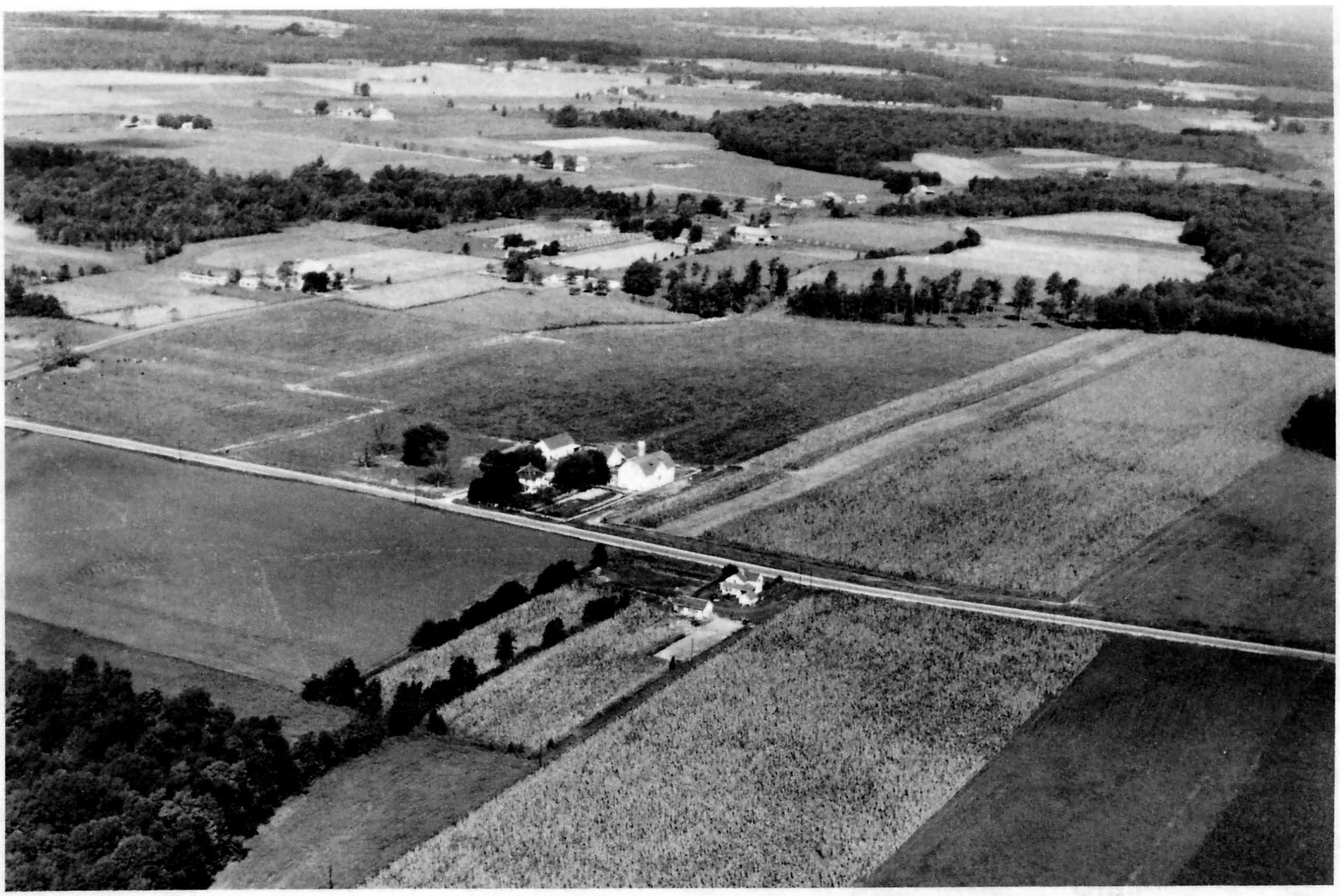
Issued April 1971

SOIL SURVEY

Kent County, Delaware



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

Major fieldwork for this soil survey was done in the period 1944–66. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1967. This survey was made by the Soil Conservation Service in cooperation with the Delaware Agricultural Experiment Station as part of the technical assistance furnished to the Kent County Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All the soils of Kent County, except those on Dover Air Force Base, are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

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

Finding and Using Information

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

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

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for residential and related uses and for recreation areas in the section "Community Development."

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

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

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

Cover picture:
General view in the Sassafras-Fallsington association, west of Dover. Cultivated areas consist mostly of Sassafras soils; the woodlands, mostly of Fallsington soils.

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SOILS SURVEYED BY WILMER F. AIST, W. R. FOX, J. M. GRANVILLE, WILLIAM IRELAND, JR., OSCAR L. LAVOIE, L. E. LINDLEY, WILLIAM R. RATLEDGE, J. J. STOUT, AND W. B. TOWLE, SOIL CONSERVATION SERVICE

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

KENT COUNTY is the central one of the three counties in Delaware (fig. 1). It has an area of 380,800 acres (595 square miles of land) and 2,560 acres of water. Dover, in the north-central part of the county, is the largest town. It is the county seat and also the capital city of Delaware. The Dover Air Force Base, covering an area of 3,585 acres, was not surveyed. Other important towns are Harrington, Milford, and Smyrna. There are a number of small towns and villages.

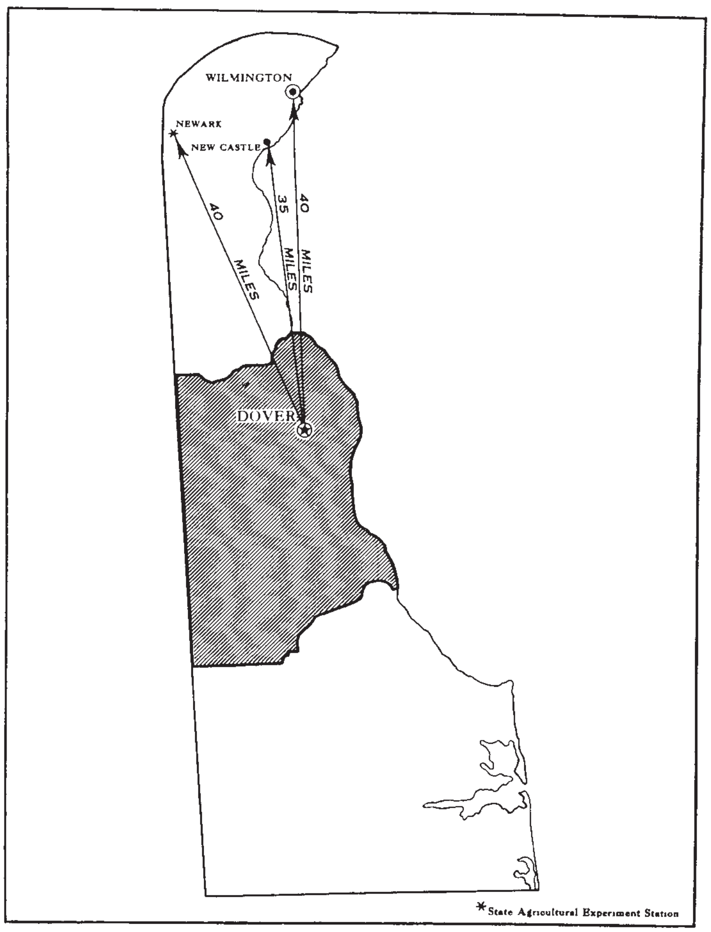

Figure 1.—**Location of Kent County in Delaware.**

Most of the soils of the county are well suited to a wide variety of uses, both farm and nonfarm. The main exceptions are the marshy tidal areas that border Delaware Bay. About 88 percent of the land area is suitable for cultivation. Most of the rest is made up of marshes and beaches.

Improvement of natural drainage is the chief overall problem in soil management. About 48 percent of the land area needs some degree of artificial drainage before it can be used extensively for farming. About 22 percent is subject to erosion, but the hazard of erosion is severe only in rather small areas. About 6 percent is moderately to severely limited by sandiness and low available moisture capacity. About 12 percent consists of soils that have few, if any, limitations for farming and need no special management. The remaining 12 percent is not suitable for farming.

The climate of the county is favorable for general farming, for raising poultry and livestock, and for growing truck crops, small fruits, orchard fruits, and woodland products. According to the 1964 Census of Agriculture, the most important farm products are general or field crops, dairy products, poultry and poultry products, truck crops, livestock and livestock products, and fruit crops, in that order. Soybeans are the most extensively planted general crop, followed in order by corn, hay, wheat, barley, rye, and oats. The most important truck crops are Irish potatoes, lima beans, peas, asparagus, sweet corn, and tomatoes. Orchards and vineyards are important locally.

Kent County is exceptionally well located in relation to markets for farm products. Wilmington, the largest city in the State, is a substantial market, and Philadelphia, Baltimore, Washington, and New York are within reasonable distances.

The marshy areas of the county attract large numbers of migratory waterfowl. Urban areas are not extensive, but residential areas are expanding considerably, particularly near Dover.

General Nature of the County

Kent County is entirely within the Atlantic Coastal Plain. It is mostly mainland, but there are some low marshy islands adjacent to Delaware Bay. Marshlands fringe all the part along Delaware Bay and extend inland along many tidal streams. The elevation gradually increases from the marshlands westward to the watershed between Delaware Bay and Chesapeake Bay. The highest point, about 80 feet, is on this watershed, near Blackiston, which is in the northwestern part of the county. The highest point on the watershed in the southern part of the county is approximately 50 feet. The elevation gradually decreases west of the watershed line and is about 40 feet in the extreme southwestern part of the county.

Most of Kent County is east of the watershed line and drains into Delaware Bay by means of many small streams. The largest of these streams, from north to south, are the Smyrna River, Duck Creek, the Little River, the St. Jones River, the Murderkill River, and the Mispillion River.

West of the watershed line, the county is nearly level. The major streams are sluggish and have swampy headwaters. These streams drain generally westward and southwestward toward the Chesapeake Bay. They include Jordan Branch, Gravelly Run, Tappahanna Ditch, Shades Branch, Cow Marsh Creek, and Marshy Hope (more recently spelled Marshyhope) Creek. Marshy Hope Creek drains southward into Sussex County.

Except for the coastal marshlands, Kent County was once covered by hardwoods. Oaks are now dominant on the better drained soils, and some species are abundant in wet areas. Other wetland trees include red maple, sweetgum, blackgum, holly, sweetbay, dogwood, beech, and birch. Conifers are not numerous. Virginia pine has invaded some areas, particularly areas of more droughty soils. Some pond pines grow in wet areas. There are a few loblolly pines, but since Kent County is almost at the northern limit of the natural range of loblolly pine, extensive or pure stands are rare. Plantations of loblolly pine, however, do well (see fig. 13, p. 31).

Although Kent County is mostly rural and agricultural, there are a number of expanding industries, mostly in and near Dover. Many of the industries use agricultural products, and others produce agricultural supplies and equipment. The growing and processing of woodland products are important in some parts of the county.

Modern highways cross the county in nearly all directions, and there are many good secondary roads. The principal north-south highway is U.S. 13. Dover and other towns have railroad service.

From colonial days through the nineteenth century, the east-central part of the county was used chiefly for cash-grain crops and the rest of the county was used for general farming. In the late nineteenth century, peaches were an important crop, but they were largely replaced by apples early in the twentieth century. Orchards were generally established on land formerly used for small grains. After about 1930 the acreage of orchard land decreased.

Since about 1910, production of truck crops has increased steadily, largely on acreage formerly used for small grain and orchards. Large-scale production of Irish potatoes began about 1940. The land used for this crop was part of that previously used for orchards, grains, vegetables, and dairying.

Corn and soybeans have replaced most of the small grain, and they are also grown in many areas formerly used for subsistence farming. Following the acceleration of the program of drainage improvement, and especially since about 1955, the acreage of corn and soybeans has expanded into the western part of the county.

According to the 1964 Census of Agriculture, there were about 1,219 farms in the county. These farms occupied about 61 percent of the land area. Between 1959 and 1964, the number of farms decreased by 314, but the average size of a farm increased by about 16 percent. The principal crops in 1964, in decreasing order of acreage, were soybeans, corn, hay crops, Irish potatoes, vegetable crops other than potatoes, wheat, barley, rye, oats, and red clover for seed. In that year Kent County led Delaware in acreage of oats, Irish potatoes, tomatoes, cucumbers, cabbage, asparagus, and red clover for seed, and in the numbers of apple trees and grape vines. The county also led the State in numbers of milk cows, heifers, and sheep and in pounds of whole milk and butterfat marketed.

Since about 1945, good farmland has steadily been converted to residential developments, industrial sites, and military installations. Increasing numbers of homes are being built along many of the secondary roads, particularly those in the west-central part of the county.

Climate [1]

Kent County has a continental type of climate, with well-defined seasons. The Atlantic Ocean, Delaware Bay, and Chesapeake Bay exert considerable modifying influence on the climate. Easterly winds off the Atlantic Ocean and Delaware Bay tend to raise the normal winter temperature and to lower the normal summer temperature.

Table 1 gives a summary of temperature and precipitation data recorded at Dover. Except for the coastal areas, where the maritime effect is most pronounced, the variations across the county are slight.

The warmest period of the year is the last part of July, when the maximum afternoon temperature averages 89° F. Temperatures of 90° or higher occur on an average of 31 days a year; the number of occurrences in 1 year has ranged from 10 to 50. Extremes of 100° or more can be expected 1 year in 4. The coldest period is the last part of January and the beginning of February, when the early morning temperature averages near 24°. The average number of days when the minimum temperature is 32° or lower is 90, but the number has ranged from 64 to 117 days. Temperatures of 0 or lower can be expected 1 year in 6.

The probabilities of the last freezing temperature in spring and the first in fall are given in table 2. At Dover, the period between the last freezing temperature in spring and the first in fall averages 199 days. It is 180 to 190 days in the western part of the county.

The annual precipitation at Dover averages 46 inches. The monthly distribution is fairly uniform during the year; August is the wettest month. During the growing season, April through September, the last week in June is the driest; the week preceding the middle of August is normally the wettest.

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[1] By WILLIAM J. MOYER, State climatologist for Maryland and Delaware, Environmental Science Services Administration, U.S. Weather Bureau.

TABLE 1.—*Temperature and precipitation data*

[Based on data recorded at Dover, elevation 30 feet, during the period 1931–60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Days with 1-inch snow cover	Average depth of snow on days with at least 1-inch snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F	°F	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	44.8	27.8	64	12	3.70	2.0	6.9	4	3
February	46.0	27.5	62	13	3.03	1.5	4.8	4	3
March	53.6	33.8	72	21	4.12	2.0	6.5	2	2
April	65.1	43.1	82	27	3.42	1.7	6.2	(1)	1
May	75.6	53.3	87	41	4.15	1.5	6.6	----------	----------
June	83.7	62.3	94	52	3.46	1.4	5.8	----------	----------
July	87.4	66.9	96	58	4.67	1.6	10.8	----------	----------
August	85.4	65.4	94	55	5.73	1.4	12.5	----------	----------
September	79.8	58.9	91	45	3.81	1.0	8.0	----------	----------
October	69.3	48.1	83	34	3.27	1.3	5.9	----------	----------
November	57.9	37.9	72	25	3.67	1.5	6.5	(1)	5
December	46.7	29.1	63	14	3.11	1.8	6.2	3	3
Year	66.3	46.2	[2] 98	[3] 7	46.14	35.3	56.2	13	3

[1] Less than half a day. [2] Average annual highest temperature. [3] Average annual lowest temperature.

