocky structure; friable; few medium and fine pores and roots; gradual, smooth boundary.

C_1 40 to 50 inches, yellowish-brown (10YR 5/8), slightly compact, massive fine sandy loam; friable; gradual, smooth boundary.

C_2 50 to 90 inches +, yellow (2.5Y 7/6) fine sandy loam with common, medium, distinct mottles of light gray (2.5Y 7/2) and reddish yellow (7.5YR 6/8); weak, fine, crumb structure; friable; grades to strong-brown (7.5YR 5/6), massive sandy clay loam with common, medium, distinct mottles of greenish gray (5GY 5/1) at 90 to 100 inches or more.

Profile of Keyport silt loam (0.6 mile north of Cobbs Creek):

A_p 0 to 8 inches, light olive-brown (2.5Y 5/4) silt loam; moderate, medium to fine, granular structure; friable; many large, medium, and fine roots; abrupt, smooth boundary.

B_{21} 8 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay; strong, coarse, angular blocky structure; distinct, continuous clay films; firm when moist, plastic when wet; few medium and fine pores; few large roots and many medium and fine roots; clear, smooth boundary.

B_{22} 18 to 27 inches, light olive-brown (2.5Y 5/4) silty clay with many medium, distinct mottles of dark gray (2.5Y 4/0) and reddish yellow (7.5YR 6/8); prismatic structure that breaks to strong, coarse to medium, angular blocky; distinct, continuous clay films; firm when moist, plastic and sticky when wet; few medium and fine pores; few medium and fine roots; gradual, smooth boundary.

B_3 27 to 37 inches, mottled light-gray (2.5Y 7/0), yellowish-red (5YR 4/8), and very dark gray (10YR 3/1) silty clay; prismatic structure that breaks to moderate, coarse, angular blocky; distinct, continuous clay films; firm when moist, sticky and plastic when wet; few medium roots and few fine roots; gradual, smooth boundary.

C 37 to 89 inches +, light brownish-gray (2.5Y 6/2), light sandy clay loam streaked with reddish yellow (7.5YR 6/8); massive (structureless); few medium and fine roots.

GRAY-BROWN PODZOLIC SOILS

Soils of the Gray-Brown Podzolic great soil group have a comparatively thin organic covering and organic-mineral layers over a grayish-brown, leached layer that rests upon an illuvial, brown horizon. These soils have developed under deciduous forest in a temperate, moist climate (*9*).

Gray-Brown Podzolic soils make up 8.1 percent of Mathews County. Two series—Sassafras and Woodstown—are classified as Gray-Brown Podzolic soils.

The Sassafras soils are well drained. They are on the higher parts of the Dismal Swamp, Chowan, and Wicomico Terraces. Because of their strong-brown colors and 1:1 lattice clays (clays with low shrink-swell characteristics and relatively low capacity to hold and supply bases), the Sassafras soils, as well as the Woodstown soils, grade toward Red-Yellow Podzolic soils.

Profile of Sassafras fine sandy loam (one-half mile south of Dixie near the junction of State Routes 3 and 198):

A_p 0 to 8 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3), light fine sandy loam; weak, fine, granular structure; very friable; many fine roots; abrupt, smooth boundary.

B_1 8 to 14 inches, yellowish-brown (10YR 5/4), heavy fine sandy loam to light fine sandy clay loam; material from A_p horizon fills root channels; very weak, fine to medium, subangular blocky structure; friable; many fine roots; abrupt, smooth boundary.

B_2 14 to 25 inches, strong-brown (7.5YR 5/6) to dark-brown (7.5YR 4/4) fine sandy clay loam; weak, medium, subangular blocky structure; thin, patchy clay films; friable; many fine roots; many medium and fine pores; gradual, smooth boundary.

B_3 25 to 36 inches, brown to dark-brown (7.5YR 4/4) fine sandy loam; weak, fine, granular structure; friable; many fine roots; gradual, smooth boundary.

C_1 36 to 51 inches, strong-brown (7.5YR 5/8) loamy fine sand; single grain (structureless); loose; few fine roots; gradual, smooth boundary.

C_2 51 to 70 inches +, brown to dark-brown (7.5YR 4/4) sand; single grain (structureless); loose.

The Woodstown soils are moderately well drained, as indicated by mottling in the B_{22} horizon.

Profile of Woodstown fine sandy loam (0.3 mile south of Retz):

A_p 0 to 9 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam; weak, fine, granular structure; very friable; few medium roots; matted with fine roots; abrupt, smooth boundary.

B_1 9 to 14 inches, light olive-brown (2.5Y 5/4), light fine sandy clay loam; material from A_p horizon fills root channels; weak, medium, subangular blocky structure; friable; many medium and fine pores; few medium roots and many fine roots; gradual, smooth boundary.

B_{21} 14 to 19 inches, light olive-brown (2.5Y 5/4) fine sandy loam; weak, medium, subangular blocky structure; friable; many medium and fine pores; many medium and fine roots; gradual, smooth boundary.

[4] Symbols express Munsell color notations (*7*).

B_{22} 19 to 27 inches, light olive-brown (2.5Y 5/6) fine sandy clay loam with common, medium, distinct mottles of yellowish brown (10YR 5/8) and a few, medium, distinct, gray (2.5Y 6/0) mottles; weak, medium to coarse, subangular blocky structure; friable; many medium and fine pores; few medium roots and many fine roots; gradual, smooth boundary.

B_3 27 to 35 inches, light olive-brown (2.5Y 5/4), light fine sandy clay loam with many, medium, distinct mottles of yellowish brown (10YR 5/6) and gray (2.5Y 5/0); weak, medium to coarse, subangular blocky structure; friable; few medium and fine pores; few medium roots and many fine roots; gradual wavy boundary.

C 35 to 88 inches +, distinctly mottled strong-brown (7.5YR 5/8) and gray (10YR 6/1) loamy fine sand; single grain (structureless); loose; few fine roots; lenses of very fine sandy loam, silt loam, and silty clay loam at 60 to 88 inches or more.

Intrazonal order

In Mathews County the intrazonal order is represented by the Low-Humic Gley great soil group. A discussion of this great soil group and the soil series within it follows.

LOW-HUMIC GLEY SOILS

This great soil group consists of somewhat poorly drained and poorly drained soils that have a thin A_1 horizon, moderately high in organic matter, over mottled gray and brown mineral horizons. Low-Humic Gley soils make up 59.7 percent of the county. The Fallsington and Elkton series are typical of this great soil group.

Profile of Fallsington fine sandy loam (0.8 mile south of Foster):

A_o 1 inch to 0, dark reddish-brown (2.5YR 2/4), partly decomposed leaves.

A_p 0 to 8 inches, dark-gray (10YR 4/1) fine sandy loam; weak, fine, granular structure; very friable; very many, large, medium and fine roots; abrupt, smooth boundary.

B_{2g} 8 to 23 inches, gray (2.5Y 5/0) fine sandy clay loam with many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; few, medium and fine pores; few large roots and many medium and fine roots; gradual, smooth boundary.

B_{3g} 23 to 37 inches, gray (10YR 5/1) loam with few, fine, faint mottles of olive (5Y 4/4); weak, coarse, subangular blocky structure; friable; few medium and fine pores; few roots; gradual, wavy boundary.

C_g 37 to 93 inches +, mottles and pockets of strong-brown (7.5YR 5/6) and gray (2.5Y 5/0) loamy fine sand; single grain (structureless); nonsticky when wet; few medium and fine roots.

Profile of Elkton silt loam in a stand of loblolly pine 75 to 100 years old (0.5 mile northwest of Cobbs Creek):

A_o 1 inch to 0, very dusky red (10R 2/2) leaf mold matted with roots.

A_p 0 to 4 inches, dark-gray (10YR 4/1), light silt loam; moderate, medium to fine, granular structure; friable; very many large, medium, and fine roots; abrupt, smooth boundary.

A_2 4 to 8 inches, gray (2.5Y 5/0), light silt loam with many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, thin to medium, platy structure;[5] friable; few medium and fine pores; few large roots and many medium and fine roots; clear, smooth boundary.

B_{2g} 8 to 40 inches, dark-gray (2.5Y 4/0) silty clay with many, medium, distinct mottles of brownish yellow (10YR 6/8); prismatic structure that breaks to strong, medium to coarse, angular blocky; distinct, continuous clay films; slightly sticky, very plastic; few medium and fine pores; many medium and fine roots; gradual, smooth boundary.