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

[All data from Dover, elevation 30 feet]

Probability	Dates for given probability and temperature		
	16° F. or lower	24° F. or lower	32° F. or lower
Spring:			
9 years in 10 later than	Feb. 3	Feb. 23	Mar 29
3 years in 4 later than	Feb. 12	Mar. 4	Apr. 5
2 years in 3 later than	Feb. 15	Mar. 8	Apr. 8
1 year in 2 later than	Feb. 22	Mar 15	Apr. 13
1 year in 3 later than	Mar. 1	Mar. 22	Apr. 18
1 year in 4 later than	Mar. 4	Mar 26	Apr 21
1 year in 10 later than	Mar. 13	Apr. 4	Apr. 28
Fall			
1 year in 10 earlier than	Nov 28	Nov. 14	Oct 13
1 year in 4 earlier than	Dec 5	Nov. 21	Oct. 20
1 year in 3 earlier than	Dec 7	Nov. 23	Oct 22
1 year in 2 earlier than	Dec. 12	Nov. 28	Oct 27
2 years in 3 earlier than	Dec. 17	Dec. 3	Nov. 1
3 years in 4 earlier than	Dec. 19	Dec. 5	Nov 3
9 years in 10 earlier than	Dec. 26	Dec. 12	Nov. 10

The average seasonal snowfall (October through April) totals 15.5 inches, but snowfall has ranged from only a trace to more than 45 inches.

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

Thunderstorms occur on an average of 30 days per year. Almost three-fourths of these storms occur in the period May through August. Tornadoes are infrequent and have caused little damage. During the period 1953 to 1964, they averaged one per year for all of Delaware. Tropical storms or hurricanes occur in the county about once a year, usually in the period August through October. Most hurricane damage has been minor.

The prevailing winds are from west to northwest most of the year but are more southerly in summer. The average annual windspeed is about 9 miles per hour, but winds of 50 miles per hour or more accompany severe thunderstorms, hurricanes, and general winter storms.

How This Survey Was Made

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series (*6*)[2] and the soil phase

[2] Italicized numbers in parentheses refer to Literature Cited, p 64.

are the categories of soil classification most used in a local survey.

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

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

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

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

Some mapping units are made up of soils of different series, or of different phases within one series. One such kind of mapping unit, the undifferentiated group, is shown on the soil map of Kent County. An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Sassafras and Evesboro soils, 15 to 40 percent slopes, is an example.

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

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

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The six soil associations in Kent County are described in this section of the survey.

1. Sassafras-Fallsington association

Dominantly level to gently sloping, well-drained and poorly drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam; on uplands

This association occurs mostly as a broad band reaching across the central part of the county from Smyrna in the north to Milford in the south. This tract is dominantly level to gently sloping. Most areas are only slightly eroded, but small areas are moderately or severely eroded. Most of the acreage is in farms, and most of the farms are well managed. Very little is idle. Communities are neat and attractive.

This association occupies about 35 percent of the county. About 60 percent of it consists of Sassafras soils, 25 percent of Fallsington soils, and the rest of minor soils.

Sassafras soils are well drained, friable, and dominantly level to gently sloping. They have a surface layer of grayish-brown sandy loam or loam and a subsoil of brown to yellowish-brown sandy loam and sandy clay loam. Although dominantly nearly level to gently sloping, they include small areas that are moderately sloping to steep. Sassafras soils have few limitations except those of slope.

Fallsington soils are poorly drained. They have almost the same general physical properties as Sassafras soils, but they have a dark grayish-brown surface layer and a subsoil of gray, mottled sandy loam and sandy clay loam. In addition, the water table is at or near the surface much of the year in areas that have not been artificially drained. These soils are generally level. If adequately drained by artificial means, they are suitable for crops. Poor natural drainage and the seasonal high water table severely limit them for many nonfarm uses, such as building sites and septic tanks.

The minor soils of this association are mostly of the Woodstown, Pocomoke, Rumford, and Klej series. They occur mostly as small spots within areas of the major soils, and they do not appreciably affect use.

The dominant Sassafras soils are intensively farmed. They have no more than slight limitations for residential, commercial, and industrial development. The Fallsington soils are mainly woodland. Some areas that have been artificially drained are used intensively for corn and soybeans.

2. *Fallsington-Sassafras-Woodstown association*

Level to sloping, poorly drained to well-drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam; on uplands

Much of this dominantly level soil association is wet, and at least half of it has a cover of second-growth hardwoods. The association occurs as three distinct areas. The largest, in the southwestern part of the county, is a broad, level, headwater upland. The area in the northwestern part has many sinks, potholes, and whale wallows (fig. 2) separated by gently sloping ridges. The area in the southeastern part is a coastal flat only a few feet above sea level.

This soil association occupies about 29 percent of the land area in the county. About 40 percent of it consists of Fallsington soils, 25 percent of Sassafras soils, 25 percent of Woodstown soils, and the rest of minor soils.

Fallsington soils are poorly drained and friable. They have a surface layer of dark grayish-brown sandy loam or loam and a subsoil of gray, mottled sandy loam and sandy clay loam. The seasonal high water table is at or very near the surface much of the year. If adequately drained by artificial means, these soils are suitable for crops. Poor natural drainage and the seasonal high water table severely limit them for many nonfarm uses. Outlets for farm drainage systems are lacking in many places.

Sassafras soils are well drained and friable. They have a surface layer of grayish-brown sandy loam or loam and a subsoil of brown to yellowish-brown sandy loam and sandy clay loam. Most areas of these soils are nearly level, but some have short, gentle slopes. Of the major soils in this association, these are the only ones that can be farmed intensively without artificial drainage. Individual areas of Sassafras soils are not large, and they are commonly surrounded by wetter soils.

Woodstown soils are moderately well drained. They have a surface layer of grayish-brown loam or sandy loam and a subsoil of yellowish-brown sandy clay loam and sandy loam mottled with grayish colors in the lower part. These soils are somewhat wetter than the Sassafras

***Figure 2.*—Small wet spot, or whale wallow, in an area of Sassafras loam, 2 to 5 percent slopes, a well-drained soil that has been planted to soybeans.**

soils but less wet than the dominant Fallsington soils. The water table is within 2 feet of the surface during most of winter and spring. Seasonal wetness and the seasonal high water table are moderate limitations for some kinds of farming and for most nonfarm uses.

The minor soils of this association are mostly of the Pocomoke, Rumford, Klej, and Plummer series. These occur as small spots or inclusions within areas of the major soils and do not appreciably affect use.

No more than half of this association is cleared. Farming is confined to Sassafras soils, which have good natural drainage, and to those areas of Woodstown and Fallsington soils that are adequately drained by artificial means. Corn and soybeans are the main crops. Some hay and pasture are grown. Poor drainage is the major limitation for all uses. Erosion is a minor hazard. Nearly all of this association is well suited to use as woodland. The 25 percent of the acreage that consists of Sassafras soils has only slight limitations for residential, commercial, and industrial uses.

The pothole topography in the northwestern part of the county makes it difficult and expensive to construct public outlet ditches (known as tax ditches in southern Delaware). In the southeastern part of the county, the ditches are very close to sea level and, consequently, are often obstructed with debris carried by storm tides. The possibilities for artificial drainage are better in the southwestern part of the county. Improvements of the channels of Marshy Hope Creek and the Choptank River, now underway, will make it possible to provide outlets for farm drainage systems.

3. Pocomoke-Fallsington-Sassafras association

Level to sloping, very poorly drained, poorly drained, and well-drained soils that have a moderately permeable subsoil of clay loam to sandy loam; on uplands

This association occurs as one large area in the west-central part of the county. The landscape (fig. 3) is mostly level, but there are some depressions and a few very gently sloping ridges, mainly in the vicinity of Hartly and Marydel.

This soil association occupies about 13 percent of the land area in the county. About 50 percent of this association consists of Pocomoke soils, 25 percent of Fallsington soils, 15 percent of Sassafras soils, and the rest of minor soils.

Pocomoke soils are very poorly drained and friable. They have a surface layer of thick, black or very dark gray loam or sandy loam and a subsoil of gray, mottled clay loam and sandy clay loam. Because of a seasonal high water table that is at or above the surface much of the year, Pocomoke soils in their natural state are too wet for any use more intensive than woodland and wildlife habitat. If thoroughly drained artificially, they are used for farming.

Fallsington soils are poorly drained and friable. They have a surface layer of dark grayish-brown sandy loam or loam and a subsoil of gray, mottled sandy loam and sandy clay loam. The water table is at or very near the surface much of the year. If adequately drained by artificial means, these soils are suitable for crops. Poor natural

***Figure 3.*—Typical landscape in the Pocomoke-Fallsington-Sassafras association, near Hartly. The darkest areas are Pocomoke soils, the lighter areas are mostly Fallsington soils, and the lightest areas are small patches of Evesboro soils, which are minor soils in this association.**

drainage and the seasonal high water table severely limit them for many nonfarm uses.

Sassafras soils are well drained and in some places are gently sloping. They have a surface layer of grayish-brown sandy loam or loam and a subsoil of brown to yellowish-brown sandy loam and sandy clay loam. They generally have few limitations.

The minor soils of this association are mostly of the Evesboro, Woodstown, Plummer, Klej, and Rumford series. They occur mainly as small spots.

In its natural state, most of this association is suited to no more intensive use than woodland and wildlife habitat. Farming is confined to Sassafras soils and drained areas of the wet soils. Small part-time farms are the most common. Corn, soybeans, hay, and pasture are the main crops. Subsistence gardening is practiced, but little intensive truck cropping or other farming is done. Large areas of Pocomoke and Fallsington soils have no drainage systems and support only a growth of water-tolerant trees. Adequate drainage outlets are lacking in many places. Most of the acreage has severe limitations for residential development and other nonfarm uses.

Large cooperative or public drainage systems will have to be established before the farming potential of this association can be fully developed.

4. Rumford-Evesboro-Fallsington association

Dominantly level to sloping, excessively drained to poorly drained soils that have a moderately permeable to rapidly permeable subsoil or underlying material of loamy sand to sandy clay loam; on uplands

This association is mostly nearly level, but there are some very sandy dunelike ridges, some scattered sinks or potholes, and some steep areas along major streams. The largest of the three areas of this association extends from just south of Felton to the Sussex County line, and from Harrington on the west to near Houston on the east. The next largest area is a narrow strip along the western border of the county between the Choptank River and Burrsville. The smallest is just east of Milford.

This association occupies about 6 percent of the total land area in the county. About 50 percent of the acreage consists of Rumford soils, 30 percent of Evesboro soils, 15 percent of Fallsington soils, and the rest of minor soils.

Rumford soils are somewhat excessively drained. They have a thick surface layer of loamy sand and a friable, brown to yellowish-brown sandy loam subsoil. These soils are rather low in their capacity to retain moisture and plant nutrients, but they are easy to work and are suited to the earliest crops in spring. They are level to sloping. All the acreage is suited to cultivation.

Evesboro soils have a surface layer of loamy sand or sand and are excessively drained. In most areas they are underlain at a depth of 3½ to 6 feet by finer textured material that serves as a reservoir of moisture for deep-rooted plants. These soils warm up very early in spring. They retain little moisture in dry seasons. The topography is level to gently rolling or dunelike.

Fallsington soils are poorly drained and have a seasonal high water table. They have a surface layer of dark grayish-brown sandy loam or loam and a subsoil of gray, mottled sandy loam and sandy clay loam. If artificially drained, they are well suited to farming, but most undrained areas remain in woodland.

The minor soils of this association are mostly of the Klej, Plummer, and Sassafras series.

This association as a whole is moderately well suited to intensive cultivation. The principal crops are corn, soybeans, and cannery crops, mainly asparagus. Crops need large amounts of fertilizer and, in dry seasons, irrigation, because the sandy Rumford and Evesboro soils do not effectively retain either plant nutrients or water. Erosion resulting from surface runoff is a minor hazard. Gullies are likely to form where water is concentrated. Soil blowing is a hazard if the surface is dry while a seedbed is being prepared. Most of the acreage is suitable for residential development and other nonfarm uses.

5. Othello-Matapeake-Mattapex association

Nearly level to sloping, poorly drained to well-drained soils that have a moderately slowly permeable to moderately permeable subsoil, mainly of silty clay loam or silt loam; on uplands

This association differs from all the other associations of Kent County in that all the major soils formed in a mantle of silty material that overlies the sandy material that is dominant in the rest of the county. It occurs as two areas in the northeastern part of the county, between the coastal marshes and the sandier interior. One of these areas is centered on Little Creek and extends from Kitts Hummock to Muddy Branch. The other extends north from the Leipsic River to the western edge of Woodland Beach Wildlife Refuge. The landscape is dominantly level, but a few areas of moderately eroded short slopes occur along the stream. Nearly all of the acreage is cleared and in crops. Most of the small woodlots are on areas of included clayey soils.

This association occupies about 6 percent of the total land area of the county. About 40 percent of the acreage consists of Othello soils, 35 percent of Matapeake soils, 15 percent of Mattapex soils, and the rest of minor soils.

Othello soils are poorly drained and friable. They have a surface layer of gray silt loam and a subsoil of gray, mottled silty clay loam and silt loam. They retain moisture and plant nutrients and are not difficult to work except when excessively dry or excessively wet. They tend to be rather hard and cloddy when dry and to be sticky and hard to work when wet. Poor drainage is the main limitation.

Matapeake soils are well drained and friable. They have a surface layer of grayish-brown to brown silt loam and a yellowish-brown to strong-brown silt loam subsoil. They retain moisture and plant nutrients and are not difficult to work except when excessively dry or excessively wet. They tend to be rather hard and cloddy when dry and to be sticky and hard to work when wet. Locally, the slope ranges to as much as 10 percent. Otherwise, these soils have few limitations.

Mattapex soils are moderately well drained and friable. They are similar to Matapeake soils except they have a subsoil of silty clay loam and fine sandy loam with gray mottles in the lower part. They retain moisture and plant nutrients and are not difficult to work except when excessively dry or excessively wet. They tend to be rather

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hard and cloddy when dry and to be sticky and hard to work when wet.

The minor soils of this association are mostly of the Bayboro, Elkton, and Keyport series. These soils have a finer textured, more slowly permeable subsoil than the major soils.

Most of this association is suited to cultivation. Truck and cannery crops are grown extensively. Irish potatoes, cabbage, carrots, peas, snap beans, lima beans, cauliflower, broccoli, Brussels sprouts, sweet corn, and horseradish are some of the main crops. Corn and soybeans also are grown on large areas. Othello soils need intensive artificial drainage if cultivated. Mattapex soils need some improvement in drainage if planted to early crops, but undrained areas can be used for late-planted crops and pasture crops. The sloping areas of Matapeake soils are subject to erosion. Only the Othello soils have severe limitations for nonfarm uses; the others have slight to moderate limitations.

6. Tidal marsh association

Soil materials that are regularly subject to flooding, mainly by salt water

This association is along the shores of Delaware Bay and extends along some major streams well into the interior of the county. It is an open, grass-covered marsh dissected by tidal streams and crisscrossed in most places by shallow ditches that have been constructed for control of mosquitoes. It occupies about 11 percent of the total land area.

The soil material is mostly organic. It consists of peaty or mucky remains of vegetation and some areas of clayey materials that contain large amounts of sulfates. The marsh is generally salty; it ranges from strongly saline near Delaware Bay to brackish or almost fresh in the upper reaches along streams. The depth to sand ranges from about 2 feet to more than 90 feet.

This association (fig. 4) is not suited to farming or to most nonfarm uses, but it is valuable as wildlife habitat and for some kinds of recreational development. It is along the Atlantic flyway of migratory waterfowl. The Bombay Hook Migratory Waterfowl Refuge is in this association. Recreational activities consist mostly of fishing and hunting. Many shallow water impoundments have been developed for waterfowl. There is some trapping, mainly for muskrats.