B_{3g} 40 to 47 inches, gray (2.5Y 5/0) fine sandy clay loam with many, medium, distinct mottles of strong brown (7.5YR 5/8); massive (structureless); slightly plastic, slightly sticky; few medium and fine pores; few medium and fine roots; gradual, wavy boundary.

D 47 to 90 inches +, stratified, light-gray (2.5Y 7/0) and yellowish-brown (10YR 5/6) sand; single grain (structureless); loose; grades to dark-gray (2.5Y 4/0), massive, plastic silt loam at 80 to 90 inches or more.

The Bertie and Dragston soils have also been placed in the Low-Humic Gley great soil group. They have dominantly brownish rather than grayish colors in the upper subsoil, however, and possibly show more evidence of movement of clay from the surface layers to the subsoil than is typical of this group. Thus, the Bertie and Dragston series are considered as grading toward the Red-Yellow Podzolic great soil group.

Profile of Bertie very fine sandy loam (1 mile southeast of Port Haywood):

A_p 0 to 10 inches, grayish-brown (2.5Y 5/2) very fine sandy loam; moderate, fine, granular structure; friable; few medium and fine pores; few medium roots and many fine roots; abrupt, smooth boundary.

B_1 10 to 17 inches, mottled strong-brown (7.5YR 5/6) and gray (2.5Y 5/0) clay loam; weak, medium, subangular blocky structure; friable; many medium and fine pores; few medium roots and many fine roots; gradual, smooth boundary.

B_2 17 to 27 inches, mottled strong-brown (7.5YR 5/6) and gray (10YR 6/1), silty clay loam; weak, medium, subangular blocky structure; firm when moist, slightly sticky and plastic when wet; few medium and small pores; few medium roots and few fine roots; gradual, smooth boundary.

B_3 27 to 37 inches, mottled strong-brown (7.5YR 5/8) and gray (10YR 6/1) fine sandy clay loam; weak, medium to coarse, subangular blocky structure; friable; few medium and fine pores; few medium and fine roots; gradual, wavy boundary.

C 37 to 64 inches +, mottled yellowish-brown (10YR 5/8) and gray (10YR 6/1) fine sandy loam with lenses of loamy fine sand; weak, fine, crumb structure; nonsticky when wet.

Profile of Dragston fine sandy loam, shallow (0.3 mile east of Wards Corner—junction of State Routes 14 and 198):

A_p 0 to 8 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; abrupt, smooth boundary.

B_{21g} 8 to 14 inches, grayish-brown (2.5Y 5/2) fine sandy clay loam with common, fine, faint mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; many medium and fine pores; few worm casts and earthworms; many fine roots; gradual, smooth boundary.

B_{22g} 14 to 22 inches, mottled gray (2.5Y 6/0) and yellowish-brown (10YR 5/6) fine sandy clay loam; weak, medium, subangular blocky structure; friable; many medium and fine pores; many fine roots; gradual, smooth boundary.

B_3 22 to 25 inches, gray (2.5Y 5/0) fine sandy loam with common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; few medium and fine pores; few fine roots; gradual, smooth boundary.

C 25 to 75 inches, gray (2.5Y 6/0) loamy sand; has common, coarse, distinct mottles of yellowish-brown (10YR 5/6) fine sandy loam and pockets of light-gray (2.5Y 7/0) sand; single grain (structureless); loose; few medium and fine pores; few fine roots.

[5] Probably old plowsole.

TABLE 11.—*Laboratory data*

Soil name and sample number	Horizon	Depth	Moisture retained in 1- by 2-inch core at tension of— 1/10 atmosphere	Moisture retained in 1- by 2-inch core at tension of— 1/3 atmosphere [1]	Moisture content at time of sampling: Cores	Moisture content at time of sampling: Clods	Bulk density (grams per cubic centimeter): Cores	Bulk density: Clods [2]	Bulk density: Oven-dry soil	Percolation rate [3]	Particle size distribution: Very coarse sand (2.0–1.0 mm.)	Particle size distribution: Coarse sand (1.0–0.5 mm.)	Particle size distribution: Medium sand (0.5–0.25 mm.)
Sassafras fine sandy loam:		*Inches*	*Percent*	*Percent*	*Percent*	*Percent*				*Inches per hour*	*Percent*	*Percent*	*Percent*
S 59 Va-58-1-(1-6)	A_p	0–8	9.3	7.2	8.7	2.7	1.68	1.73	1.73	[4] 1.1; [5] 6.0	0.6	4.2	15.0
	B_1	8–14	10.6	9.2	9.1	3.8	1.73	1.74	1.74	7.9	.3	3.1	12.3
	B_2	14–25	16.6	14.8	15.0	6.5	1.57	1.54	1.55	12.9	.1	2.2	9.9
	B_3	25–36	(6)	(6)	(6)	8.5	(6)	1.54	1.56	43.3	.2	3.0	13.6
	C_1	36–51	7.8	6.4	7.5	(6)	1.48	(6)	(6)	>60	.1	3.9	17.1
	C_2	51–70									1.6	5.8	19.2
S 59 Va-58-2-(1-5)	A_p	0–8	14.4	11.5	6.7	2.6	1.48	1.63	1.63	4.0	1.2	15.3	18.0
	A_p	8–9	13.1	10.7	7.8	2.5	1.65	1.78	1.78	1.9			
	B_1	9–16	12.8	10.9	8.9	5.1	1.69	1.62	1.62	3.1	1.0	12.1	14.6
	B_2	16–32	13.7	12.4	12.4	6.7	1.68	1.72	1.73	4.9	1.4	14.4	16.6
	B_3	32–39	10.0	8.6	9.1	6.9	1.73	1.66	1.66	8.5	1.5	17.8	21.6
	C	39–85	9.1	7.8	7.8	(6)	1.78	(6)	(6)	12.3	2.1	20.6	23.2
Keyport silt loam:													
S 59 Va-58-3-(1-7)	A_2	0–4	31.6	27.9	28.0	23.0	1.20	1.28	1.28	2.1	.4	1.2	1.4
	A_3	4–8	24.9	22.3	21.9	16.4	1.47	1.50	1.51	.2	.2	1.1	1.1
	B_{21}	8–19	29.8	28.7	27.0	25.2	1.47	1.50	1.58	1.0	.1	.5	.6
	B_{22}	19–29	31.3	30.4	29.0	26.8	1.49	1.48	1.60	.2	.2	.7	.8
	B_3	29–50	29.1	27.8	26.3	25.0	1.55	1.50	1.60	.1	.5	2.2	3.6
	C	50–75+	19.2	17.1	18.1	10.9	1.72	1.74	1.74	.1	8.1	21.0	14.6
S 59 Va-58-4-(1-5)	A_p	0–8	17.9	14.6	13.8	9.2	1.63	1.60	1.60	.2	2.6	8.0	8.2
	B_{21}	8–18	21.4	19.6	17.8	17.1	1.64	1.62	1.65	.6	1.5	3.1	2.8
	B_{22}	18–27	29.0	27.9	25.7	29.1	1.56	1.45	1.62	.3	1.0	2.7	2.5
	B_3	27–37	20.8	18.6	17.6	25.5	1.71	1.51	1.70	1.1	.6	2.0	2.5
	C	37–89	13.1	11.0	11.5	10.9	1.72	1.78	1.79	1.3	11.6	27.5	20.1
Dragston fine sandy loam, shallow:													
S 59 Va-58-5-(1-5)	A_p	0–8	19.2	16.8	17.4	8.4	1.52	1.57	1.58	1.7	.5	2.0	5.9
	B_{21}	8–14	16.6	15.3	13.0	10.7	1.74	1.62	1.62	1.1	.7	1.4	4.4
	B_{22}	14–22	16.6	15.1	14.4	9.7	1.75	1.72	1.72	1.1	.9	1.7	4.9
	B_3	22–25	13.4	11.6	13.5	7.0	1.76	1.79	1.80	1.5	1.4	3.2	7.9
	C	25–75	12.0	9.4	13.7	8.3	1.82	1.74	1.74	4.6	1.2	3.1	10.8
S 59 Va-58-6-(1-5)	A_p	0–6	21.4	17.9	18.9	15.1	1.49	1.60	1.60	4.4	.1	.3	.7
	B_{21}	6–12	23.1	19.6	20.3	11.9	1.56	1.52	1.52	.8	.1	.3	.6
	B_{22}	12–24	18.9	15.8	16.1	10.7	1.64	1.71	1.72	2.6	.2	.2	.5
	B_3	24–27	18.7	14.3	15.6	11.6	1.70	1.71	1.71	1.5	.2	.3	.7
	C	27–55	20.1	9.0	16.4	6.2	1.65	1.70	1.70	5.3	.2	.2	.5

[1] Values are approximately equal to field moisture capacity of soil horizons.

[2] At the moisture content indicated in the column headed "Moisture content at time of sampling."

Laboratory Determinations

The results of laboratory tests made on soil samples from six profiles are given in table 11. Bulk density, which is shown in table 11, refers to the relative weight of dry soil weighed without disturbing its natural structure, as compared with an equal volume of water. It is usually measured in grams per cubic centimeter. Values range from less than 1.0 gram for soils high in organic matter to more than 2.0 grams for highly consolidated soils. As shown in table 11, the bulk density of the A horizons, except that of Keyport silt loam (S 59 Va-58-3-(1-7)), is very high. This probably resulted from a loss of moisture as the samples were being brought to the laboratory. None of the samples contained evident concretions, fragments of organic matter, or other special formations. Chemical data in table 11 were obtained by standard methods in the Soil Survey Laboratory, Soil Conservation Service.

Chemical analyses of samples from profiles of eight soils are reported in table 12. These data were obtained by the Virginia Agricultural Experiment Station. Samples of three profiles, one each of a Sassafras, a Keyport, and a shallow Dragston soil, were analyzed in both laboratories.

General Nature of the County

This section contains a discussion of the history and development, climate, geology, agriculture, and other important features of Mathews County.

for six soil profiles

Particle size distribution—Continued				Reaction	Organic carbon	Nitrogen	Free iron oxide Fe_2O_3	Exchange capacity NH_4Ac	Extractable cations (meq./100 gm.)					Base saturation	
Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)						Ca	Mg	H	Na	K	NH_4Ac	Sum of cations
Percent	*Percent*	*Percent*	*Percent*	*pH*	*Percent*	*Percent*	*Percent*	*meq./100 gm.*							
59.8	1.1	14.1	5.2	5.5	0.47	0.043	0.6	3.0	1.3	0.6	3.5	<0.1	0.2	70	38
49.4	.9	22.4	11.6	5.4	.25	--------	1.5	3.8	2.6	.6	3.7	<.1	.4	95	49
40.1	.7	25.6	21.4	4.9	.17	--------	2.7	6.4	2.2	.6	6.5	<.1	.4	50	33
50.3	.8	19.0	13.1	5.1	.09	--------	1.9	4.1	1.6	.6	3.7	<.1	.2	58	39
67.3	.5	3.8	7.3	5.2	.07	--------	1.5	2.3	1.1	.3	2.7	<.1	.1	65	36
70.0	.8	.8	1.8	5.5	.05	--------	1.4	1.4	.6	.4	2.2	<.1	.1	78	33
22.4	4.1	31.5	7.5	4.9	.53	.051	.6	2.8	.2	.4	3.7	<.1	.1	25	16
18.1	3.5	35.2	15.5	5.4	.18	--------	1.3	3.4	1.4	.3	3.0	<.1	.2	56	39
18.9	3.3	27.5	17.9	5.5	.08	--------	1.6	4.6	2.1	1.2	3.5	<.1	.2	78	51
26.2	4.4	16.5	12.0	5.7	.06	--------	1.1	3.5	1.3	.9	2.7	<.1	.1	66	46
24.5	4.0	17.5	8.1	5.3	.03	--------	.6	1.9	.2	.7	2.7	<.1	.1	53	27
4.6	2.4	77.7	12.3	4.1	.96	.040	.6	5.7	<.1	.4	8.0	<.1	.2	10	7
3.3	2.4	66.6	25.3	4.1	.64	.041	1.5	9.0	<.1	.2	11.8	<.1	.2	6	4
2.4	2.4	48.0	46.0	4.3	.42	.044	4.7	15.4	<.1	1.1	18.0	.1	.3	10	8
2.9	2.6	42.2	50.6	4.3	.28	--------	5.0	18.1	<.1	1.5	22.2	.1	.3	10	8
12.1	3.6	31.1	46.9	4.2	.19	--------	1.1	19.7	<.1	2.0	21.1	.1	.5	13	11
30.9	2.1	5.8	17.5	4.4	.06	--------	.7	6.8	<.1	.8	8.0	.1	.2	16	12
15.1	9.6	48.6	7.9	4.9	.52	.040	.7	3.9	1.3	.4	3.7	<.1	.2	49	34
5.1	4.7	40.3	42.5	5.3	.35	--------	5.0	14.3	8.8	1.6	7.6	.1	.2	75	58
4.9	4.6	35.6	48.7	4.5	.18	--------	2.5	19.4	4.8	.6	25.5	.1	.4	30	19
8.6	7.8	33.9	44.6	4.4	.14	--------	1.0	17.7	3.0	2.8	16.3	.1	.5	36	28
16.3	2.2	6.2	16.1	4.6	.06	--------	.9	6.2	1.0	1.3	7.0	.1	.2	42	27
39.0	3.6	38.7	10.3	5.5	1.02	.090	.6	6.3	1.9	1.2	5.7	<.1	.2	52	37
28.7	3.1	40.7	21.0	4.7	.32	--------	.7	7.1	1.5	.6	7.0	<.1	.2	28	22
32.7	3.2	37.3	19.3	4.6	.15	--------	.6	7.0	1.3	.4	7.3	<.1	.1	26	20
53.3	5.2	17.3	11.7	4.6	.07	--------	.2	4.2	.6	.1	5.0	<.1	.1	19	14
63.1	5.4	8.6	7.8	4.5	.05	--------	.4	2.8	.3	<.1	4.0	<.1	.1	14	9
53.5	7.1	27.0	11.3	4.8	1.39	.108	.4	6.3	.4	<.1	10.3	<.1	.3	11	6
51.0	5.4	27.4	15.2	4.9	.41	.048	.4	5.3	.9	.2	7.5	.1	.3	23	14
45.3	5.4	32.2	16.2	4.7	.15	--------	.4	5.6	1.1	.2	6.5	.1	.2	27	19
64.2	6.4	16.1	12.1	4.6	.07	--------	.2	4.1	.8	.2	5.0	.1	.1	27	18
79.6	7.5	5.7	6.3	4.6	.05	--------	.1	2.4	.4	.2	2.7	.1	.1	21	16

[3] Percolation rates represent approximate permeability of the soil. (See "Permeability" in the Glossary.)
[4] Measured at a depth of 2 to 3 inches.
[5] Measured at a depth of 7 to 8 inches.
[6] Not sampled.

History and Development

What is now Mathews County was once inhabited by the Chiskiake Indians, who called the area Werowocomico. The first white settlers probably arrived in the middle 1600's.

Originally, the present Mathews and Gloucester Counties were part of York County. Later, Gloucester County was formed and was divided into four districts, or parishes. In about 1790 Kingston, one of the four parishes, was established as Mathews County, named after Maj. Thomas Mathews. The colonial courthouse was built in the town of Mathews in 1792.

Hesse, a plantation established by land grant in about 1643, is located along Milford Haven across from Gwynn Island. Judith Armstead, an ancestress of Gen. Robert E. Lee, lived at Hesse. Poplar Grove, on the East River south of the courthouse at Mathews, was a land grant from George III of England to Samuel Williams and son. It was once the home of Capt. Sally Thompkins, a nurse during the Civil War and the only woman commissioned by the Confederacy.

Mathews County is still a rural area. In 1950 the population was 7,148. The unincorporated town of Mathews had a population of about 500 in 1950. The population of the three magisterial districts was Piankatank, 2,404; Westville, 2,469; and Chesapeake, 2,275. The boundary between the Westville and Chesapeake Districts runs through the edge of the town of Mathews. The population of the county is greatest in summer when vacationists take advantage of the waterfront.