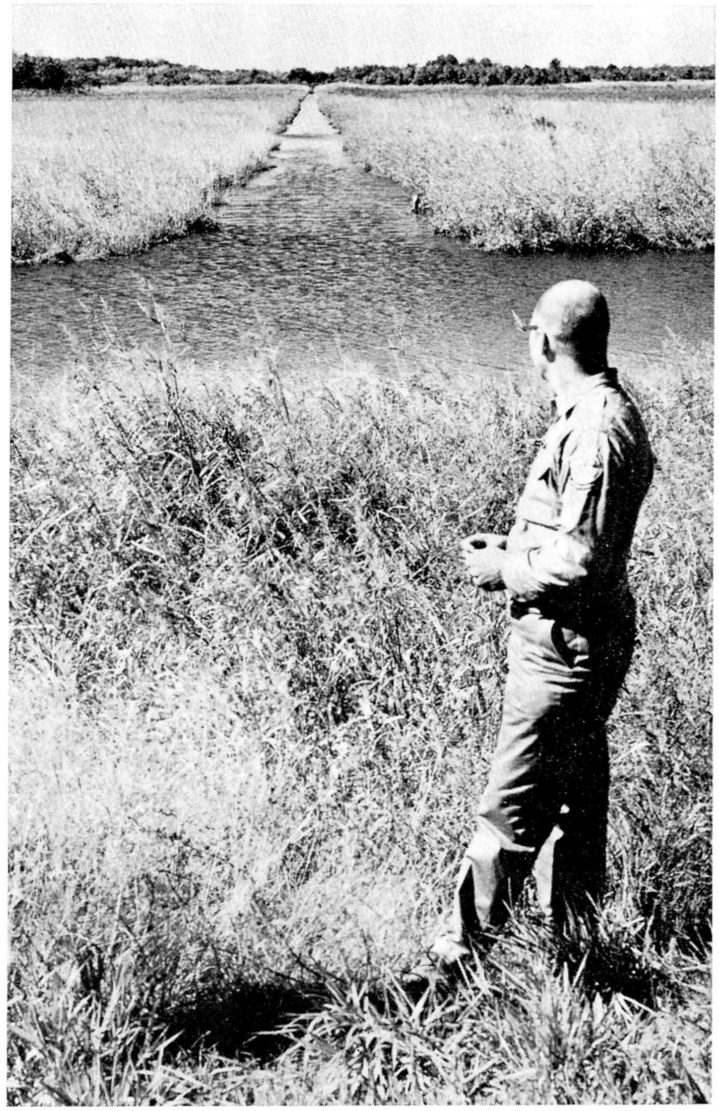

Figure 4.—**A general view of the Tidal marsh association, within the Bombay Hook Migratory Waterfowl Refuge. The many ditches increase the open water areas for waterfowl.**

Descriptions of the Soils

In this section the soils of Kent County are described in detail. The procedure is to describe first a soil series and then the mapping units in that series. To get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which it belongs. The miscellaneous land types, which are not true soils, are described in alphabetic order along with other mapping units.

The description of each soil series contains a short description of a typical soil profile and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. The descriptions of the mapping units give the characteristics and qualities of each soil. Also included in each description are suggestions for use and management of the soils, somewhat general for the series but more specific for the individual soils. At the end of the description of each mapping unit are listed the capability unit and the woodland subclass in which the mapping unit has been placed.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. The approximate acreage and proportionate extent of each mapping unit are given in table 3.

The color of each soil horizon is described in words, such as light brownish gray, but it can also be indicated by symbols that show hue, value, and chroma of the color, such as 10YR 6/2, which stands for light brownish gray. These symbols, called Munsell color notations, are used by soil scientists to evaluate the color of the soil precisely.

Unless otherwise stated, the colors given in the typical profile are for moist soils; when soils are dry, their colors may be slightly different.

Depth to bedrock is not given in the descriptions of the soils. The soils of Kent County are underlain by unconsolidated sediments of very great but undetermined thickness; consequently, depth to bedrock does not affect use.

Many terms used in the soil descriptions and in other sections of the survey are defined in the Glossary.

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

Soil	Acres	Percent
Bayboro silt loam	645	0. 2
Borrow pits	445	. 1
Coastal beaches	585	. 2
Elkton sandy loam, thin subsoil	600	. 2
Elkton silt loam, thin subsoil	2, 505	. 7
Evesboro sand	225	. 1
Evesboro loamy sand, 2 to 5 percent slopes	3, 620	. 9
Evesboro loamy sand, 5 to 15 percent slopes	665	. 2
Evesboro loamy sand, clayey substratum	3, 110	. 8
Fallsington sandy loam	33, 115	8. 7
Fallsington loam	56, 245	14. 8
Johnston silt loam	9, 315	2. 4
Keyport sandy loam	290	. 1
Keyport silt loam	190	(1)
Klej loamy sand	830	. 2
Made land	140	(1)
Matapeake silt loam, 0 to 2 percent slopes	5, 580	1. 5
Matapeake silt loam, 2 to 5 percent slopes	4, 260	1. 1
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	345	. 1
Mattapex silt loam	3, 950	1. 0
Mixed alluvial land	1, 010	. 3
Othello silt loam	10, 140	2. 7
Plummer loamy sand	630	. 2
Pocomoke sandy loam	3, 535	. 9
Pocomoke loam	27, 415	7. 2
Rumford loamy sand, 0 to 2 percent slopes	5, 490	1. 4
Rumford loamy sand, 2 to 5 percent slopes	9, 080	2. 4
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	815	. 2
Rumford loamy sand, 5 to 10 percent slopes, severely eroded	275	. 1
Rumford loamy sand, 10 to 15 percent slopes	190	(1)
Sassafras sandy loam, 0 to 2 percent slopes	25, 840	6. 8
Sassafras sandy loam, 2 to 5 percent slopes	51, 665	13. 6
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	3, 395	. 9
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	1, 370	. 4
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	1, 055	. 3
Sassafras loam, 0 to 2 percent slopes	13, 865	3. 6
Sassafras loam, 2 to 5 percent slopes	19, 550	5. 1
Sassafras loam, 5 to 10 percent slopes, moderately eroded	770	. 2
Sassafras and Evesboro soils, 15 to 40 percent slopes	485	. 1
Swamp	1, 945	. 5
Tidal marsh	38, 995	10. 2
Woodstown sandy loam	16, 420	4. 3
Woodstown loam	16, 620	4. 4
Unmapped area	3, 585	. 9
Total land area	380, 800	100. 0

1 Less than 0 05 percent.

Bayboro Series

The Bayboro series consists of very poorly drained soils on headwater flats and in closed depressions on the uplands. The native vegetation is a mixture of hardwoods, including red maple, swamp maple, gum, and oak.

In a typical profile the surface layer is black silt loam about 10 inches thick. The subsoil is about 32 inches thick. The uppermost 9 inches of the subsoil is very dark gray silty clay loam that is sticky when wet. The next 13 inches is gray or light-gray, mottled silty clay that is very sticky when wet. The rest is sandy clay loam that is less sticky.

Bayboro soils are little used for tilled crops. They are not ready to be worked until late in spring. They are difficult to till because they tend to be hard when dry and sticky when wet. The structure breaks down if they are worked when wet. The water table generally is at or near the surface until late in spring. In depressions that have neither natural nor artificial outlets, water remains on the surface for long periods. Artificial drainage is difficult to establish because of very slow permeability. The available moisture capacity is high.

Profile of Bayboro silt loam, in a wooded area just off Route 253, about 2 miles southwest of Petersburg:

O1—1 inch to 0, a litter of leaves, mostly of swamp maple.

A11—0 to 6 inches, black (10YR 2/1) silt loam; moderate, coarse, granular structure; friable, slightly sticky; roots abundant; many pores and some wormholes and crayfish holes; very strongly acid; clear, smooth boundary. 5 to 6 inches thick.

A12—6 to 10 inches, black (10YR 2/1) silt loam; weak, coarse, subangular blocky structure; very friable, slightly sticky; many roots and pores; some wormholes and crayfish holes; very strongly acid; clear, smooth boundary. 4 to 8 inches thick.

B21tg—10 to 19 inches, very dark gray (N 3/0) silty clay loam; moderate, medium to coarse, prismatic structure; friable, sticky and plastic; roots common; common pores, crayfish holes, and old vertical root channels; clay films moderately thick on vertical faces and thin on horizontal faces; very strongly acid; abrupt, irregular boundary, tonguing into horizon below. 8 to 26 inches thick.

B22tg—19 to 32 inches, gray or light-gray (10YR 6/1) silty clay; common, medium, prominent mottles of yellowish brown (10YR 5/8); strong, coarse, prismatic structure; firm, plastic and very sticky; few roots; common pores, crayfish holes, and old vertical root channels; clay films very thick on vertical faces but thin and patchy on horizontal faces; very strongly to extremely acid; abrupt, wavy boundary. 6 to 13 inches thick.

B3—32 to 42 inches +, gray or light-gray (10YR 6/1) sandy clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/8); structureless (massive); some widely spaced vertical cracks; friable, sticky; no roots; very strongly acid.

The A12 horizon ranges to silty clay loam. The B2t horizon ranges from heavy clay loam or silty clay loam to clay (clay content more than 35 percent). The C horizon, where observed, is sandy clay loam, sandy clay, or silty clay. It contains pockets or thin strata of fine sandy materials but usually no pebbles or other coarse fragments.

The colors throughout the profile are 10YR in hue or are neutral. In most places an undisturbed A horizon is black, but an Ap horizon is likely to be very dark gray or very dark brown. In the B horizon, the matrix color has a value of 3 to 7 and a chroma of 0 to 2. The color of the mottles in the B and C horizons has a hue of 10YR or, rarely, redder; a value of 5 to 7; and a chroma of 4 to 8. The structure of the B horizon is blocky or prismatic or both.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth.

Bayboro soils are similar to Pocomoke soils in color and in natural drainage but are much more clayey, particularly in the subsoil, and much less readily permeable. They formed in the same kind of parent material as Elkton soils, which are poorly drained and have a gray instead of a black surface layer Their parent material was also like that of Keyport soils, which are moderately well drained and have a yellowish-brown subsoil mottled in the lower part with gray.

Bayboro silt loam (Ba).—Most of this soil is in shallow depressions or potholes. These depressions have no natural outlets, and water ponds in them unless artificial outlets are provided. Included in mapping were some spots where the texture of the surface layer or the plow layer is loam.

Artificial drainage is a necessity if this soil is to be tilled. Because of the very slow permeability of the subsoil, tile drains usually are not effective. Open ditches, rather closely spaced, are better. Each area needs a main drainage ditch as an outlet and laterals from this main ditch, the number depending upon the size of the area to be drained. Areas that are some distance from natural drainageways need very long main ditches, which might be very expensive for the size of the area to be drained. Some farmers grade the strips between ditches so that excess water runs off into the ditches more readily.

Even after it has been drained, this soil is difficult to till. Corn and soybeans are the most common crops. Some hay and pasture crops are also grown. Pastures should not be overgrazed, particularly when wet, because the soil tends to puddle and compact when wet. (Capability unit IIIw-9; woodland subclass 2w)

Borrow Pits

Borrow pits (Bo) are areas from which soil material has been removed, most commonly for use in road and highway construction. If the original soils were well drained, the pits are commonly dry. If the original soils had a high water table, the pits are partly filled with water for at least part of the year.

Most of the soil material removed has been sandy in texture. Even that taken from pits opened specifically to obtain gravel is very sandy (Capability unit VIIIs-4; not placed in a woodland subclass)

Coastal Beaches

Coastal beaches (Co) are measurable areas of noncoherent, loose sand that has been worked and reworked by waves and tides and by wind and is still subject to such action. The beaches are mostly along the shores of the Delaware Bay, but minor areas occur within the estuaries of some of the streams that flow into the Bay.

The sand shows no evidence of soil development. Most areas are smooth and are level or gently sloping, but some areas are hummocky and dunelike and have short, irregular slopes that are constantly being changed by winds that move and rework the sand.

Vegetation is commonly sparse. It consists of American beachgrass, beach goldenrod, scattered clumps of switchgrass, and, on a few partially stabilized areas, some shrubs or even some scattered pines. Many areas have no vegetation at all. (Capability unit VIIIs-2; woodland subclass 5t)

Elkton Series

The Elkton series consists of poorly drained, dominantly gray soils on upland flats and in slight depressions. These soils formed in old, fine marine sediments. The native vegetation consists of oak, gum, swamp maple, holly, and other wetland hardwoods.

A typical profile in a cultivated area has a 7-inch surface layer of gray or grayish-brown silt loam and a 2-inch subsurface layer of gray silt loam. The subsoil, about 12 inches thick, is gray or light-gray, mottled, very sticky silty clay or clay. The substratum, to a depth of about 84 inches, consists of gray or light-gray, mottled, stratified sand, fine sand, and silt.

Elkton soils have a seasonally high water table, and in places water stands on the surface of undrained areas in winter and early in spring. Open ditches are the best means of drainage.

Profile of Elkton silt loam, thin subsoil, in a slightly depressed, cultivated area, just east of Route 326 and about one-tenth of a mile south of Route 83, northwest of Leipsic:

Ap—0 to 7 inches, gray (10YR 5/1) silt loam; weak, medium, granular structure; friable, slightly sticky; roots abundant; many pores; neutral (limed); abrupt, smooth boundary. 7 to 8 inches thick.

A2g—7 to 9 inches, gray (10YR 5/1) silt loam; weak, medium, subangular blocky structure; friable, slightly sticky; many fine roots; numerous pores; neutral; abrupt, smooth boundary. 2 to 3 inches thick.

B2tg—9 to 21 inches, gray or light-gray (10YR 6/1) silty clay; many, coarse, prominent mottles of yellowish brown (10YR 5/6); strong, coarse, prismatic and blocky structure; firm, plastic and very sticky; a few roots between prisms; dark-gray (N 4/0) clay films, thick on vertical and thin on horizontal faces; very strongly acid; abrupt, irregular boundary. 10 to 20 inches thick.

IICg—21 to 84 inches, gray or light-gray (10YR 6/1) stratified, thin layers of sand, fine sand, and silt; many, coarse, prominent mottles of strong brown (7.5YR 5/6), friable to firm; no roots; vertical cracks, 8 to 16 inches apart, filled with silt and/or clay; very strongly acid.

The A horizon is either silt loam or sandy loam In places the B2tg horizon is partly clay or heavy silty clay loam (clay content generally considerably more than 35 percent). In some areas the IICg horizon is uniformly loamy sand to sandy loam, and in some there is a conforming C horizon of silty material There are generally no pebbles or other coarse fragments in the profile The solum is 20 to 30 inches thick; the solum of Elkton soils in other survey areas is generally thicker. In some areas the profile is underlain at depths of 7 feet or more by much older sediments that in places are highly organic.

The matrix colors throughout the profile are 10YR or yellower in hue and in places are neutral. The matrix colors have a value of 4 to 7 and a chroma of 0 to 2, or, rarely, 3. In an undisturbed A1 horizon the value ranges to 3. Mottles range from faint to prominent in hues of 7.5YR or yellower and chromas from 4 to 8

Except where lime has been applied, the reaction is strongly acid to extremely acid. In rare cases, in the vicinity of salt water, the C horizon at some depth may be less strongly acid than the solum

Elkton soils formed in the same kind of sediments as Keyport soils, which are moderately well drained, and Bayboro soils, which are very poorly drained: and like those soils they have a slowly permeable subsoil Other poorly drained soils of the county are those of the Fallsington, Othello, and Plummer series Elkton soils are less silty and more clayey, particularly in the subsoil, than Othello soils, and they are less readily permeable Fallsington soils have a subsoil of friable sandy clay loam Plummer soils consist of loamy sand underlain by loose sand.

Elkton sandy loam, thin subsoil (El).—Except for the texture of the surface layer, the profile of this soil is like the representative profile. The soil is nearly level.

This soil is fairly easy to work if excess surface water is removed. Because of the slow permeability of the subsoil, tile drains are not very effective, but properly spaced ditches remove excess water readily if adequate outlets are available.

This soil is severely limited by poor natural drainage, very slow permeability in the subsoil, and a seasonally very high water table. It is fairly well suited to some crops if artificially drained and otherwise well managed. Establishing adequate drainage is difficult. Few crops other than corn and soybeans are grown. (Capability unit IIIw–11; woodland subclass 3w)

Elkton silt loam, thin subsoil (Em).—The profile of this soil is the one described as representative of the Elkton series. The soil is nearly level.