There are modern, consolidated high schools in Math-

TABLE 12.—*Chemical data for eight soil profiles*

[Analyses by Virginia Agricultural Experiment Station]

Soil name and horizon	Depth	Reaction	Phosphorus (Truog)	Organic matter	Exchangeable manganese	Exchangeable cations (meq./100 gm. soil)						Base saturation
						Ca	Mg	K	Na	H	Total	
Dragston fine sandy loam, shallow:	*Inches*	*pH*	*P.p.m.*	*Percent*	*P.p.m.*							*Percent*
A_p	0–8	5. 50	4. 45	1. 74	0. 44	1. 60	1. 01	0. 09	0. 03	4. 85	7. 58	36. 02
B_{21}	8–14	4. 88	1. 21	. 70	. 44	1. 18	. 57	. 10	. 03	6. 39	8. 27	22. 73
B_{22}	14–22	4. 76	1. 21	. 18	. 22	1. 15	. 33	. 09	. 04	6. 31	7. 92	20. 33
B_3	22–25	4. 70	0	. 12	. 66	. 64	. 18	. 04	. 01	4. 64	5. 51	15. 79
C	25–45	4. 68	. 81	. 05	. 22	. 35	. 16	. 03	. 01	2. 62	3. 17	17. 35
Fallsington fine sandy loam:												
A_0	1–0	3. 70	41. 62	23. 81	6. 16	2. 79	1. 91	1. 00	. 21	53. 06	58. 97	10. 02
A_p	0–8	3. 94	7. 27	4. 86	. 22	0	. 07	. 11	. 05	14. 80	15. 03	1. 53
B_{2g}	8–23	4. 18	2. 83	. 50	. 66	. 02	. 04	. 06	. 04	9. 04	9. 20	1. 74
B_{3g}	23–37	4. 22	10. 91	. 44	. 22	. 02	. 08	. 01	. 07	7. 57	7. 75	2. 32
C_g	37–57	4. 04	1. 21	. 17	. 88	0	. 23	. 16	. 03	5. 37	5. 79	7. 25
Kempsville fine sandy loam:												
A_p	0–8	5. 20	7. 27	1. 45	1. 54	1. 51	. 20	. 13	. 02	5. 24	7. 10	26. 20
A_2	8–11	5. 52	1. 62	. 52	. 66	1. 76	. 20	. 05	. 02	3. 04	5. 07	40. 04
B_1	11–16	5. 60	2. 02	. 44	. 22	3. 68	. 28	. 09	. 04	3. 93	8. 02	51. 00
B_2	16–34	5. 72	9. 29	. 17	. 22	4. 76	. 26	. 10	. 06	3. 80	8. 98	57. 68
B_3	34–40	5. 72	18. 19	. 10	. 66	3. 02	. 30	. 06	. 04	3. 01	6. 43	53. 19
C_1	40–50	5. 72	6. 47	. 10	. 44	3. 98	. 68	. 09	. 04	3. 28	8. 07	59. 36
C_2	50–70	5. 68	53. 75	. 07	. 88	2. 87	1. 12	. 14	. 03	1. 97	6. 13	67. 86
Kempsville loamy fine sand, thick surface:												
A_p	0–10	5. 90	4. 45	. 79	. 88	. 92	. 32	. 13	. 01	1. 76	3. 14	43. 95
A_2	10–22	5. 12	2. 02	. 19	. 88	. 75	. 60	. 12	. 02	2. 62	4. 11	36. 25
B_2	22–32	4. 76	3. 23	. 11	. 66	1. 20	. 30	. 14	. 01	4. 59	6. 24	26. 44
B_3	32–37	4. 74	4. 04	. 05	. 88	. 77	. 18	. 13	. 01	3. 14	4. 23	25. 77
C	37–55	4. 88	4. 45	. 07	. 44	. 55	. 14	. 15	0	2. 52	3. 36	25. 00
Keyport silt loam:												
A_0	1–0	3. 58	40. 41	52. 23	5. 06	4. 66	2. 57	1. 90	. 57	68. 78	78. 48	12. 36
A_2	0–4	4. 12	8. 89	1. 51	. 22	. 08	. 13	. 08	. 08	8. 12	8. 49	4. 36
A_3	4–8	4. 16	2. 42	. 97	. 66	0	. 14	. 16	. 04	10. 90	11. 24	3. 02
B_{21}	8–19	4. 46	1. 21	. 60	. 22	. 01	. 76	. 25	. 08	15. 51	16. 61	6. 62
B_{22}	19–29	4. 50	1. 62	. 30	. 88	0	1. 27	. 29	. 10	20. 59	22. 25	7. 46
B_3	29–50	4. 38	1. 21	. 15	. 22	0	1. 14	. 41	. 16	19. 20	20. 91	8. 18
C	50–75	4. 52	1. 62	. 10	. 88	. 01	. 40	. 13	. 06	7. 62	8. 22	7. 30
Sassafras fine sandy loam:												
A_p	0–8	5. 56	149. 52	. 90	2. 20	1. 01	. 12	. 21	. 05	2. 93	4. 32	32. 18
B_1	8–14	5. 26	27. 48	. 42	. 88	1. 00	. 16	. 25	. 01	3. 28	4. 70	30. 21
B_2	14–25	4. 90	4. 04	. 21	. 88	1. 51	. 45	. 30	. 02	5. 48	7. 76	29. 38
B_3	25–36	5. 00	3. 64	. 14	1. 10	1. 38	. 39	. 22	. 02	3. 93	5. 94	33. 84
C_1	36–51	5. 22	4. 45	. 12	. 88	. 77	. 28	. 06	. 03	2. 38	3. 52	32. 39
C_2	51–70	5. 32	3. 64	. 07	. 88	. 30	. 11	. 01	. 03	1. 97	2. 42	18. 60
Sassafras loamy fine sand:												
A_p	0–9	5. 18	24. 25	1. 40	. 88	. 85	. 10	. 23	. 03	4. 48	5. 69	21. 27
A_2	9–23	5. 04	1. 62	. 44	. 88	. 62	. 10	. 08	. 02	2. 80	3. 62	22. 65
B_2	23–36	5. 12	9. 29	. 20	. 44	2. 09	. 55	. 14	. 02	4. 35	7. 15	39. 16
B_3	36–43	5. 00	3. 23	. 10	. 88	. 84	. 34	. 12	. 02	2. 91	4. 23	31. 21
C_1	43–72	5. 10	3. 64	. 14	. 66	. 52	. 19	. 06	. 02	3. 54	4. 33	18. 24
C_2	72–82	5. 36	5. 25	. 11	. 66	. 28	. 08	. 11	. 03	1. 99	2. 49	20. 08
Woodstown fine sandy loam:												
A_p	0–9	5. 86	17. 38	1. 92	. 44	2. 00	. 68	. 14	. 04	4. 09	6. 95	41. 15
B_1	9–14	5. 18	2. 42	. 90	1. 10	1. 65	. 44	. 11	. 03	4. 74	6. 97	31. 99
B_{21}	14–19	5. 06	2. 02	. 66	0	2. 71	. 37	. 11	. 04	4. 72	7. 95	40. 63
B_{22}	19–27	4. 76	1. 62	. 33	. 44	1. 71	. 10	. 10	. 04	5. 66	7. 61	25. 62
B_3	27–35	4. 68	2. 02	. 17	1. 10	1. 04	. 03	. 11	. 03	4. 22	5. 43	22. 28
C	35–53	4. 60	1. 62	. 06	1. 10	. 41	0	. 05	. 03	3. 07	3. 56	13. 76

ews and elementary schools at Cobbs Creek and Shadow. The total enrollment for the 1954–55 school year was 1,364. Churches of various denominations are located conveniently throughout Mathews County. Electricity is available in all areas.

Climate

Mathews County has a temperate, humid, semimarine climate. The adjacent Chesapeake Bay and the Atlantic Ocean, farther to the east, temper the heat of summer and especially the cold of winter. In addition, the comparatively high humidity is mitigated by land and sea breezes. A fairly large amount of precipitation and a long growing season favor the production of truck crops. Because of the tempering influence of large bodies of water, fruits and other crops are seldom damaged severely by late frosts. The prevailing wind is from the southwest, except in April when it is from the northeast.

Temperature and precipitation data given in this section are based on records of the U.S. Weather Bureau station at Mathews-Cardinal, Mathews County; and also on the U.S. Weather Bureau stations at Christchurch, Middlesex County, and Norfolk, Norfolk County. The data from the Christchurch, Mathews-Cardinal, and Norfolk stations are representative of Mathews County.

Temperature.—Data on temperature are based on records at the Christchurch station, 1924–40, and the Mathews-Cardinal station, 1948–59. Maximum temperatures recorded were 104° F. at Christchurch and 102° at Mathews-Cardinal, both in July. Minimum temperatures recorded were −5°, in January at Christchurch, and 0°, in December at Mathews-Cardinal. The average temperature in July is 77.8° at Christchurch and 78.9° at Mathews-Cardinal. The average temperature in January is 41.1° at Christchurch and 39.9° at Mathews-Cardinal. Average annual temperatures are about 58° at both stations. According to the records at Mathews-Cardinal, the average annual maximum temperature is 68.5° and the average annual minimum temperature is 48.4°. Average temperatures by seasons are as follows: Winter (December, January, February), 42.0° at Christchurch and 40.6° at Mathews-Cardinal; spring (March, April, May), 55.6° at Christchurch and 53.4° at Mathews-Cardinal; summer (June, July, August), 75.9° at Christchurch and 76.4° at Mathews-Cardinal; and fall (September, October, November), 61.0° at Christchurch and 60.4° at Mathews-Cardinal. The average date of the last killing frost in spring at Christchurch is March 31, and that of the first killing frost in fall is November 8. The latest frost recorded in spring was on May 9 (1956), and the earliest in fall was on October 28 (1957). Generally, fruit and other crops are not damaged by frost between April 1 and October 31. The average growing season of 222 days is adequate for all suitable crops.

Few livestock fatalities are caused by low temperature. The grazing season generally starts in March and ends in November. The growing of small grains for pasture may lengthen the grazing season.

Bare ground generally does not freeze more than 1 foot deep. Foundations for buildings, however, should be constructed at least 2 feet below grade to prevent damage from occasional freezes to a depth of more than 1 foot. When the soil is frozen, the construction of highways and dams should be avoided.

Although fish and oysters can be obtained throughout the year, crabs can be taken only when the water is warm late in spring, in summer, and early in fall.

Precipitation.—Data on precipitation are also based on records at the Christchurch station, 1924–40, and the Mathews-Cardinal station, 1948–59. Most of the precipitation occurs as rainfall, but an average of 9.7 inches of snow falls at Christchurch. In the driest year (1930) recorded at Christchurch, precipitation was 27.23 inches, and in the wettest year (1934), it was 59.75 inches. In the driest year (1959) recorded at Mathews-Cardinal, precipitation was 35.99 inches, and in the wettest year (1958), it was 58.88 inches. The average annual precipitation of about 46 inches at both stations is generally well distributed throughout the year. According to records at both stations, precipitation averages highest in summer (14.26 inches at Christchurch and 16.05 inches at Mathews-Cardinal), when needed most by crops and trees. The average precipitation is less in fall (9.90 inches at Christchurch and 10.03 at Mathews-Cardinal). This permits the harvesting of corn and soybeans and the seeding of small grains, alfalfa, and perennial hay and pasture plants. There is generally enough soil moisture for high yields of crops, continuous growth of pasture, and good growth of trees.

Because of winter rain and occasional snow, low evapotranspiration, and poor natural drainage, the construction of highways and drainage facilities, as well as other structures involving earthmoving, is usually not advisable from December to March. Tile drainage systems usually should not be installed during this part of the year.

Short, intense rainfalls significantly affect crop production and construction work and design. Heavy rainfall during a few minutes or hours packs the soil excessively and causes flooding, ponding, and puddling. Drainage systems, highways, and dams should be designed to take care of excess runoff. The frequency with which various amounts of precipitation can be expected during different intervals is shown in table 13.

TABLE 13.—*Frequency and intensity of precipitation at Norfolk, Va.*

Frequency	Precipitation during period of—							
	5 minutes	10 minutes	15 minutes	30 minutes	1 hour	2 hours	4 hours	8 hours
Precipitation expected once in:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
2 years	0. 39	0. 68	0. 80	1. 16	1. 52	1. 90	2. 28	2. 60
5 years	. 50	. 83	1. 08	1. 55	2. 08	2. 60	3. 16	3. 60
10 years	. 58	. 95	1. 25	1. 80	2. 46	3. 10	3. 76	4. 36
25 years	. 66	1. 10	1. 43	2. 10	2. 90	3. 64	4. 40	5. 12
50 years	. 71	1. 20	1. 60	2. 35	3. 30	4. 10	5. 00	5. 76
100 years	. 76	1. 33	1. 75	2. 65	3. 60	4. 54	5. 52	6. 40

Drought.—Although rainfall is generally adequate and well distributed throughout the growing season, there are frequent long droughts and occasional short droughts.

Droughts are periods when there is not enough available soil moisture in the root zone to provide optimum plant growth.

Except where shallow-rooted crops are grown on sandy soils, serious droughts are not to be expected until June. From June through September, there is a probability of frequent periods of moisture deficiency in at least 3 out of 10 years. The probability of drought days is shown in table 14. The data, which apply to the area that includes Mathews County, are taken from studies of agricultural drought in Virginia (*11*). A drought day refers to a day on which "the supply of soil moisture is exhausted."

TABLE 14.—*Probability of drought days* (*11*)

Month	Probability of drought	Minimum number of drought days expected if available moisture capacity within the root zone is—				
		1 inch	2 inches	3 inches	4 inches	5 inches
April	1 year in 10	13	0	0	0	0
	2 years in 10	9	0	0	0	0
	3 years in 10	7	0	0	0	0
	5 years in 10	0	0	0	0	0
May	1 year in 10	25	20	15	6	0
	2 years in 10	21	16	9	0	0
	3 years in 10	18	12	0	0	0
	5 years in 10	13	7	0	0	0
June	1 year in 10	24	22	20	17	12
	2 years in 10	21	18	15	12	7
	3 years in 10	19	15	12	8	0
	5 years in 10	15	10	7	0	0
July	1 year in 10	21	21	20	19	17
	2 years in 10	18	16	15	13	11
	3 years in 10	16	13	12	10	7
	5 years in 10	12	8	6	0	0
August	1 year in 10	22	18	16	15	14
	2 years in 10	18	13	10	8	7
	3 years in 10	16	9	5	0	0
	5 years in 10	13	0	0	0	0
September	1 year in 10	21	18	16	14	13
	2 years in 10	18	13	10	6	0
	3 years in 10	15	9	5	0	0
	5 years in 10	11	0	0	0	0

The average available moisture capacity within the root zone of soils in the county is approximately 2 inches. In July a minimum of 8 drought days can be expected in 5 out of 10 years, as shown in table 14, if the available moisture capacity is 2 inches. From April through September in 5 out of 10 years, the minimum number of drought days that can be expected is—

Drought days:	*Inches of available moisture capacity within root zone*
64	1
25	2
13	3
0	4
0	5

As determined in the studies, there is a 55 percent probability of 3 consecutive drought days; a 32 percent probability of 6; a 17 percent probability of 9; a 10 percent probability of 12; a 6 percent probability of 15; a 3 percent probability of 18; and a 2 percent probability of 21 (*11*). The long droughts seriously damage crops.

A comparison of the total precipitation with the amount lost through evaporation, including transpiration from vegetation, at Norfolk is given in table 15. As shown in this table, losses of moisture through evapotranspiration exceed the total rainfall for the months of May, June, July, and September. Irrigation may be needed at times during these months to insure maximum growth of plants and satisfactory yields.

TABLE 15.—*Average monthly precipitation and evapotranspiration at Norfolk, Va.* (*11*)

Month	Total precipitation	Total evapotranspiration	Difference
	Inches	*Inches*	*Inches*
January	3. 5	0. 7	+2. 8
February	3. 1	1. 3	+1. 8
March	3. 6	2. 0	+1. 6
April	3. 6	3. 2	+. 4
May	3. 5	4. 2	−. 7
June	4. 4	4. 7	−. 3
July	4. 6	4. 8	−. 2
August	4. 8	4. 2	+. 6
September	3. 1	3. 2	−. 1
October	2. 6	1. 8	+. 8
November	2. 1	1. 0	+1. 1
December	3. 3	. 6	+2. 7

Storms.—On the average there are about 30 to 40 thunderstorms a year. About 75 percent of them occur from May to September. Most of the rainfall in the growing season comes during these storms. Gusty winds, lightning, and hail that accompany thunderstorms cause some damage.