Elkton silt loam, thin subsoil, is less easy to work than Elkton sandy loam and more difficult to drain, but it has a higher available moisture capacity. Poor natural drainage, very slow permeability of the subsoil, and a water table that remains high for a large part of the year are limitations. Artificial drainage is difficult. There is little or no hazard of erosion. Drainage by rather closely spaced open ditches and adequate outlets is necessary. Some farmers grade the strips between ditches to let excess water run into the ditches more readily. Improved drainage makes it possible to grow annual crops that do not require early planting, mainly corn and soybeans. (Capability unit IIIw–9; woodland subclass 3w)

Evesboro Series

The Evesboro series consists of very deep, excessively drained soils on uplands. The native vegetation consists chiefly of hardwoods.

In a typical profile the surface layer is dark grayish-brown loamy sand about 9 inches thick. Beneath this layer and extending to a depth of about 27 inches is brown to yellowish-brown sand or loamy sand. This is underlain by light brownish-gray sand or loamy sand that commonly contains some very thin layers of yellowish-brown material. In most areas this material extends to a considerable depth and becomes gradually paler. In nearly level areas, however, where the upper part of the profile is loamy sand, there is a layer of heavy loamy sand, sandy loam, or sandy clay loam, deep in the profile.

Evesboro soils warm up early in spring, are very easy to work, and can be worked within a wide range of moisture content. Although the available moisture capacity is low and the natural fertility very low, the loamy sands of this series are suited to crops. Most crops need large amounts of fertilizer. Crops respond to irrigation, and in dry years irrigation is a necessity. Blowing sand sometimes damages young plants.

Profile of Evesboro loamy sand, 2 to 5 percent slopes, in a gently sloping cultivated area, near the intersection of Routes 429 and 430, about 4 miles northwest of Houston:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loamy sand; structureless (single grain); loose; many roots; very strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

C1—9 to 27 inches, brown (10YR 5/3) loamy sand; structureless (single grain); loose; many fine roots; very strongly acid; abrupt, wavy boundary. 15 to 20 inches thick.

C2—27 to 45 inches +, light brownish-gray (10YR 6/2) loamy sand; structureless (single grain); few roots; some thin lamellae (¼ to ½ inch thick, 3 to 5 inches apart) of yellowish-brown (10YR 5/4) loamy sand that is very friable but not loose; very strongly acid

The texture of both the A and C horizons is sand or loamy sand. The hue ordinarily is 10YR throughout but ranges to 2 5Y or 7 5YR. Where the profile has not been disturbed, there is a very thin A11 horizon and a somewhat thicker A12 horizon. The color of the A horizon ranges from 3 to 6 in value and from 2 to 4 in chroma; the value is lowest in the very thin A11 horizon. The color of the C horizon has a value of 5 or 6 and, generally, a range in chroma of 3 to 8. In parts of some horizons, however, the chroma is less than 3 Except where lime has been applied, the reaction is strongly acid to extremely acid.

The moderately well drained Klej soils and the poorly drained Plummer soils are the only other soils in the county that are as sandy as Evesboro soils.

Evesboro loamy sand, 2 to 5 percent slopes (EsB).—This soil occurs on slightly elevated ridges or side slopes within or adjacent to areas of Evesboro loamy sand, clayey substratum. The profile of this soil is the one described as representative of the Evesboro series. Included in mapping were some small areas where the subsoil is darker brown or slightly reddish brown and is very slightly sticky.

The available moisture capacity of this soil is low, and the natural fertility is low. Most of the rainfall infiltrates rapidly, so there is little hazard of erosion except after unusually heavy rainfall or where runoff from other areas discharges. Gullies can form where runoff water concentrates. Blowing sand is a hazard to young crops when the surface is bare.

Because it is sandy and droughty, this soil is one of the least productive soils of the county for general field crops. Asparagus, melons, cucumbers, strawberries, and other special crops are well suited. Irrigation is needed for crops of high acre-value. Use of cover crops, green-manure crops, crop residue, and manure increases the organic-matter content and otherwise improves this soil. Young crops of high acre-value need to be protected from blowing sand. Unplowed strips of winter grain can be used for this purpose. (Capability unit IVs–1; woodland subclass 3s)

Evesboro loamy sand, 5 to 15 percent slopes (EsD).—This soil is on the sand ridges. Its short, irregular, dune-like slopes are evidence of reworking by wind. Blowing sand is a hazard.

This soil is better suited to wood crops and wildlife habitat than to crops and pasture. Except for small areas included in fields of other soils, it is not farmed. There are some subsistence gardens and a few patches of cucumbers and cantaloups. Much of the acreage is covered with hardwoods. (Capability unit VIIs–1; woodland subclass 3s)

Evesboro loamy sand, clayey substratum (Ev).—The lower part of the substratum of this soil is finer textured than any of the layers above. This finer textured layer occurs at a depth ranging from 42 to 72 inches but most commonly is at a depth of about 60 inches. Ordinarily, this layer is 14 to 20 inches thick and is strong brown (10YR 5/6) streaked with gray. It ranges from heavy or sticky loamy sand to sandy clay loam but is commonly sandy loam. The upper part of the profile is like the corresponding part in the profile described as typical. The slope of this soil is less than 2 percent. Included in mapping were small areas, just east of Farmington, where the substratum is even finer textured and is as little as 24 to 30 inches below the surface.

Because of its finer textured substratum, this soil holds more moisture than the other Evesboro soils in Kent County and is, consequently, better suited to crops.

Most of this soil is used for crops, and some areas are intensively cultivated. Truck crops can be planted early. Almost all commercial vegetables can be grown, and cantaloups and cucumbers are especially well suited. Areas intensively cultivated receive large and frequent applications of fertilizer and applications of manure. Most such areas are irrigated, commonly by sprinkler systems. Blowing when the soil is dry and nearly bare is a hazard. Windbreaks of winter grain help to protect seedlings from damage by blowing sand. Water erosion is not a significant hazard. (Capability unit IIIs-1; woodland subclass 3s)

Evesboro sand (Eo).—This soil is on the sand ridges. The texture from the surface to a depth of more than 72 inches is sand. The sand is noncoherent and very loose, particularly in the lower part. Wind has reworked this soil in some places, and the surface is hummocky or dunelike in appearance. The slope range is 0 to 10 percent.

This soil is better suited to wood crops and wildlife habitat than to cultivated crops and pasture. Except for small subsistence gardens and patches of melons and cucumbers, little of it is used for crops. Crops need large amounts of fertilizer and all the manure and crop residue available. Even small gardens need a source of water for irrigation during dry periods. Low windbreaks help to protect young plants from damage by blowing sand. Most pastures have a low carrying capacity and can be grazed for only short periods. (Capability unit VIIs-1; woodland subclass 3s)

Fallsington Series

The Fallsington series consists of poorly drained soils on uplands. These soils formed in old, predominantly sandy sediments. The native vegetation consists of oak, birch, swamp maple, holly, and other wetland hardwoods.

A typical profile in a cultivated area has a 7-inch plow layer of dark grayish-brown sandy loam and a 4-inch subsurface layer of grayish-brown sandy loam. The subsoil is about 16 inches thick. The upper 7 inches is gray or light-gray, mottled, slightly sticky heavy sandy loam, and the lower part is gray or light-gray, mottled, sticky sandy clay loam. The substratum, to a depth of at least 46 inches, consists of gray or light-gray, mottled, stratified sandy loam and sandy clay loam.

Fallsington soils cannot be farmed unless the water table is lowered by artificial drainage (fig. 5). They are not hard to drain if outlets are adequate. Except when too wet, they are easy to work. The available moisture capacity is high.

Profile of Fallsington sandy loam, in a cultivated area north of Harrington, about one-tenth mile south of the intersection of Route 289 and Route 290:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, coarse, granular structure that tends toward subangular blocky; very friable, slightly sticky; roots numerous; many pores and some wormholes; slightly acid (limed); abrupt, smooth boundary. 7 to 10 inches thick.

A2—7 to 11 inches, grayish-brown (10YR 5/2) sandy loam; weak, coarse, granular to subangular blocky structure; very friable, slightly sticky; roots plentiful; common pores and crayfish holes, usually filled with Ap material; very strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B21tg—11 to 18 inches, gray or light-gray (10YR 6/1) heavy sandy loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; friable, slightly sticky; common roots, pores, and crayfish holes filled with Ap material; thin, discontinuous clay films; very strongly acid to extremely acid; gradual, wavy boundary. 6 to 10 inches thick.

B22tg—18 to 27 inches, gray or light-gray (10YR 6/1) sandy clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; friable, sticky and slightly plastic; few roots; common crayfish holes filled with Ap material; distinct to prominent clay films; very strongly acid to extremely acid; gradual, wavy boundary. 7 to 12 inches thick.

Cg—27 to 46 inches +, gray or light-gray (10YR 6/1) alternate thin strata of sandy loam and sandy clay loam; common, coarse, distinct mottles and streaks of yellowish brown; friable to firm, slightly sticky; very few roots; crayfish holes filled with Ap material; extremely acid.

The A horizon is either loam or sandy loam. The B2t horizon ranges from heavy sandy loam to sandy clay loam (clay content generally between 18 and 25 percent). The C horizon generally is sandier than the B horizon. Fine, smooth pebbles are scattered through some profiles. The solum is 24 to 37 inches thick.

The matrix colors throughout the profile are 10YR or neutral in hue. In the A horizon, the matrix color has a value of 3 to 5 and a chroma of 1 to 3; the value is lowest in the thin A1 horizon. In the B and C horizons, the matrix color has a value of 4 to 6 and a chroma of 0, 1, or 2. The mottles in these horizons range from yellowish brown to yellowish red or, in places, to olive brown. Some profiles are not mottled. Except where lime has been applied, the reaction is strongly acid to extremely acid.

Fallsington soils are similar to Elkton, Othello, and Plummer soils in color and in natural drainage. Fallsington soils are more readily permeable than Elkton and Othello soils but less so than Plummer soils. Fallsington soils formed in the same kind of sediments as the well drained Sassafras soils, the moderately well drained Woodstown soils, and the very poorly drained Pocomoke soils.

Fallsington sandy loam (Fa).—The profile of this soil is the one described as representative of the Fallsington series. Included in mapping were scattered areas in which the slope is more than 2 percent, some spots that are slightly eroded, and some in which material washed from other soils has accumulated.

This soil retains moisture and plant nutrients, and it is easy to work. It is poorly drained and, in its natural state, has a water table at or near the surface for long periods. It can be drained without much difficulty, wher-

Figure 5.—**Fallsington loam before improvement of drainage.**

ever outlets are adequate, either by tile systems or by ditches.

If adequately drained by artificial means, this soil can be used for crops almost continuously. Corn and soybeans are the most common crops, but other field crops are grown and also some truck crops, principally sweet corn. Although there is little hazard of erosion, the residue from corn and soybeans is often left on the surface through the winter, and winter rye is grown as a cover crop in some places. Some hay and pasture crops are grown. Most undrained areas have a cover of wetland hardwoods. (Capability unit IIIw–6; woodland subclass 2w)

Fallsington loam (Fs).—This soil has a slightly finer textured surface layer and subsoil than the soil that has the representative profile. Included in mapping were a few acres that have a slope of slightly more than 2 percent, some spots that are slightly eroded, and some in which material washed from other soils has accumulated.

This soil holds a larger supply of moisture and of plant nutrients than Fallsington sandy loam. It stays wet a little longer in spring, and it is slightly more difficult to drain. Closer spacing of tile or ditches is necessary.

Corn and soybeans are the chief crops. This is a very good soil for wood crops and for wildlife habitat. Large areas, mainly in the western third of the county, still have a cover of trees. (Capability unit IIIw–7; woodland subclass 2w)

Johnston Series

The Johnston series consists of very wet, very poorly drained soils on flood plains. These soils formed in recent accumulations that consist of both sediments and large amounts of organic matter. The native vegetation is chiefly swamp maple, gum, holly, pond pine, and water-tolerant species of oak.

In a typical profile the surface layer is very dark grayish-brown to black silt loam about 14 inches thick. This layer contains large amounts of organic matter; in undisturbed woodland, the uppermost part is slightly to moderately mucky. The surface layer is underlain by about 12 inches of material that is similar to it in color but is more sandy and less silty. Below this, to a depth of at least 42 inches, is gray, loose, wet sand.

Johnston soils are very wet for long periods. Artificial drainage is a necessity for most uses except woodland and wildlife habitat. Drainage is not difficult if outlets are adequate, but not all areas have outlets. If drained and protected from flooding, these soils are suited to crops and pasture. They are easy to work but are slow to warm up and have to be planted late. Most areas remain in woodland because clearing is difficult and expensive and limitations are severe.

Profile of Johnston silt loam, in a level, wooded area on the flood plain of Cow Marsh Creek, near Sandtown:

A11—0 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam flecked or spotted with brown or dark brown (7 5YR 4/4) ; weak, medium, granular structure that grades toward subangular blocky; friable, slightly sticky; roots abundant; very strongly acid; clear, smooth boundary. 10 to 15 inches thick.

A12—14 to 26 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; very friable; roots plentiful in upper part; extremely acid; abrupt, smooth boundary. 10 to 15 inches thick.

IICg—26 to 42 inches +, gray (10YR 5/1) sand, structureless (single grain) ; loose; no roots; some thin strata and pockets of dark-brown (10YR 3/3), finer textured, somewhat sticky material; extremely acid

The A12 horizon is silt loam, fine sandy loam, or sandy loam. In most places the C horizon is sand or sand stratified with other materials. The total thickness of the A horizon ranges from 20 to 30 inches but is most commonly not much more than 20 inches.

The A horizon is commonly black, very dark gray, very dark grayish brown, or very dark brown The color ranges from 10YR in hue to neutral. The A12 horizon is one unit higher in value than the A11. In the C horizon the matrix color has a value of 4 or more and a chroma of 0 to 2 The C horizon is streaked or mottled.

Except where lime has been applied, the reaction is very strongly acid to extremely acid; acidity increases with depth.

Superficially, Johnston soils are similar to Bayboro and Pocomoke soils, but Johnston soils are on flood plains, and Bayboro and Pocomoke soils are on flats and in depressions on uplands. Also Johnston soils have a subsoil of sand, but Bayboro soils have a subsoil of silty clay loam and silty clay. Pocomoke soils have a subsoil of sandy clay loam

Johnston silt loam (Jo).—In many places the surface layer of this soil is black instead of very dark grayish brown. In wooded areas the uppermost part of the surface layer is mucky, and in some isolated spots this mucky material is several inches thick. Some scattered areas have on the surface recent deposits of a few inches of silty or sandy material that is not dark colored. Johnston soils adjoin areas of Mixed alluvial land and grade into areas of Swamp and Tidal Marsh.

Where the hazard of flooding is only moderate and artificial drainage is adequate, some areas have been cleared and are cultivated. Corn and soybeans are the principal crops. Some areas have been developed for pasture. Most areas, however, cannot be drained easily unless cleared, and clearing is commonly difficult and expensive. Consequently, a large part of the acreage remains in wetland woodland that produces good hardwoods and provides cover for wildlife. (Capability unit IIIw-7; woodland subclass 2w)

Keyport Series

The Keyport series consists of deep, moderately well drained, slowly permeable to very slowly permeable soils on uplands. These soils formed in old upland deposits of clay or silty clay. The native vegetation is water-tolerant hardwoods.

In a typical profile the surface layer is very dark grayish-brown silt loam about 3 inches thick. The subsurface layer is dark yellowish-brown silt loam about 4 inches thick. The subsoil is about 35 inches thick. The upper 26 inches is yellowish-brown, sticky silty clay loam to silty clay. The lower part is yellowish-brown and strong-brown, very sticky silty clay mottled with light gray. Below a depth of about 42 inches is mottled, sticky silty clay or clay.