Mathews County is also subject to hurricanes and tropical storms. There were approximately 75 hurricanes and tropical storms from 1900 to 1959. Some of these storms brought only general rain, but others severely damaged exposed areas. As many as three hurricanes have occurred during a year, but several years have passed without a hurricane. Nearly all of the most severe disturbances have occurred during the fall. The greatest damage in the county has resulted from the flooding of land, roads, and buildings by highly saline tidewater. Damage by winds has usually been fairly light, except for that caused by Hurricane Hazel in October 1954. Maturing crops are damaged somewhat in fall by strong winds and heavy rains. A number of times, rainfall that has accompanied storms, such as Hurricane Flossie in September 1956 and Hurricane Connie in August 1955, has broken agricultural droughts. Other notable hurricanes occurred in August 1933 and September 1936.

Northeasters occur much more frequently than hurricanes but are much less intense. They are more common during fall, winter, and spring than in summer. Northeasters are often accompanied by rain (sometimes excessive), by the flooding of the lower lying areas with very highly saline tidewater, and by damaging winds. Because these storms occur much more frequently than hurricanes, the damage that results probably exceeds that caused by hurricanes and tropical storms.

Tide stages.—Because most of Mathews County is less than 10 feet in elevation and much of it is less than 5 feet, the fluctuations of tides are important. According to the U.S. Coast and Geodetic Survey Station at Wolf Trap Light, the mean low tide is +0.8 foot, the seasonal high tide is +2.2 feet, and the seasonal low tide −0.5 foot. The mean tide range (difference in height between mean high and mean low water) is normally 1.6 feet, and the spring tide range (average semidiurnal range occurring semimonthly—when the moon is new or full) is 1.9 feet.

Storm tides flood parts of the county that are at elevations of approximately 6 feet and less. The largest area affected by storm tides is along the Chesapeake Bay. A study made in the Garden Creek area of the county by the U.S. Army Corps of Engineers shows that on August 23, 1933, there was a high tide of 7.1 feet. Other high tides were as follows: September 1936, 6.1 feet; April 1956, 4.5 feet; September 1933, 4.3 feet; September 1956 and August 1955, 4.0 feet.

It has been determined by statistical method calculation that there is a 40 percent chance that a high tide of 3 feet will occur once in 2.5 years, a 10 percent chance that a tide of 4.1 feet will occur once in 10 years, and a 5 percent chance that a tide of 5 feet will occur once in 20 years. There is a 2.5 percent chance that a tide of 7.1 feet (equal to that of August 1933) will occur once in 75 years.

Before the Civil War, much of the lowland along the Chesapeake Bay in the vicinity of Garden Creek and Winter Harbor was protected by sand dunes and dikes. Since that time much of the dune sand has been removed, breaks in the dikes have not been repaired, and tide gates have not been maintained. As a result, much farmland has been abandoned and has become forest. The encroachment of salt water in recent years is apparently causing the stands of loblolly pine to die back before they mature. High storm tides flood roads in some places and prevent the use of motor vehicles for short periods. Some land and crops are still being damaged by tidal flooding. Salt left in the soil is toxic to crops.

Geology

The oldest and deepest formation underlying the county is Precambrian granite rock. It is at a depth of 2,325 feet, as determined in a drilled well at Mathews (*4*). Overlying the granite is an overlapping series of Cretaceous and Tertiary sediments that, for the most part, are only slightly indurated. The uppermost formation is composed of terrace sands and clays of Pleistocene age. This formation is 5 feet thick, as logged at the well at Mathews. Below this is a bed of sand, 78 feet thick; sand and shell, 16 feet thick; shell, 1 foot thick; and sand and shell, 100 feet thick.

Four of the six Coastal Plain terraces occur in the county. The Princess Anne Terrace, at elevations from 0 to 15 feet above sea level, covers most of the county; it extends from New Point Comfort, on the Chesapeake Bay, to Blakes, near the northern boundary of the county. The other three terraces are Dismal Swamp (elevation of 10 to 25 feet), Chowan (30 to 45 feet), and Wicomico (60 to 70 feet). According to Wentworth (*14*) there is an overlap in the ranges of terrace elevations. The two lower terraces are wedge shaped; the broad ends are along the Piankatank River and the points are near Fort Nonsense, where State Routes 14 and 3 enter the county. The Wicomico Terrace crosses the Mathews-Gloucester line for a short distance and centers on the Windsor Farm.

All of the terraces are nearly level, except the Wicomico, which is gently sloping. The county is fairly well dissected by tidal rivers and creeks, and navigable water is only a short distance from all points. The Chesapeake Bay is bordered by Coastal beach and salt marshes. Very low banks are adjacent to the arable land further inland. The banks of creeks and rivers are higher. The highest bank in the county, along the Piankatank River near Dixie, reaches an elevation of 20 feet.

The best drained areas are along the creeks and rivers, which provide natural drainage. Large inland areas beyond the influence of natural drainage are poorly drained. These areas require artificial drainage for satisfactory use.

Waterfront Development

Perhaps the greatest natural resource of Mathews County is the waterfront, which is more than 150 miles long. The extensive beach along the Chesapeake Bay is being developed as homesites and is also suitable for commercial resorts. Many new homes have been built, especially along the waterfront, for retired people, commuters, vacationists, and sportsmen. The price of waterfront property has increased markedly. Some lots consisting entirely of Coastal beach and Tidal marsh are being sold. As a result, the problem of shore erosion, which is especially serious on the more exposed shorelines, is increasing. An outstanding example of recent shore erosion can be seen south of Pribble at Cedar Point on Mobjack Bay. The shoreline has been eroded by pounding waves, and tree stumps and roots stand in the water at high tide and are exposed when the tide is out (fig. 12).

An example of shore-erosion control is evident on Mobjack Bay, south of Motorun. About 35 years ago, the

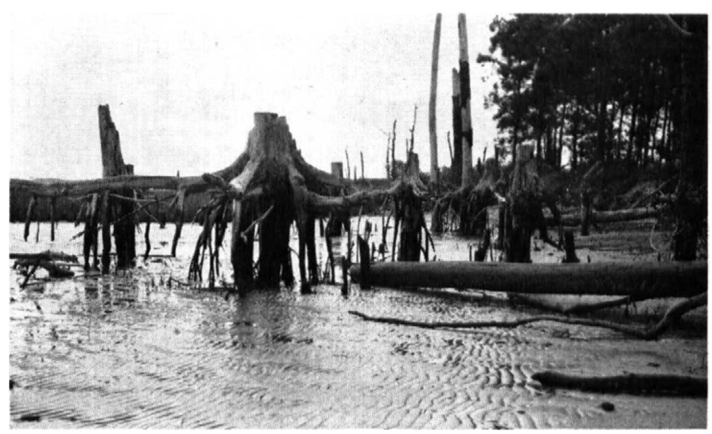

Figure 12.—**Tree stumps and roots on eroded shore at Cedar Point on Mobjack Bay.**

Figure 13.—**Concrete seawall and riprap along State Highway No. 223; in background is the unprotected shoreline of Gwynn Island.**

shore was retreating at a rate of several feet a year. At that time beachgrass was planted at the edge of the water. Plugs of grass were spaced about 8 or 10 feet apart, and within 3 years they formed a solid mat of grass. According to reports, the shoreline has not eroded since that time.

Along State Highway No. 223 at the entrance to Gwynn Island, a masonry retaining wall and riprap have been used to arrest the water at the mouth of the Piankatank River. Above the wall is more riprap bound together with concrete (fig. 13). At this point the highway was once cut half through by water.

Water Supply

In Mathews County drinking water is obtained mainly from wells. The water in creeks and rivers is salty and unfit for consumption. There are a few springs in the county; the best of these are in the higher terraces in the northwestern section.

Driven wells supply enough water, but the quality varies. In places fine sands clog pipes and cut the valves of driven wells. Dug wells are more satisfactory where this problem occurs (*6*). Over much of the county, the water in dug wells rises nearly to the surface during wet periods. The water level fluctuates with the rise and fall of the tide. The average depth of dug wells is approximately 10 feet, and the quality of water ranges from poor to good, depending on the content of sulfur, iron, salt, and carbonates. Also, the water ranges from soft to hard, according to the kinds and amounts of minerals. Deep wells are more likely to produce hard water, and shallow wells, soft water.