Most Keyport soils are not difficult to work when at the right moisture content. If the plow layer includes a part of the B horizon, it is sticky and plastic when too wet and very hard and cloddy when a little too dry. Artificial drainage is needed for some crops. Drainage may be difficult, because water moves very slowly in the subsoil. The available moisture capacity is high.

Profile of Keyport silt loam, in a wooded area on Route 66, about 1 mile east of Dover:

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

A2—3 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; roots plentiful; strongly acid; clear, smooth boundary. 4 to 6 inches thick.

B1—7 to 15 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, medium, subangular blocky structure; friable to firm, sticky and plastic; roots common; strongly acid; gradual, smooth boundary. 6 to 9 inches thick.

B21t—15 to 26 inches, yellowish-brown (10YR 5/6 to 5/8) silty clay; moderate, coarse, blocky and subangular blocky structure; firm, very sticky and very plastic; few roots; thin clay films; strongly acid; clear, smooth boundary. 10 to 12 inches thick

B22t—26 to 42 inches, variegated yellowish-brown and strong-brown (10YR 5/4 and 7 5YR 5/6) silty clay; common, medium, distinct mottles of light gray (10YR 7/2) ; moderate, coarse, blocky structure; very firm, very sticky and very plastic; no roots; prominent brown (10YR 5/3) clay coats; strongly acid; diffuse boundary. 15 to 30 inches thick

C—42 to 54 inches +, more or less equal parts of strong-brown, yellowish-brown, and light-gray (7 5YR 5/6 and 10YR 5/4 and 7/2) silty clay or clay; structureless (massive) ; very firm, very sticky and very plastic; no roots; very strongly acid.

The A horizon is either silt loam or sandy loam. The B2t horizon is heavy silty clay loam to clay (clay content generally more than 40 percent). In places the C horizon is sandy. The solum is 40 to 50 inches thick.

In most places the matrix colors in the solum are 10YR or yellower in hue but are 7 5YR in some parts of the B horizon. In the A horizon, the matrix color has a value of 1 to 4 and a chroma of 1 to 4; the A1 horizon has the lower value and chroma. In the B horizon, the matrix color has a value of 5 to 6 and chroma generally of 6 or higher but as low as 4 in spots The gray mottles in the B22t horizon have a chroma of 2 or less The C horizon is variously colored and generally includes some colors that have a chroma of 2 or less.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth.

Keyport soils are similar to Klej, Mattapex, and Woodstown soils in color and in natural drainage Keyport soils, however, have a clayey subsoil, Mattapex soils a more silty subsoil, Woodstown soils a subsoil of heavy sandy loam or light sandy clay loam, and Klej soils a sandy subsoil. Keyport soils formed in the same kind of material as the poorly drained Elkton soils and the very poorly drained Bayboro soils

Keyport sandy loam (Ka).—Except for the texture of the surface layer, the profile of this soil is like the representative profile. Most areas are level or nearly so. Included in mapping were areas in which the surface layer is 12 to 15 inches thick, some spots in which mottles occur nearer the surface than in the typical profile, and a few that have a slope of as much as 2 percent.

This soil is easier to work than Keyport silt loam and can be worked throughout a wider range in moisture content. Seasonal wetness and a high water table are major limitations. The water table is within 2 feet of the surface for rather long periods. Improved drainage is necessary for crops that have to be planted early in spring and is beneficial to all other crops. In general, ditches are better than tile for removing excess water because the subsoil is so slowly permeable that tile does not function properly.

Corn and soybeans are the principal crops, but some truck crops are grown also. Although there is little hazard of erosion, a winter cover crop should be grown where crop residue is not left on the surface through the winter. Undrained areas are suitable for pasture, woodland, and wildlife habitat. (Capability unit IIw–9; woodland subclass 3w)

Keyport silt loam (Ke).—The profile of this soil is the one described as representative of the Keyport series. Most areas are level or nearly level. Included in mapping were a few scattered areas that have a slope of slightly more than 2 percent and some small local accumulations of silty soil materials.

This soil is not so easy to work as Keyport sandy loam, and it must be worked within a much narrower range of moisture content. Also, it is more difficult to drain than Keyport sandy loam. The seasonal high water table is within 2 feet of the surface. Unless the water table is lowered artificially, it remains high until spring is well advanced. Artificial drainage is necessary for crops that have to be planted early and is beneficial for other crops.

Corn and soybeans are the most common crops, but some truck crops, hay crops, and pasture crops are grown also. A winter cover of live vegetation or crop residue is needed. (Capability unit IIw–8; woodland subclass 3w)

Klej Series

The Klej series consists of deep, moderately well drained soils on uplands. The native vegetation consists of mixed oaks, sweetgum, red maple, and scattered pine.

In a typical profile the surface layer is grayish-brown loamy sand about 6 inches thick. At a depth of about 6 to 20 inches is light yellowish-brown, loose loamy sand. Below this, to a depth of at least 48 inches, is pale-yellow, streaked and mottled, loose sand.

Klej soils are very easy to work and can be worked when dry or when wet. The water table fluctuates widely and rapidly, according to the season. Artificial drainage is needed for early crops and for deep-rooted later crops. Drainage is not difficult if outlets are adequate. The available moisture capacity is low, and natural fertility is low. Large amounts of fertilizer are needed. Supplemental irrigation is helpful in extended dry seasons.

Profile of Klej loamy sand, in a level, wooded area at the intersection of Route 398 and Route 399, about 3 miles northwest of Milford:

A11—0 to 1 inch, very dark grayish-brown (10YR 3/2) loamy sand; very weak, medium, granular structure; loose; many roots; clean white sand grains visible; strongly acid; gradual, wavy boundary. 1 to 3 inches thick.

A12—1 to 6 inches, grayish-brown (2.5Y 5/2) loamy sand; structureless (single grain); loose; roots common; very strongly acid; clear, smooth boundary. 4 to 7 inches thick.

C1—6 to 20 inches, light yellowish-brown (2.5Y 6/4) loamy sand; structureless (single grain); loose; few roots; very strongly acid; clear, smooth boundary. 12 to 15 inches thick.

C2—20 to 48 inches +, pale-yellow (2.5Y 7/4) sand; variously mottled and streaked with light gray (2.5Y 7/2); loose and structureless; no roots; very strongly acid.

The C2 horizon is loamy sand, sand, or fine sand. Fine, smooth pebbles are scattered through some profiles. Some profiles have, within 6 feet of the surface, a nonconforming substratum that ranges from sandy loam to sandy clay in texture. The depth to grayish colors (chromas of 2 or less) is less than 30 inches and may be as little as 16 inches.

The color hues are 10YR, 2.5YR, or 5Y. In parts of the C2 horizon, which is strongly gleyed, the colors are neutral. In the A horizon, the color has a value of 3 to 6 and a chroma of 1 to 4; the value and chroma are lowest in the A11 horizon. In the C1 horizon, the color has a value of 5 to 7 and a chroma of 3, 4, or in places 6. In some parts of the C2 horizon, the dominant chroma is 3 or more and the mottles have a lower chroma; in other parts the dominant chroma is 2 or less and the mottles have a higher chroma.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth.

Klej soils are similar to Keyport, Mattapex, and Woodstown soils in color and in natural drainage, but Klej soils are sandier and more rapidly permeable than the soils of the other series. Klej soils formed in the same kind of very sandy materials as the poorly drained Plummer soils.

Klej loamy sand (Kl).—The profile of this soil is the one described as representative of the Klej series. Most of the acreage is nearly level. Generally, erosion is not a problem. Included in mapping were a few scattered areas in which the slope is slightly more than 2 percent, some spots that are slightly eroded, and some in which sandy materials have accumulated locally in slight dips and depressions.

This soil is seasonally wet; the water table is within 2 feet of the surface for a fairly long period. The available moisture capacity and the capacity to retain plant nutrients are low. Artificial drainage is necessary for crops that have to be planted early. Tile drains are effective; open ditches tend to cave.

Drained areas of this soil are used for truck crops and other crops. Some areas are used intensively. Intensive use calls for large and frequent applications of fertilizer and large amounts of manure and plant residue. Supplemental irrigation should be available for use in dry seasons. (Capability unit IIIw–10; woodland subclass 3s)

Made Land

Made land (Md) consists of areas where the soil material has been so disturbed or so modified that it cannot be classified properly. These are mostly small areas where fill material has been placed over marshes or other wet lands to make shores more readily accessible to vehicles and more suitable for some kinds of buildings. Included in mapping were areas that have been graded or leveled and also low spots that have been filled to make a more nearly level surface for buildings, shopping centers, and parking lots.

This land type is generally not suitable for farming. No specific interpretations can be made without examining and evaluating each site separately. (Not placed in a capability unit or woodland subclass)

Matapeake Series

The Matapeake series consists of deep, well-drained, dominantly brown, silty soils on uplands. These soils formed in a mantle of silty material over older sandy sediments. The native vegetation is primarily oak and other hardwoods, but in places there is some Virginia pine.

A typical profile in a cultivated area has a 12-inch plow layer of brown or dark-brown silt loam and a 5-inch subsurface layer of dark yellowish-brown silt loam. The subsoil is about 15 inches of strong-brown, sticky, heavy loam or silt loam. The substratum, to a depth of at least 42 inches, consists of yellowish-brown sandy loam.

Matapeake soils are fairly easy to work, and they warm up readily in spring. They are well suited to the crops commonly grown in the county. The available moisture capacity is high. Erosion is a hazard in areas where the slope is more than 2 percent.

Profile of Matapeake silt loam, in a level, cultivated area on Route 86, just southeast of Leipsic:

Ap—0 to 12 inches, brown or dark-brown (10YR 4/3) silt loam; weak, coarse, granular structure; friable, slightly sticky; many roots, pores, and wormholes; medium to slightly acid (limed); abrupt, smooth boundary. 10 to 12 inches thick.

A2—12 to 17 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, coarse, granular to subangular blocky structure; very friable, slightly sticky; a few fine roots; many pores and common wormholes; medium to slightly acid; clear, wavy boundary. 4 to 7 inches thick.

B2t—17 to 32 inches, strong-brown (7.5YR 5/6) heavy loam or silt loam; weak to moderate, coarse, subangular blocky structure; friable, sticky; few roots; thin, discontinuous clay films; many pores of all sizes; common wormholes; strongly to very strongly acid; clear, wavy boundary. 14 to 20 inches thick.

IIC—32 to 42 inches +, yellowish-brown (10YR 5/4) sandy loam, variegated with brown or dark brown (7.5YR 4/4); structureless (massive); friable, slightly sticky; few roots; many pores; strongly to very strongly acid.

The B2t horizon is either heavy silt loam or light silty clay loam (clay content generally between 18 and 30 percent). Some profiles have a somewhat sandy IIB3 horizon between the B2t and IIC horizons, and some have a conforming C horizon of silt loam above the IIC horizon. Fine, smooth pebbles are scattered through the IIC horizon. The solum is 28 to 40 inches thick.

The color of the A horizon is 10YR or 2.5Y in hue, 3 to 6 in value, and 2 to 4 in chroma. The value is lowest in the undisturbed A1 horizon. Values of 6 are confined to some A2 horizons. The color of the B2t horizon is 7.5YR or 10YR in hue, 4 or 5 in value, and 4 to 8 in chroma. In many profiles the B2t horizon is divided into B21t and B22t horizons, in one of which the chroma is less than 6 and in the other more than 6. The C horizon has the same general color range as the solum and commonly is variegated or streaked.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity increases with depth.

Matapeake soils are similar to Sassafras and Rumford soils in color and in natural drainage. Unlike those soils, however, they are dominantly silty in the surface layer and the subsoil. Sassafras soils have a loam to sandy loam surface layer and a sandy clay loam subsoil. Rumford soils have a loamy sand surface layer and a sandy loam subsoil. Matapeake soils formed in the same kind of silty material as the moderately well drained Mattapex soils and the poorly drained Othello soils.

Matapeake silt loam, 0 to 2 percent slopes (MeA).—The profile of this soil is the one described as representative of the Matapeake series. Included in mapping were areas where the silty material extends to a depth of slightly more than 40 inches.

This soil is suited to all crops commonly grown in the county. It has no serious limitations. Management needs include the application of fertilizer, lime, and manure; minimum tillage; and the use of a cover crop or crop residue to protect the surface in winter. (Capability unit I-4; woodland subclass 3o)

Matapeake silt loam, 2 to 5 percent slopes (MeB).—This soil has generally smooth and regular slopes, but areas east of Little Creek and northeast of Leipsic are slightly hummocky. Although the erosion hazard is moderate, only small areas are significantly eroded. Included in mapping were areas in which silt loam extends to a depth of more than 40 inches.

Management needs include the application of fertilizer, lime, and manure; minimum tillage; and the use of cover crops or crop residue. A crop rotation in which a clean-cultivated crop is grown only every second or third year and close-growing crops the rest of the time reduces the hazard of erosion. Sodded waterways with well-constructed outlets are needed to collect and dispose of surface runoff. (Capability unit IIe-4; woodland subclass 3o)

Matapeake silt loam, 5 to 10 percent slopes, moderately eroded (MeC2).—Except in a few wooded areas, this soil has lost a significant amount of its original surface layer, and in places plowing turns up some of the subsoil. In scattered areas the subsoil is exposed, and a few gullies have cut into the subsoil. The hazard of further erosion is severe. Included in mapping were some spots where the subsoil is more clayey than is typical and a few areas in which the slope is slightly more than 10 percent.

Because of the severe hazard of erosion on this soil, the use of sodded waterways to remove excess surface water is especially important in preventing surface wash and the formation of gullies. (Capability unit IIIe-4; woodland subclass 3o)

Mattapex Series

The Mattapex series consists of deep, moderately well drained soils on uplands. These soils formed in a mantle of very silty material underlain by older, coarser textured sediments. The native vegetation is primarily oak and other water-tolerant hardwoods.

A typical profile in a cultivated area has an 8-inch surface layer of brown or dark-brown silt loam. The subsoil is about 28 inches thick. The upper 20 inches is yellowish-brown, slightly sticky to sticky silty clay loam that is mottled in the lower 8 inches. The lower 8 inches of the subsoil is strong-brown and yellowish-brown, slightly sticky fine sandy loam. The substratum, to a depth of at least 48 inches, consists of strong-brown, structureless sandy loam.

Mattapex soils are limited for some uses by seasonal wetness and impeded drainage. They dry out and warm up too late in spring for early planting. Artificial drainage is necessary for some crops. Drainage is not difficult if outlets are adequate. The available moisture capacity is high.

Profile of Mattapex silt loam, in a cultivated area on Route 345, about 1 mile east of Dover:

Ap—0 to 8 inches, brown or dark-brown (10YR 4/3) silt loam; weak, medium, granular structure that tends toward subangular blocky; friable, slightly sticky; roots abundant; strongly acid; clear, smooth boundary. 8 to 10 inches thick.

B21t—8 to 19 inches, yellowish-brown (10YR 5/4) light silty clay loam; weak, medium, subangular blocky structure; friable to firm, slightly sticky; roots common; faint clay films; strongly acid; clear, wavy boundary. 10 to 13 inches thick.

B22t—19 to 28 inches, yellowish-brown (10YR 5/4 to 5/6) silty clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; friable to firm, sticky and slightly plastic; few roots; distinct, brown (10YR 5/3) clay films; strongly acid; clear, wavy boundary. 6 to 10 inches thick.

IIB3—28 to 36 inches, variegated strong-brown and yellowish-brown (7.5YR 5/8 and 10YR 5/6) heavy fine sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; no roots; strongly acid; gradual, wavy boundary. 6 to 8 inches thick.

IIC—36 to 48 inches +, strong-brown (7 5YR 5/8) sandy loam; structureless (single grain); loose to very friable; no roots; strongly acid.