At Port Haywood a driven well, of a depth of 70 feet, entered blue mud at about 20 feet and soft rocks at 40 feet; the yield of water was not satisfactory. Another driven well at Fitchetts produced water that was too salty for use. A 817-foot drilled well at Mathews contained 167 parts per million of chloride, and it was abandoned (*3*). At North a drilled well, 460 feet deep, yielded 12 gallons of water a minute and contained 550 parts per million of chloride.

Experience has shown that wells 400 feet or more deep are likely to produce poor-quality, highly mineralized water that contains salt, iron, and sulfur. In recent years, shallow wells, which have also proved unsatisfactory, have been replaced by wells that are 100 to 120 feet deep. Prospects of obtaining good water in Mathews County are best in areas along the Gloucester County line.

Water for irrigation can be obtained from dug ponds throughout most of the county. Two such ponds are on farms near North. Water to be used for irrigation should be tested to determine the content of substances that may be toxic to plants.

Mineral Resources

Although no known minerals of commercial value have been unearthed in Mathews County, there are small amounts of iron sandstone and gravel and large amounts of shell marl. The iron sandstone generally occurs in thin layers, 3 feet or more beneath the ground surface. It rarely outcrops, except on the steeper slopes that border streams in the northwestern part of the county. Some gravel occurs in the Dismal Swamp Terrace in the northwestern part. Coarse- to medium-textured sand of excellent quality is on the beaches.

Shell marl apparently is abundant at a depth exceeding 40 feet, according to well logs at Mathews and New Point Comfort. Shell marl has been excavated at a depth of about 10 feet from dug ponds near North. Shell marl or coquina is exposed in the bank of Piankatank River near Ginny Point north of Cobbs Creek. This material lies a few feet above the level of high tide and about 12 feet below the ground surface.

Transportation and Markets

State highways enter the county at three points: Route 198, near Soles; Route 14, near Fort Nonsense; and Route 3, from the north near Dixie. Route 14 extends from the west to the center of the county and then goes south to Bayside on Mobjack Bay. Route 14 and Route 198 join at Wards Corner. Many secondary roads, most of which are paved, provide access to all sections of the county except the north-central section, which is heavily wooded and poorly drained.

There are no railroads in the county. The nearest railroads are the Southern at West Point, and the Chesapeake and Ohio at Newport News. Most freight is transported by motortrucks and small boats.

Norfolk, Richmond, Washington, Baltimore, Philadelphia, and New York serve as markets for Mathews County.

Industries

The seafood industry is the main nonagricultural enterprise in Mathews County. Most of the seafood, principally fish, oysters, and crabs, is sold by commercial dealers. Income from seafood accounts for about 21 percent of the taxable income in the county. The lumber industry is second in importance. There are several boatbuilders in the county who specialize mostly in small boats used by fishermen and oystermen.

Agriculture

In this section the agriculture of Mathews County is discussed. Statistics given under the heading "Present Agriculture" are taken from the U.S. Census of Agriculture.

Agricultural history

The Chiskiake Indians grew maize (corn) and tobacco in this area before the first settlers arrived. They cut trees with stone axes and tilled the soil with tools made of stones and bones. In about 1657 the Indians left the area and moved westward.

In 1612 colonist John Rolfe discovered that tobacco grew well in this part of Virginia. This crop spread rapidly, and in 1619 it was the chief export to England. Exports of tobacco increased from 60,000 pounds in 1628 to 1,500,000 pounds in 1639. Tobacco dominated trade in the bay area and became the medium of exchange. There was a tobacco warehouse and customhouse on the East River.

Some of the early land grants were Hesse, about 1643; Old Field Point, 1653; and Poplar Grove, about 1750. The tide mill at Poplar Grove was patterned after its forerunners used in London. It ground corn on both the incoming and outgoing tides. During the Revolutionary War, meal was furnished to Washington's troops at Yorktown from this mill, which ground about 32 bushels of meal on a tide. The mill was burned during the Civil War but was rebuilt and used until 1912. The building, much of the water wheel, and the mechanism are still in place.

In colonial days silk was produced by silkworms imported from Italy. The silkworms fed on mulberry trees.

John Clayton, a famous English botanist, lived at Windsor in the western part of Mathews County. Here he established a botanical garden.

Before 1700, tobacco fields began to wear out. These fields were then used to grow wheat and corn. Some old fields were fenced, and cattle grazed in them instead of in wooded pastures. More emphasis was given to the raising of sheep and hogs, and the acreage in corn was increased to provide additional feed.

The soil was fertilized by the Indians and the early settlers by placing fish in the hills of corn. Early in the 1800's, guano was imported from the West Indies for use as fertilizer. In 1832 a small amount of guano was brought from Peru, and it proved to be highly successful.

Before the Civil War, most of the poorly drained part of the county was drained by an extensive system of ditches and was farmed. Dikes and tide gates were used to protect some of the lowest areas along the Chesapeake Bay. After the war, much of the wet area grew up in trees because the clogged ditches and broken dikes caused the soil to become waterlogged.

Little of the poorly drained area is now farmed. Most of it is in forest, predominantly of loblolly pine. Clogged ditches can be seen in the woods throughout the county.

By 1940 most people in the county derived their income from the sale of seafood. A typical family had a small farm and practiced subsistence farming. Vegetables were grown and livestock was raised for home use; in addition, fish, oysters, and crabs were obtained from the water. At present the chief source of income is still seafood, but subsistence farming is largely a thing of the past. Some residents work for the government or the shipbuilding industry and commute to York County and Newport News.

Present agriculture

Both the acreage in farms and the number of farms have been declining steadily since 1935. In 1954 there were 16,278 acres in farms in Mathews County. Of this, 7,606 acres consisted of cropland and 979 acres of pasture. The land in pasture included 639 acres of woodland pasture and 340 acres of pasture that was not cropland or woodland. Nearly all the rest of the acreage in farms was made up of woodland.

The estimated number of farms by type was as follows: Field crop (all of which sold grain), 50; poultry, 20; general (producing crops and livestock), 5; miscellaneous and unclassified, 340. A total of 5 nurseries was reported in the 1954 census. Also reported were 9 farms growing cut flowers, principally daffodils; 11 farms growing strawberries; and 2 farms growing commercial vegetables.

The total number of farms was 458, and the average-size farm was 35.5 acres. There were 136 farms of less than 10 acres; 188 farms had 10 to 29 acres; 49 farms, 30 to 49 acres; 43 farms, 50 to 99 acres; 21 farms, 100 to 139 acres; and 21 farms, 140 to 999 acres.

In 1954 livestock and livestock products accounted for 55 percent of the cash receipts on farms, and poultry and poultry products, mostly eggs, accounted for 37 percent. The number of cattle and calves decreased from 1,049 in 1945 to 740 in 1954. Since 1945 the number of milk cows and hogs and pigs has declined steadily. In 1954 there were 308 milk cows and 912 hogs and pigs. In the same year, 483 sheep and 264 horses and mules were reported. The number of poultry has declined markedly since 1929. At present only about a half a dozen commercial poultry producers, who deal mainly in eggs, operate in the county.

The land in corn declined from 4,226 acres in 1944 to 2,145 acres in 1954. Soybeans are replacing a substantial part of the acreage formerly used for corn, and in 1954 a total of 3,115 acres was in soybeans. The land in hay was 744 acres. Wheat declined from 957 acres in 1944 to 245 acres in 1954.

Horticultural specialties, mainly daffodils, accounted for 3.4 percent of the value of all farm products sold in 1944, and 8.1 percent in 1949. In 1954 the value of horticultural specialties sold was slightly above that of 1949.

In 1954 full owners operated 387 farms, and part owners operated 70. Only 1 farm was operated by a tenant. Many of the farms were classified as part time. A total of 200 tractors was reported on 170 farms. Of these, 45 were garden tractors.

The acreage used for crops and livestock is declining in Mathews County, but the acreage in forest is increasing. Much can be done to improve the economy of the county by applying forest practices suggested by the Virginia Division of Forestry. (In the section "Forests," elsewhere in this report, there is a discussion of the forests of the county.)

A favorable agricultural future in Mathews County depends on the intensive farming of small units. Apparently, the greatest possibilities are in the raising of poultry and, on well-drained soils, the growing of cut flowers (especially daffodils), nursery stock, vegetables, fruit trees (especially peach), pecans, and possibly blueberries.

In addition to agricultural prospects in Mathews County, the extensive beach along the Chesapeake Bay affords the possibility of the development of commercial resorts for vacationists and sportsmen. Also, the seafood industry will likely continue to be of great economic importance. It might be said that the people of Mathews County have one foot in the water and the other on land.

Literature Cited

(1) American Association of State Highway Officials.
1955–58. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 7, 3 v., illus.

(2) Bryan, Mackay B.
1957. FOREST STATISTICS FOR THE COASTAL PLAIN OF VIRGINIA, 1956. U.S. Dept. Agr. Forest Survey Release 50, 42 pp., illus.

(3) Cederstrom, D. J.
1943. DEEP WELLS IN THE COASTAL PLAIN OF VIRGINIA. Va. Geol. Survey Reprint Ser. 6 [13 pp.], illus. [Reprinted with slight revision from "The Commonwealth," April 1943.]

(4) ———
1945. SELECTED WELL LOGS IN THE VIRGINIA COASTAL PLAIN NORTH OF JAMES RIVER. Va. Geol. Survey Cir. 3, 82 pp.

(5) Coile, T. S., and Schumacher, F. X.
1953. SITE INDEX OF YOUNG STANDS OF LOBLOLLY AND SHORTLEAF PINES IN THE PIEDMONT PLATEAU REGION. Jour. Forestry 51: 432–435.

(6) Sanford, Samuel.
1913. UNDERGROUND WATER RESOURCES OF THE COASTAL PLAIN PROVINCE OF VIRGINIA. Va. Geol. Survey Bul. V, 361 pp., illus.

(7) Soil Survey Staff.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook No. 18, 503 pp., illus.

(8) Thorp, James, and Smith, Guy D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67 (2): 117–126.

(9) United States Department of Agriculture.
1938. SOILS AND MEN. U.S. Dept. Agr. Ybk., 1232 pp., illus.

(10) United States Forest Service, Office of Experiment Stations, and Cooperating Agencies.
1929. VOLUME, YIELD, AND STAND TABLES FOR SECOND-GROWTH SOUTHERN PINES. U.S. Dept. Agr. Misc. Pub. 50, 202 pp.

(11) Van Bavel, C. H. M., and Lillard, J. H.
1957. AGRICULTURAL DROUGHT IN VIRGINIA. Va. Agr. Expt. Sta. Tech. Bul. 128, 38 pp., illus.

(12) Virginia Polytechnic Institute Agronomy Department.
1959. A HANDBOOK OF AGRONOMY. 167 pp., illus.

(13) Waterways Experiment Station, Corps of Engineers.
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3-357, 2 v. and appendix. 44 pp., illus.

(14) Wentworth, Chester K.
1930. SAND AND GRAVEL RESOURCES OF THE COASTAL PLAIN OF VIRGINIA. Va. Geol. Survey Bul. 32, 146 pp., illus.

Glossary

Aggregate, soil. Many fine soil particles held in a single mass or cluster, such as a clod, crumb, block, or prism. Many properties of the aggregate differ from those of an equal mass of unaggregated soil.

Alluvium (alluvial deposits). Soil materials deposited by streams.

Artesian water. Water confined in the earth under pressure; water rises to the surface when tapped by drilling.

Catena. A group of soils, within a specific soil zone, formed from similar parent materials but with unlike soil characteristics because of differences in relief or drainage.

Clay. As a soil separate, the mineral soil particles less than 0.002 mm. in diameter. As a soil textural class, soil material that contains 40 percent or more of clay, less than 45 percent of sand, and less than 40 percent of silt.

Concretions. Hard grains, pellets, or nodules from concentrations of compounds in the soil that cement the soil grains together. The composition of some concretions is unlike that of the surrounding soil. Concretions can be of various sizes, shapes, and colors.

Consistence. The combination of properties of soil material that determine its resistance to crushing and its ability to be molded or changed in shape. Consistence depends mainly on the forces of attraction between soil particles. Terms used to describe consistence are as follows: For wet soil—*nonsticky, slightly sticky, sticky, very sticky, nonplastic, slightly plastic, plastic, very plastic;* for moist soil—*loose, very friable, friable, firm, very firm, extremely firm;* and for dry soil—*loose, soft, slightly hard, hard, very hard, extremely hard.*

Drainage, artificial. Removal of surplus water from the soil through a system of open ditches or underground tile drains.

Drainage, natural. Refers to those conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by such factors as sudden deepening of channels or blocking of drainage outlets. The following relative terms are used to express natural drainage: *Very poorly drained, poorly drained, imperfectly or somewhat poorly drained, moderately well drained, well drained, somewhat excessively drained, and excessively drained.*

Erosion. The wearing away of the land surface by detachment and transport of soil and rock materials through the action of moving water, wind, or other geological agents.

Fluvial material. Soil material deposited by streams.

Genesis, soil. The mode of origin of the soil, with special reference to the processes responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Gleization. The process of soil formation, under wet conditions, that leads to development of a gley horizon in the lower subsoil. A gley horizon is one in which waterlogging and lack of oxygen have caused the material to be a neutral gray in color.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, with characteristics produced by soil-forming processes.

Loam. The textural class name for soil having a moderate amount of sand, silt, and clay. Loam soils contain 7 to 27 percent of clay, 28 to 50 percent of silt, and less than 52 percent of sand.

Marine deposits. Soil materials laid down by the sea.

Mottled (soil). Soil horizons irregularly marked with spots of color. A common cause of mottling is imperfect or impeded drainage, although there are other causes, such as soil development from an unevenly weathered rock. Different kinds of minerals may cause mottling. Mottling is described in terms of (1) Abundance—*few, common, many;* (2) Size—*fine, medium, coarse;* (3) Contrast—*faint, distinct, prominent.*

Parent material. The unconsolidated mass of rock material (or peat) from which the soil profile develops.

Permeability. The ability of porous material to permit movement of air and water through it. Described in terms of rate of percolation as follows:

	Inches per hour
Very slow	Less than 0.05
Slow	0.05 to 0.20
Moderately slow	0.20 to 0.80
Moderate	0.80 to 2.50
Moderately rapid	2.50 to 5.00
Rapid	5.00 to 10.00
Very rapid	Over 10.00

Pleistocene. A geologic epoch that occurred between 25 thousand and a million years ago; refers to geologic material deposited during this time.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil mass, expressed in either pH values or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6–7.3
Very strongly acid	4.5–5.0	Mildly alkaline	7.4–7.8
Strongly acid	5.1–5.5	Moderately alkaline	7.9–8.4
Medium acid	5.6–6.0	Strongly alkaline	8.5–9.0
Slightly acid	6.1–6.5	Very strongly alkaline	9.1 and higher

All of the soils in Mathews County are acid.

Relief. The elevations and inequalities of the land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 mm. to 2.0 mm. Usually, sand grains consist chiefly of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more of sand and not more than 10 percent of clay.

Silt. (1) Individual mineral particles of soil that range in diameter between the upper size of clay, 0.002 mm., and the lower size of very fine sand, 0.05 mm. (2) Soil of the textural class silt contains 80 percent or more of silt and less than 12 percent of clay. (3) Sediments deposited from water in which the individual grains are approximately of the size of silt, although the term is sometimes applied loosely to sediments containing considerable sand and clay.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. Structure can be described by the following terms: (1) Grade—*Structureless* (*massive or single grain*), *weak, moderate, strong;* (2) Size—*very fine, fine, very thin, thin, medium, coarse, very coarse, thick, very thick;* (3) Type—*platy, prismatic, columnar, angular blocky, subangular blocky, granular, crumb.*

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness.

Texture, soil. The relative proportions of the various size groups of individual soil grains in a mass of soil. Specifically, it refers to the proportions of sand, silt, and clay. The following textural classes, based on the texture of the surface soil, have been recognized in Mathews County: *Loamy fine sand, fine sandy loam, very fine sandy loam,* and *silt loam.*

Water table. The upper limit of the part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS

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