The A horizon is silt loam (silt content commonly more than 70 percent). The B2t horizon is heavy silt loam or silty clay loam (clay content generally between 18 and 35 percent). The IIB3 horizon is replaced in some profiles by a IIB23t horizon that has clay films, and some profiles have neither. The IIB3 and IIC horizons are more sandy than the A horizon and the upper part of the B horizon. The IIC horizon is sandy loam, loamy sand, or sand. Some profiles contain fine, smooth pebbles, most commonly in the IIC horizon. The solum is 30 to 42 inches thick

The matrix hue centers on 10YR but includes a hue of 2 5Y. The hue ranges to 7.5YR in some profiles. In the A horizon, the color has a value of 3 to 5 and a chroma of 1 to 4; the value and chroma are lowest in an undisturbed A1 horizon. In the B horizon the matrix color has a value of 4 to 5 and a chroma of 3 to 8; in all profiles some part of the B2t horizon has a chroma of less than 6 No mottles having a chroma of 2 or 1 occur in the upper 10 inches of the B2t horizon. The B3 and C horizons are mottled in places.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth.

Mattapex soils are similar to Keyport, Klej, and Woodstown soils in color and in natural drainage. Mattapex soils have a coarser textured subsoil than Keyport soils, and they have a less sandy and less friable subsoil than Woodstown soils. Mattapex soils formed in the same kind of silty material as the well-drained Matapeake soils and the poorly drained Othello soils

Mattapex silt loam (Mt).—This soil is nearly level. In most areas erosion is not a hazard. Locally, silty material has accumulated in slight depressions. Included in mapping were small areas where the grayish colors are a little nearer the surface than in the typical profile, and some spots where the subsoil is more silty and less sticky.

This soil is moderately wet in winter and spring, and it does not warm up early. Improved drainage is necessary for some crops, especially for those that have to be planted early. Either tile drains or ditches are effective. It is sometimes necessary to intercept and divert water that runs off high adjacent soils. (Capability unit IIw-1; woodland subclass 3o)

Mixed Alluvial Land

Mixed alluvial land (Mv) occurs on flood plains. It consists of various kinds of mixed and unclassified soil material. Most areas are flooded at least once a year, and some are flooded for long periods. Most areas are poorly drained. Within short distances the texture of the soil material ranges from sand to loam or silt loam to clay. In most areas the surface layer consists of recently deposited silty or sandy material washed from adjacent sloping uplands. The color of the surface layer ranges from light gray to dark gray or from brown to grayish brown, and in places where much organic matter has accumulated, it is black.

Mixed alluvial land is little used for crops. Cleared and partly cleared areas are used mainly for unimproved pasture, and uncleared areas for wetland forest. (Capability unit VIw-1; woodland subclass 2w)

Othello Series

The Othello series consists of poorly drained soils on uplands. These soils formed in silty material underlain by older deposits of sand. The native vegetation consists of gum, holly, swamp maple, many species of oak, and other wetland hardwoods.

A typical profile in a cultivated area has an 8-inch plow layer of grayish-brown silt loam and a 7-inch subsurface layer of grayish-brown, mottled silt loam. The subsoil, to a depth of about 28 inches, is gray, mottled, sticky light silty clay loam to heavy silt loam. This is underlain, to a depth of at least 72 inches, by gray, mottled light sandy loam that grades to loamy sand.

Othello soils are not difficult to work when the moisture content is favorable. They should not be worked when wet or when the water table is near the surface. Artificial drainage (fig. 6) is necessary. Drainage is generally not difficult. The available moisture capacity is high.

Figure 6.—**Field collector ditch being constructed by dragline, to improve drainage in an area of Othello silt loam, near Smyrna.**

Profile of Othello silt loam, in a level cultivated area in the Bombay Hook Migratory Waterfowl Refuge, just south of Route 83, about 0.15 mile east of Route 11:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, coarse, granular structure; very friable, slightly sticky; roots abundant; neutral (limed); abrupt, smooth boundary. 8 to 9 inches thick.

A2—8 to 15 inches, grayish-brown (10YR 5/2) silt loam; few, medium, distinct mottles of brownish yellow (10YR 6/6); moderate, medium, granular and moderate, thin, platy structure (plowsole); friable, slightly sticky; many roots; pores of all sizes; slightly acid to neutral; clear, smooth boundary. 4 to 7 inches thick.

B21tg—15 to 21 inches, gray (10YR 5/1) light silty clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); moderate, coarse, subangular blocky structure; friable, sticky and slightly plastic; few roots; distinct clay films; slightly acid; gradual, smooth boundary. 6 to 10 inches thick.

B22tg—21 to 28 inches, gray (10YR 5/1) heavy silt loam; many, coarse, prominent mottles of strong brown and brownish yellow (10YR 6/6); moderate, coarse, prismatic structure; friable, sticky and slightly plastic; fine roots between prisms; thick clay and silt films on vertical faces of prisms; medium acid; clear, wavy boundary. 5 to 10 inches thick.

IICg—28 to 72 inches +, gray (10YR 5/1) light sandy loam that grades to loamy sand; many, coarse, prominent mottles of strong brown (7.5YR 5/6); structureless (single grain); friable; no roots; strongly acid.

The B horizon ranges from light silty clay loam to heavy silt loam and, in the extreme lower part, fine or very fine sandy clay loam (clay content generally between 18 and 30 percent). Between the B22tg and the IIC horizons in some profiles there is a conforming C horizon that is dominantly silt. Some profiles contain fine, smooth pebbles, most commonly in the IIC horizon. The solum is 24 to 36 inches thick.

The matrix colors are 10YR to neutral in hue. In the A horizon the matrix color has a value of 3 to 6 and a chroma of 0 to 3; the value and chroma are lowest in an undisturbed A1 horizon. In the B horizon the matrix color has a value of 5 or 6 and a chroma of 0 to 2; in some places the hue is 5YR and the chroma 3. The color of the mottles has a hue of 10YR or redder, a value of 5 or 6, and a chroma of 4 to 8. The C horizon is mottled in places.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity increases with depth.

Othello soils are similar to Elkton, Fallsington, and Plummer soils in color and in natural drainage. The silty subsoil of Othello soils is more readily permeable than the clayey, heavy subsoil of Elkton soils. It is not so readily permeable as the sandy clay loam subsoil of Fallsington soils or the very sandy subsoil of Plummer soils.

Othello silt loam (Ot).—This soil is nearly level. Erosion is not a hazard. Locally, silty material has accumulated in slight depressions. Included in mapping were small areas where the surface layer is a little browner in color than is typical and spots where the uppermost part of the surface layer is almost white.

General farm crops and some truck crops, especially sweet corn, can be grown if excess water is removed by means of tile drains or open ditches, so that farming operations can begin reasonably early in spring. Even in drained areas, some perennial crops, such as alfalfa, are subject to severe damage by frost heave in winter. Row crops are commonly grown in strips between drainage ditches or tile lines, and in some places the surface is graded slightly to facilitate drainage toward the ditches or tiles. This soil retains plant nutrients and holds moisture effectively during dry seasons. Most undrained areas still support a stand of water-tolerant hardwoods. (Capability unit IIIw-7; woodland subclass 3w)

Plummer Series

The Plummer series consists of poorly drained, dominantly gray soils on flats and in depressions. These soils formed in old sediments that consist predominantly of sand. The native vegetation is swamp maple, holly, gum, some pond pine, and some water-tolerant oak.

A typical profile in a cultivated area has a 12-inch surface layer of dark-gray loamy sand. The underlying material, to a depth of about 36 inches, is light brownish-gray, very friable to loose loamy sand mottled with brownish colors. Below this depth, the material is gray or light-gray loose sand.

Plummer soils can be worked at any time when they are dry enough to support tillage implements. Their use is severely limited, however, by poor natural drainage, a high water table, very low natural fertility, very low available moisture capacity, and generally by extreme acidity.

Profile of Plummer loamy sand, in a cultivated area, about 1½ miles south of Harrington:

Ap—0 to 12 inches, dark-gray (10YR 4/1) loamy sand; single grain; loose; roots plentiful; very strongly acid; clear smooth boundary. 10 to 12 inches thick.

C1—12 to 36 inches, light brownish-gray (10YR 6/2) loamy sand; common, medium, faint to distinct mottles of brown to yellowish brown (10YR 5/3 to 5/4); structureless (single grain) to very weak, medium, granular structure; loose to very friable; roots common in upper part; slightly more silt or clay in lower part; very strongly to extremely acid; clear, smooth boundary. 20 to 30 inches thick.

C2—36 to 50 inches +, gray or light-gray (10YR 6/1) sand; loose and structureless; no roots; extremely acid.

The C2 horizon is sand or coarse sand. The loamy sand layers are 25 to 40 inches thick. In some places, fine, smooth pebbles occur in the C2 horizon.

Colors throughout the profile are 10YR or neutral in hue. The color of the A horizon ranges from 3 to 5 in value and from 0 to 2 in chroma. Where the profile has not been disturbed, there is a very thin A1 horizon that has a value of 3. The color of the C horizon has a value mostly of 5 to 7 and a chroma of 0, 1, or 2. In some places the C horizon is mottled or streaked with color that ranges from 3 to 6 in chroma. Generally, the reaction is very strongly acid to extremely acid.

Plummer soils are similar to Elkton, Fallsington, and Othello soils in color and natural drainage, but Plummer soils are more rapidly permeable and sandier. Plummer soils formed in the same kind of very sandy material as the moderately well drained Klej soils.

Plummer loamy sand (Pl).—This soil is nearly level, but in many places it occupies slight depressions. Erosion is not a hazard. Included in mapping were scattered small areas of soils that are wetter and more poorly drained than is typical. These areas have a black or nearly black, very sandy surface layer.

Only a few areas of this soil are used for crops, and these are mainly in places where small areas are surrounded by other soils. There are a few areas, however, where the soil is used rather intensively for truck crops. In these places intensive treatment is required. Such treatment consists of artificial drainage to lower the water table effectively; frequent applications of fertilizer and generally in large amounts; applications of lime in amounts and kinds as predetermined by soil tests; large amounts of manure, crop residue, or other organic material to increase the ability of the soil to retain moisture and plant nutrients; and supplemental irrigation in prolonged dry spells. Tile drains are effective; open ditches tend to cave in and fill with sand. Most large, undrained areas are wooded. (Capability unit IVw-6; woodland subclass 3w)

Pocomoke Series

The Pocomoke series consists of very poorly drained soils on upland flats and in depressions. These soils have a black or nearly black surface layer that is high in organic-matter content. The native vegetation consists of wetland hardwoods, including oak, gum, and swamp maple, and scattered pond pines.

A typical profile in a cultivated area has a 12-inch surface layer of black, crumbly loam. The subsoil is about 15 inches of gray and light-gray, mottled, sticky light clay loam or sandy clay loam. The underlying material, to a depth of at least 60 inches, consists of gray or light-gray, mottled sandy loam that grades to gravelly coarse sand.

Pocomoke soils are limited by very poor natural drainage, a very high water table, and very strong acidity. They are easy to work, but they stay wet until late in spring. Water stands for fairly long periods in depressions that have no outlets. Drainage is not difficult if outlets are available. The available moisture capacity is high.

Profile of Pocomoke loam, in a cultivated area on Route 10, just west of Petersburg:

Ap—0 to 7 inches, black (10YR 2/1) loam; very weak, coarse, granular structure; very friable, slightly sticky; roots abundant; many pores and wormholes; very strongly acid; indistinct boundary. 7 to 10 inches thick.

A1—7 to 12 inches, black (10YR 2/1) loam, including some gray (10YR 5/1); weak, coarse, granular structure that tends toward blocky; very friable, slightly sticky; many roots, pores, and wormholes; very strongly acid; clear, irregular boundary. 2 to 6 inches thick.

B21tg—12 to 18 inches, gray (10YR 5/1) light clay loam or sandy clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, coarse, subangular blocky structure; friable to firm, sticky and slightly plastic; roots common; thin, discontinuous clay films; many pores and wormholes; very strongly acid; gradual, wavy boundary. 4 to 8 inches thick.

B22tg—18 to 27 inches, gray and light-gray (10YR 5/1 and 6/1) light clay loam or sandy clay loam; common, medium, prominent mottles of reddish yellow (7.5YR 6/8); moderate, coarse, subangular blocky structure; friable, sticky and plastic; few rocks; thick clay films; many pores and wormholes; very strongly acid; gradual, wavy boundary. 7 to 12 inches thick.

C1g—27 to 45 inches, gray or light-gray (10YR 6/1) sandy loam; many, coarse, prominent mottles of reddish yellow (7.5YR 6/8); structureless (massive); a few widely separated cracks; firm, slightly sticky; very few roots; very strongly acid; clear, smooth boundary. 15 to 20 inches thick.

IIC2g—45 to 60 inches +, gray (10YR 5/1) fine sand and gravelly coarse sand; loose and structureless; no roots; extremely acid.

The A horizon is loam or sandy loam. The B2t horizon is heavy sandy loam, sandy clay loam, or clay loam that borders on sandy clay loam (clay content generally between 18 and 35 percent). The C horizon generally is coarser textured than any part of the solum; unconforming C horizons are significantly coarser Fine, smooth pebbles occur in some profiles, but they are abundant only locally in the IIC horizon. The solum is 24 to 36 inches thick but averages less than 30.

The colors throughout the profile, except for mottling, are 10YR in hue or yellower, including neutral. The A1 horizon or, in cultivated areas, the Ap, is black in most places, but it is very dark brown, very dark gray, or very dark grayish brown in others. In the B and C horizons, the matrix color has a value of 4 to 6 and a chroma of 0, 1, or rarely, 2. The mottles have a hue of 10YR or 7.5YR, a value of 4 to 6, and a chroma of 4 to 8. Locally, however, any horizon can be just gray, without mottling.

Except where lime has been applied, the reaction is very strongly acid to extremely acid; acidity increases with depth.

Pocomoke soils are similar to Bayboro soils in color and in natural drainage but are less clayey and more readily permeable in the subsoil. Pocomoke soils formed in the same general kind of sediments as the well drained Sassafras soils, the moderately well drained Woodstown soils, and the poorly drained Fallsington soils.

Pocomoke loam (Po).—The profile of this soil (fig. 7) is the one described as representative of the Pocomoke series. The soil is nearly level.

Figure 7.—**Profile of Pocomoke loam.**

Drained areas of this soil are used mostly for corn and soybeans. Most undrained areas are wooded. Control of wetness is the most serious management problem. There is no hazard of erosion. (Capability unit IIIw–7; woodland subclass 2w)

Pocomoke sandy loam (Pm).—This soil has a profile like that described as representative of the series, except that it contains less silt and clay and more sand, especially in the surface layer but to a lesser degree in the subsoil. Included in mapping were small areas where the subsoil is somewhat finer textured and more sticky than in most soils of this series. The soil is nearly level.

This soil is easier to work than Pocomoke loam, and it can be tilled throughout a wider range of moisture content. In most places it is easier to drain than that soil, and ditches or tile lines can be spaced more widely. The available moisture capacity is lower than that of Pocomoke loam, and average yields are a little lower.

Wetness causes a severe limitation for farming in undrained areas, and control of wetness is the most serious management problem. There is no hazard of erosion, and the soil retains plant nutrients reasonably well. Lime is needed by some crops. (Capability unit IIIw–6; woodland subclass 2w)

Rumford Series

The Rumford series consists of deep, somewhat excessively drained soils. These soils formed in beds of very sandy sediments that contained rather small amounts of clay and very little silt. The native vegetation is mostly hardwoods but includes some pine.

A typical profile in a cultivated area has a 10-inch surface layer of dark grayish-brown loamy sand and a 9-inch subsurface layer of yellowish-brown loamy sand. The subsoil, to a depth of about 42 inches, is light sandy loam that is mostly strong brown in color. It is slightly sticky when wet but crumbles readily. Below the subsoil, to a depth of at least 49 inches, is strong-brown loamy sand.

Rumford soils warm up very early in spring and are very easy to work. They are suited to some of the earliest maturing crops, especially high-value truck crops. The chief limitations are those caused by sandiness. The available moisture capacity is moderate, and the natural fertility is low. Irrigation and large amounts of fertilizer are needed, particularly for high-value crops.

Profile of Rumford loamy sand, in a gently sloping, cultivated area on Route 390, about 2 miles south of Frederica:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loamy sand; weak, medium, subangular blocky structure and single grain; very friable; many roots and pores; a few wormholes; neutral (limed); abrupt, smooth boundary. 8 to 10 inches thick.

A2—10 to 19 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; very friable; few roots and wormholes; many pores; strongly acid; clear, smooth boundary. 8 to 10 inches thick.

B1—19 to 27 inches, yellowish-brown (10YR 5/6) light sandy loam; weak, coarse, subangular blocky structure; friable, slightly sticky; few roots and wormholes; many pores; strongly acid; clear, smooth boundary. 5 to 9 inches thick.

B21t—27 to 36 inches, strong-brown (7.5YR 5/6) heavy sandy loam; weak, coarse, subangular blocky structure; friable, slightly sticky; a few fine roots; many pores of all sizes; clay films in larger pores and in clay bridges between sand grains; strongly acid; clear, wavy boundary. 8 to 9 inches thick.

B22t—36 to 42 inches, strong-brown (7.5YR 5/6) light sandy loam; weak, coarse, subangular blocky structure; very friable; no roots; many pores; clay bridging between sand grains; strongly acid; clear, smooth boundary. 5 to 7 inches thick.

C—42 to 49 inches +, strong-brown (7.5YR 5/6) loamy sand; structureless (single grain); loose; no roots; strongly acid.

In most places the B2t horizon is sandy loam, but in some places it is light sandy clay loam (clay content less than 18 percent). The C horizon is sand or loamy sand. Fine, smooth pebbles occur throughout the profile but are more common in the C horizon. The solum ranges from about 24 inches to a little more than 40 inches in thickness.

In most places the A horizon is 10YR in hue. The color of the A horizon ranges from 3 to 5 in value and from 1 to 4 in chroma; the lowest value and chroma occur in a very thin A1 horizon, but this horizon does not occur in all profiles. The hue of the B horizon is 5YR in places The color of the B horizon has a value of 5 or 6 and a chroma of 4 to 8, commonly 6. The C horizon has the same range of color as the B horizon but tends to be yellower in hue and to have a higher value

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth. Base saturation in unlimed Rumford soils is very low.

Rumford soils are similar to Sassafras and Matapeake soils in color and in natural drainage. They are coarser textured in all horizons than Sassafras soils, which have a B2t horizon that has a clay content of more than 18 percent. Rumford soils are coarser textured than Matapeake soils.

Rumford loamy sand, 0 to 2 percent slopes (RuA).—The surface layer of this soil absorbs water readily, and there is little runoff and very little hazard of water erosion. Generally, there is little hazard of erosion unless freshly plowed areas are exposed to seasonal strong winds. Included in mapping were a few spots of finer textured soils with thinner surface layers.

Most of the acreage is used for early maturing truck crops. The soil retains plant nutrients poorly; the available moisture capacity is moderate to low. Thus, irrigation (fig. 8) is needed in prolonged dry spells. (Capability unit IIs-4; woodland subclass 3o)

Rumford loamy sand, 2 to 5 percent slopes (RuB).—The profile of this soil is the one described as representative of the Rumford series. Slopes are short. Infiltration is rapid. Gullies occur in small scattered areas where field roads or other structures have caused runoff to concentrate. Soil blowing tends to harm tender plants.

Most of this soil is used for early maturing truck crops. The limited ability of the soil to retain moisture and plant nutrients is generally a more important factor in management for crops than is the hazard of erosion. All measures to conserve moisture should be used, and sources of water for irrigation should be available. Windbreaks bordering fields and within fields, especially between crop strips, help to prevent damage to tender plants from blowing sand. Three- to four-foot strips of winter cover crops left to mature in the field help to check sand blowing. Such strips also serve as driveways for spray rigs, harvesting equipment, and other machinery. (Capability unit IIs-4; woodland subclass 3o)

Rumford loamy sand, 5 to 10 percent slopes, moderately eroded (RuC2).—This soil is of limited extent. It occurs in narrow strips at the edges of fields adjacent to streamways. Shallow gullies have formed as a result of concentration and discharge of runoff from higher areas.

The retention of moisture and plant nutrients is poor. Erosion is best controlled by use of close-growing, semipermanent crops, such as hay or pasture. Sodded waterways are needed for annual tillage. (Capability unit IIIe-33; woodland subclass 3o)

Rumford loamy sand, 5 to 10 percent slopes, severely eroded (RuC3).—This soil is of limited extent. It occurs in small areas on slopes next to streamways. Severe erosion in the form of shallow gullies has resulted from the concentration and discharge of runoff from higher areas.

Control of erosion is the main management problem in the use of this soil for farming. Unless very carefully protected, this soil is subject to further very severe erosion if cultivated. The soil retains moisture and plant nutrients poorly.

This soil is marginal for cultivated crops. It is well suited to orchards on the contour, especially if the surface of the soil is protected by sod or other close-growing vegetation. If properly managed, it can also be used for permanent pasture or hay. (Capability unit IVe-5; woodland subclass 3o)

Rumford loamy sand, 10 to 15 percent slopes (RuD).—The strong slope of this soil severely limits its use for farming. The hazard of erosion is severe. Most of the acreage has not been cleared and is practically uneroded. The few cleared areas are moderately to severely eroded.

Wooded areas of this soil should remain uncleared wherever feasible. Cleared areas should be kept under permanent vegetation, such as hay, pasture, or sodded orchards. In cultivated areas tillage should be limited to no more than once in 5 years and, where the landscape

Figure 8.—Irrigation of peas on Rumford loamy sand, 0 to 2 percent slopes. This area is near Houston.

permits, should be in contour strips. (Capability unit IVe–5; woodland subclass 3o)

Sassafras Series

The Sassafras series consists of deep, well-drained soils on uplands. These soils formed in very old, predominantly sandy sediments. The native vegetation is chiefly mixed hardwoods, but pines are common in second-growth and cutover areas.

A typical profile in a cultivated area has an 8-inch surface layer of dark grayish-brown sandy loam and a 3-inch subsurface layer of brown sandy loam. The subsoil is about 22 inches thick. The uppermost 4 inches is dark yellowish-brown, friable heavy sandy loam. The next 10 inches is strong-brown, friable, slightly sticky and slightly plastic sandy clay loam. The rest is strong-brown variegated with yellowish-brown, very friable heavy sandy loam or light sandy clay loam. The substratum, to a depth of at least 54 inches, consists of yellowish-brown, loose to very friable sand or loamy sand.

Sassafras soils are easy to work, and they warm up early in spring. They are suitable for most uses but are limited by slope and the hazard of erosion. The available moisture capacity is high.

Profile of Sassafras sandy loam, in a level, intensively cultivated area on the north side of Route 12, about 1 mile west of Felton:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, medium, granular structure; very friable; roots abundant; medium acid (limed); abrupt, smooth boundary. 7 to 10 inches thick.

A2—8 to 11 inches, brown (10YR 5/3) sandy loam; weak, medium, granular structure; friable to firm; many roots; abundant worm channels; medium acid; clear, smooth boundary. 2 to 4 inches thick.

B1—11 to 15 inches, dark yellowish-brown (10YR 4/4) heavy sandy loam; weak, fine and medium, subangular blocky structure; friable; roots common; abundant worm channels; slightly acid; clear, smooth boundary. 3 to 5 inches thick.

B21t—15 to 25 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak to moderate, medium, subangular blocky structure; friable; slightly sticky and slightly plastic; roots fairly common; almost continuous, brown or dark-brown (7.5YR 4/4 and 10YR 4/3) clay films; some worm channels; some fine black specks in lower part; slightly acid; clear, smooth boundary. 8 to 12 inches thick.

B22t—25 to 33 inches, strong-brown (7.5YR 5/6) heavy sandy loam or light sandy clay loam, variegated with yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure; very friable; a few roots in upper part; discontinuous, brown or dark-brown (7.5YR 4/4) clay films; some very thin strata of sand in lower part; slightly acid; clear, smooth boundary. 6 to 12 inches thick.

C—33 to 54 inches +, yellowish-brown (10YR 5/6) sand or loamy sand; structureless (single grain); loose to very friable; no roots; some thin strata or lamellae of finer material; slightly acid.

The texture of the A horizon is sandy loam or loam. The B2t horizon is generally sandy clay loam but in places is loam or heavy sandy loam (clay content generally about 18 to 30 percent). The C horizon is coarser than the B horizon and in places is coarser than the A horizon. Fine, smooth pebbles occur in any part of the profile, but they are abundant only in the C horizon. The solum is 26 to 40 inches thick.

The color of the A horizon is generally 10YR in hue. It ranges from 3 to 5 in value and from 1 to 4 in chroma; the value and chroma are lowest in the thin A1 horizon, where this horizon is present. The color of the B horizon centers on 7.5YR in hue but ranges to 10YR and 5YR. The value is generally 5, but it is 4 or 6 in places; the chroma ranges from 4 to 8 but is most commonly 6. The color of the C horizon is similar to that of the B horizon but is generally yellower in hue and, in places, has higher values and chromas

Except in areas where lime has been applied, the reaction is strongly acid to extremely acid: acidity generally increases with depth.

Sassafras soils are similar to Matapeake soils, but they are sandy instead of silty. These soils are less sandy than Rumford soils, and they have a thinner A horizon. Sassafras soils formed in the same kind of material as the moderately well drained Woodstown soils, the poorly drained Fallsington soils, and the very poorly drained Pocomoke soils.

Sassafras sandy loam, 0 to 2 percent slopes (SaA).—The profile of this soil is the one described as representative of the Sassafras series. Included in mapping were a few spots that show evidence of washing of the surface soil.

This soil has few, if any, limitations for farm or nonfarm uses. It is well drained, retains moisture and plant nutrients moderately well, and is easy to work. The hazard of erosion is slight.

This soil can be used intensively for cultivated crops, with little risk of deterioration if properly managed. (Capability unit I–5; woodland subclass 3o)

Sassafras sandy loam, 2 to 5 percent slopes (SaB).—The profile of this soil is like the one described as representative of the Sassafras series, except that in some areas it has lost a few inches of its original surface layer. There are a few widely scattered, shallow gullies and a few scattered galled spots where erosion has exposed or nearly exposed the subsoil. In most areas the slopes are smooth and are less than 300 feet long. Included in mapping were some areas where the surface is irregular and is dimpled with small potholes, depressions, or wet spots.

Fairly simple conservation measures can be used to control further soil loss or soil damage. Farming on the contour (fig. 9) is effective on the gentle slopes. Carefully graded and sodded waterways can be used to collect and dispose of surface runoff after exceptionally heavy rainfall.

This is one of the most productive soils in the county, and it is the most extensive of the well-drained soils. It is intensively cropped, especially where it occurs in large areas Most of the vegetable crops of the county and many other crops are grown on this soil. (Capability unit IIe–5; woodland subclass 3o)

Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded (SaC2).—Most of this soil has lost several inches of its original surface layer. There are some shallow gullies and some hummocky areas and small depressions. The hazard of erosion, especially by washing, is severe.

If this soil is properly managed, it is well suited to hay, pasture, and orchard crops. Contour stripcropping, where slopes are long enough, especially when combined with crop rotations every 3 or 4 years, is the most effective means of conserving soil and water. Tilled areas especially need to be protected between cropping seasons. Cover crops and proper use of crop residue provide protection. (Capability unit IIIe–5; woodland subclass 3o)

Sassafras sandy loam, 5 to 10 percent slopes, severely eroded (SaC3).—The subsoil is exposed in many areas of this soil, and normal plowing turns up subsoil almost everywhere. In places gullies extend into the subsoil, and a few gullies have cut into the loose, sandy underlying material. Slopes are short to moderate in length, and most are smooth. Included in mapping were some hummocky spots that have small sinkholes. Also included were areas where the soil contains a little more silt and less sand than is typical.

Figure 9.—Contour tillage on Sassafras sandy loam, 2 to 5 percent slopes. This area is near Milford. The broad vegetated strip through the field is a carefully constructed and sodded waterway for the safe disposal of surface water.

If this soil is used regularly for crops, maximum protection against further gullying and loss of soil is necessary. Erosion control measures include contour stripcropping in narrow strips, where slopes are long enough, combined with long rotations. Also needed are maximum use of crop residue and use of hay or another close-growing cover crop immediately after harvesting the tilled crop. Sodded waterways should be constructed where safe outlets are available. (Capability unit IVe-5; woodland subclass 3o)

Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded (SaD2).—In most areas of this soil, a large part of the original surface layer has been lost through erosion. Some areas of permanent woodland are only slightly eroded. Gullies have formed in many small, scattered spots in cleared or formerly cleared areas, and in places the subsoil is exposed. Included in mapping were areas that contain a little more silt and less sand, especially in the surface layer, than is typical.

This soil is better suited to permanent pasture or hay or to sodded orchards on the contour than to tilled crops. If these areas are used for tilled crops, the hazard of erosion is very severe and the soil should be protected by contour tillage combined with long rotations of 4 or 5 years. Slopes generally are not long enough for contour stripcropping. (Capability unit IVe-5; woodland subclass 3o)

Sassafras loam, 0 to 2 percent slopes (SfA).—This soil has a finer textured surface layer than the soil that has the representative profile. The A horizon contains more silt, generally a little more clay, and less sand than the corresponding horizon of Sassafras sandy loam. Included in mapping were a few spots that show some minor washing.

This soil holds a larger supply of moisture and of plant nutrients than Sassafras sandy loam and is a little more productive of most crops, especially in drier seasons. Generally, the hazard of erosion is slight, and the soil has few or no limitations for most uses.

If this soil is well managed, it can be cropped every year. Minimum tillage, use of crop residue, and use of winter cover crops are needed. This soil is used for truck crops somewhat less intensively than some of the sandier soils that warm up a bit earlier in spring. (Capability unit I-4; woodland subclass 3o)

Sassafras loam, 2 to 5 percent slopes (SfB).—In some areas this soil has lost a few inches of its original surface layer through erosion, and in a few spots erosion has been more severe. A few shallow gullies have formed in places. The erosion hazard is moderate. Most slopes are smooth and fairly long, but, locally, there are some short, irregular slopes and small sinkholes or whale wallows.

Except for the moderate hazard of erosion, this soil has few limitations for farm or nonfarm use. It can be protected from further erosion damage by fairly simple, easily applied conservation measures. Safe disposal of excess water during and after heavy rains is important. This can best be accomplished by constructing sodded waterways. (Capability unit IIe-4; woodland subclass 3o)

Sassafras loam, 5 to 10 percent slopes, moderately eroded (SfC2).—Most of this soil has lost 4 to 8 inches of its original surface layer. Some gullies have cut into, but not through, the subsoil. Included in mapping were some small wooded areas where erosion has been minimal.

The hazard of further erosion is severe on this soil if it is tilled regularly without some intensively applied conservation measures. The safe disposal of runoff water is one of the most important management problems. Tillage should be kept to a strict minimum.

This soil is well suited to hay, pasture, and orchard crops. It is also well suited to woodland, but because of its suitability for more intensive uses, little of the acreage remains in woodland. (Capability unit IIIe-4; woodland subclass 3o)

Sassafras and Evesboro soils, 15 to 40 percent slopes (SvE).—The soils of this undifferentiated unit occur mostly as steep, narrow strips on the sides of draws or ravines, but some areas are on bluffs adjacent to the larger streams. Most of the acreage consists of Sassafras sandy loam or loam. The Evesboro soils in this unit are most commonly loamy sand. The slopes are short and steep. The soils are generally sandy, well drained to excessively drained, and very susceptible to erosion.

These soils are generally unsuitable for cultivation, because of the severe hazard of erosion. All areas should be kept in permanent protective vegetation. Grazing is a suitable use in most areas if it is carefully controlled. Generally, areas in good woodland cover should remain so. (Capability unit VIe-2; woodland subclass 3r)

Swamp

Swamp (Sw) consists of land areas where fresh water stands most, if not all, of the time. These areas occur mainly along the lower courses of streams, just upstream from the coastal marshes, which are affected by salt. The native vegetation generally consists of dense stands of water-tolerant vegetation, including swamp maple or red maple, gum, holly, sweet bay, and pond pine. The soil material consists of sand, silt, clay, or muck, or of mixtures of these, commonly stratified and without profile development.

Swamp cannot be used for crops. There are scattered commercially valuable timber trees, but planting and management of trees generally is not economically feasible. In dry seasons these areas provide some browse for livestock. Swamp generally provides food and cover for some kinds of wildlife. (Capability unit VIIw-1; not placed in a woodland subclass)

Tidal Marsh

Tidal marsh (Tm) (fig. 10) is extensive along low coastal areas and the tidal areas of streams and their estuaries. The largest areas border Delaware Bay, between Little Creek and the Smyrna River, but large areas also occur farther south.

The soil materials in Tidal marsh vary widely. They range from salty to brackish. They consist of variously stratified sand and clay; in many places they have thick peaty layers. Some areas, particularly areas of clay, contain large amounts of sulfur compounds.

Tidal marsh is not used for farming. It is used chiefly to provide food and cover for wildlife and shooting facilities for hunting migratory waterfowl. (Capability unit VIIIw-1; not placed in a woodland subclass)

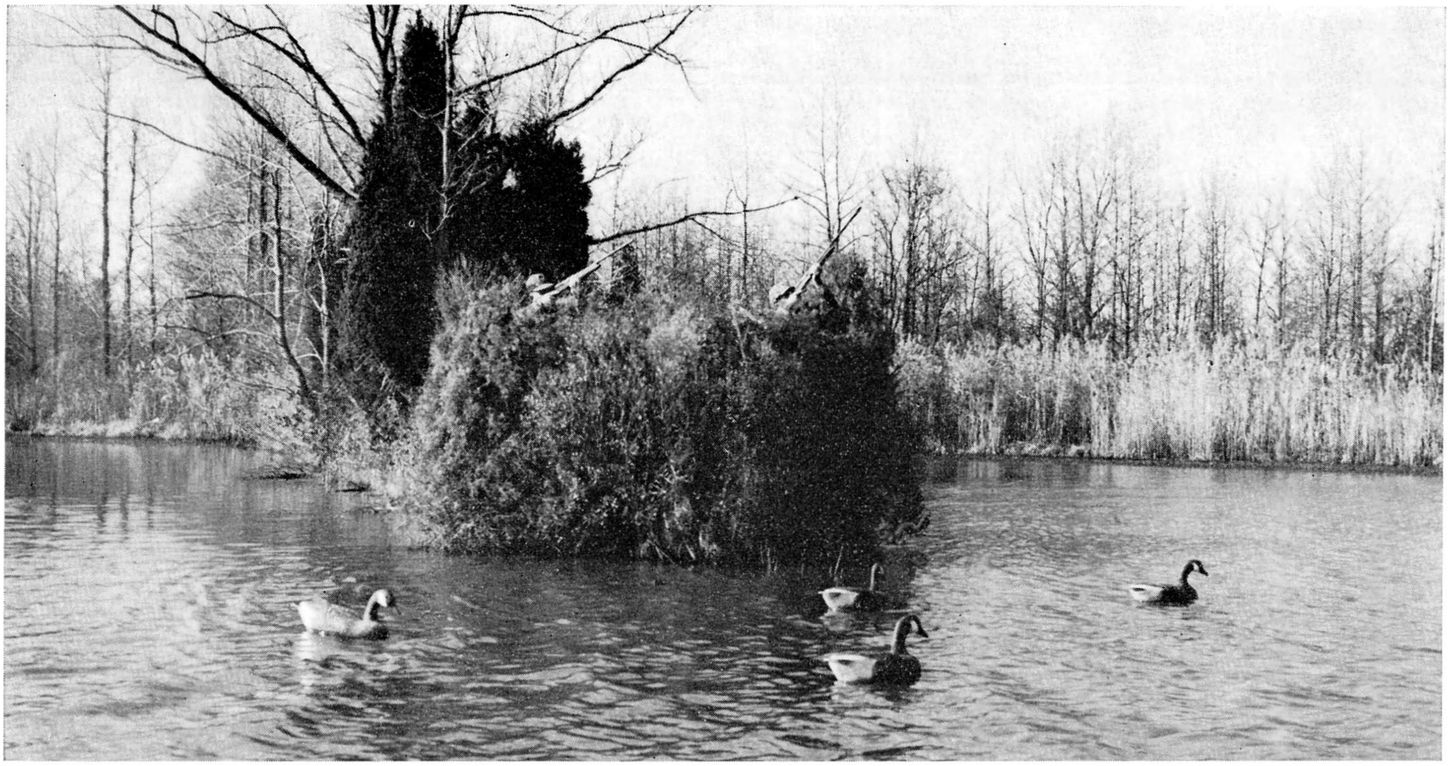

Figure 10.—**A shooting blind, with decoys, at the edge of an area of Tidal marsh, the grassy area fringing the water on the right. The somewhat higher, wooded soil in the background is Othello silt loam.**

Woodstown Series

The Woodstown series consists of deep, moderately well drained soils on uplands. These soils formed in old, predominantly sandy sediments. The native vegetation consists of water-tolerant hardwoods, dominantly oak, but there are some second-growth pines.

A typical profile in a cultivated area has an 8-inch plow layer of dark grayish-brown sandy loam and a subsurface layer of yellowish-brown sandy loam about 3 inches thick. The subsoil is about 14 inches thick. The upper 11 inches is yellowish-brown, friable, sticky and slightly plastic light sandy clay loam. The rest is yellowish-brown, mottled, very friable, slightly sticky heavy sandy loam. Below this, to a depth of at least 36 inches, is stratified, yellowish-brown to strong-brown, mottled loamy sand to sandy loam.

Woodstown soils are easy to work, but they tend to be wet in spring and to warm up too late for early planting. Artificial drainage is necessary for some crops, particularly for early ones and for those in the more nearly level areas. The soils are not hard to drain if outlets are adequate. Tile systems are effective. The available moisture capacity is moderately high. Under good management the soils are moderately productive. They are limited for some uses by seasonal wetness and a moderately high water table.

Profile of Woodstown sandy loam, in a nearly level, cultivated area on the north side of Route 211, about one-tenth mile west of intersection with Route 208, just north of Sandtown:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) sandy loam; very weak, coarse, subangular blocky and weak, fine, granular structure; very friable, slightly sticky; many fine roots; many pores and wormholes; slightly acid (limed); abrupt, smooth boundary. 8 to 10 inches thick.

A2—8 to 11 inches, yellowish-brown (10YR 5/4) sandy loam; very weak, coarse, subangular blocky structure; very friable, slightly sticky; many fine roots; many pores and wormholes; slightly acid; clear, smooth boundary. 3 to 4 inches thick.

B21t—11 to 22 inches, yellowish-brown (10YR 5/6) light sandy clay loam, faintly variegated with strong brown (7.5YR 5/6); weak, coarse, subangular blocky structure; friable, sticky and slightly plastic; many fine roots; many pores and wormholes; thin clay films; medium to strongly acid; abrupt, smooth boundary. 10 to 12 inches thick.

B22t—22 to 25 inches, yellowish-brown (10YR 5/6) heavy sandy loam, faintly variegated with strong brown (7 5YR 5/6); few, fine, distinct mottles of light gray (10YR 7/2); weak, coarse, subangular blocky structure; very friable, slightly sticky; few roots and wormholes; many pores; thin clay films in larger pores; very strongly acid; clear, wavy boundary. 3 to 4 inches thick.

C1—25 to 28 inches, yellowish-brown (10YR 5/6) loamy sand, faintly variegated with strong brown (7.5YR 5/6); many, coarse, distinct mottles of light gray (10YR 7/2); structureless (single grain); loose; few roots and wormholes; many pores; very strongly acid; abrupt, smooth boundary. 3 to 4 inches thick.

C2—28 to 31 inches, dark-brown (7 5YR 4/4) loamy sand; stratified; firm; very few roots; very strongly acid; abrupt, wavy boundary. 3 to 5 inches thick.

C3—31 to 36 inches +, strong-brown (7.5YR 5/6) sandy loam; few, fine, prominent mottles of red (2 5YR 5/6) and light gray (10YR 7/2); structureless (single grain); friable, slightly sticky; no roots; very strongly acid.

The A horizon is loam or sandy loam. The B2t horizon is light sandy clay loam or heavy sandy loam (clay content generally between 18 and 25 percent). The solum of Woodstown soils normally ranges from about 28 to 42 inches in thickness, but in Kent County the solum ranges from 22 to 30 inches in thickness.

The colors throughout the profile are 10YR or 2.5Y in hue, with a hue of 5Y in the lower part of the B horizon and in the C horizon in some profiles. In undisturbed areas the A1 horizon is 2 to 5 inches thick. In the A horizon the color has a value of 3 to 6 and a chroma of 1 to 4; the value and chroma are lowest in the A1 horizon. In the B2t horizon the matrix color has a value of 5 or 6 and a chroma of 6 or 8 and in places has some high-chroma mottling. The B21t horizon is at least 10 inches thick and has no low-chroma mottling. Mottles in the B22t horizon have chromas of 2 or less In some places the C horizon is uniform in color; in others it is variegated. Mottles in the C horizon range from high to low in chroma.

Except where lime has been applied, the reaction is strongly acid to extremely acid; acidity generally increases with depth

Woodstown soils are similar to Keyport, Klej, and Mattapex soils in color and in natural drainage. They have a much lower content of clay and a higher content of sand in their subsoil than Keyport soils. Also, they have a much lower content of silt and a higher content of sand in their subsoil than Mattapex soils They are much less sandy than Klej soils Woodstown soils formed in the same kind of sediments as the well-drained Sassafras soils, the poorly drained Fallsington soils, and the very poorly drained Pocomoke soils

Woodstown sandy loam (Wo).—The profile of this soil is the one described as representative of the Woodstown series. The soil is generally nearly level. The hazard of erosion is slight. Included in mapping were areas where the slope is slightly more than 2 percent, a few slightly washed areas, and areas that have local accumulations of sandy material in dips and slight depressions.

All kinds of good management are needed on this soil, except that, in general, erosion control is not required. In winter and early in spring, the water table is near the surface. Improved drainage is the most important management need if the soil is used for crops, especially those crops that require early planting. Drainage in many areas has already been artificially improved (fig. 11).

With improved drainage this soil is well suited to most crops commonly grown in the county, except those that require very early planting. Some perennial crops, such as alfalfa, are damaged by frost heave in winter. (Capability unit IIw-5; woodland subclass 3o)

Woodstown loam (Ws).—This soil has a finer textured surface layer than the soil that has the representative profile. The surface layer of Woodstown loam contains more silt and less sand than that of Woodstown sandy loam. Most areas are nearly level. Included in mapping were some minor areas that have slopes of 2 to 3 percent.

This soil holds a slightly larger supply of moisture and of plant nutrients than Woodstown sandy loam, but it is generally not so easy to work and to drain because it is less sandy. It is usually not ready for planting quite so early in spring as the sandier soil. Improved drainage is the most important management need if this soil is to be used for crops. In many areas drainage has already been artificially improved. (Capability unit IIw-1; woodland subclass 3o)

Use and Management of the Soils

This section contains information about the use and management of the soils of Kent County as cropland, as

Figure 11.—**Installing a tile drainage system in an area of Woodstown sandy loam. This area is near Milford.**

woodland, and as wildlife habitat, and as engineering material. It also discusses use of the soils in community development.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

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

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

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

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants, require special conservation practice, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in this county.)
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.
- Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.
- Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States (not in Kent County), shows that the chief limitation is climate that is too cold or too dry.

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

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIw-7. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

The capability units in Kent County are described in the following list. They are not numbered consecutively within the subclasses, because they fit into a statewide system of capability classification, and not all the capability units in the State are represented in this county.

- Unit I-4. Deep, well-drained, nearly level, medium-textured soils.
- Unit I-5. Deep, well-drained, nearly level, moderately coarse textured soils.
- Unit IIe-4. Deep, well-drained, gently sloping, medium-textured soils.
- Unit IIe-5. Deep, well-drained, gently sloping, moderately coarse textured soils.
- Unit IIw-1. Moderately well drained, nearly level, medium-textured soils that have a moderately permeable to moderately slowly permeable subsoil.
- Unit IIw-5. Moderately well drained, nearly level, moderately coarse textured soils that have a moderately permeable subsoil.
- Unit IIw-8. Moderately well drained, nearly level, medium-textured soils that have a slowly permeable subsoil.
- Unit IIw-9. Moderately well drained, nearly level, moderately coarse textured soils that have a slowly permeable subsoil.
- Unit IIs-4. Deep, somewhat excessively drained, nearly level to gently sloping soils that have a coarse-textured surface layer and a somewhat finer textured subsoil.
- Unit IIIe-4. Deep, well-drained, moderately sloping, medium- textured soils.
- Unit IIIe-5. Deep, well-drained, moderately sloping, moderately coarse textured soils.

Unit IIIe-33. Deep, somewhat excessively drained, moderately sloping soils that have a coarse-textured surface layer and a somewhat finer textured subsoil.
Unit IIIw-6. Poorly drained and very poorly drained, moderately coarse textured soils that have a moderately permeable subsoil.
Unit IIIw-7. Poorly drained and very poorly drained, medium-textured soils that have a moderately permeable to moderately slowly permeable subsoil.
Unit IIIw-9. Poorly drained and very poorly drained, medium-textured soils that have a slowly permeable subsoil.
Unit IIIw-11. Poorly drained, moderately coarse textured soils that have a slowly permeable subsoil.
Unit IIIs-1. Excessively drained, nearly level, coarse-textured soils that are rapidly permeable but have a moisture-retaining layer at some depth below the profile.
Unit IVe-5. Deep, well-drained to somewhat excessively drained, strongly sloping or moderately sloping, moderately coarse textured and coarse textured soils that are severely eroded.
Unit IVw-6. Poorly drained, coarse-textured, rapidly permeable soils.
Unit IVs-1. Excessively drained, gently sloping, coarse-textured, rapidly permeable soils.
Unit VIe-2. Well-drained and excessively drained, steep soils.
Unit VIw-1. Nearly level, wet soils that have a very severe hazard of flooding.
Unit VIIw-1. Very wet, unclassified soil material, covered with fresh water for long periods.
Unit VIIs-1. Excessively drained, level to steep, coarse-textured, rapidly permeable soils.
Unit VIIIw-1. Land types that are subject to flooding.
Unit VIIIs-2. Nearly bare, loose sands.
Unit VIIIs-4. Areas where the soil material has been removed for construction purposes.

To find the capability classification of any given soil, refer to the "Guide to Mapping Units" at the back of this publication or to the soil descriptions, pages 9 to 25. Use and management of each soil is discussed in the soil description.

General Management Practices

Some management practices are applicable to all or nearly all of the soils used for crops in Kent County. These practices include draining the soils that are wet part of the year or most of the year, applying the proper soil amendments, choosing suitable crop rotations, tilling the soils properly, managing crop residue, and irrigating.

Drainage

Improving drainage is one of the main management needs in Kent County. Drainage has already been improved in many areas. Some farms are made up mostly or entirely of well-drained soils, but many are made up partly of soils that need drainage, and some farms, particularly in the western part of the county, consist mostly or entirely of soils that have drainage problems. For information about methods of improving drainage, see the Delaware Agricultural Drainage Guide.[3]

Soils that are not limited for use by drainage problems are those of the Evesboro, Matapeake, Rumford, and Sassafras series. These soils make up about 40 percent of the county.

Soils that are moderately limited for some uses by impeded natural drainage are those of the Keyport, Klej, Mattapex, and Woodstown series. These soils make up about 10 percent of the county.

Soils that are severely limited for most uses by poor natural drainage are those of the Elkton, Fallsington, Othello, and Plummer series. These soils make up about 27 percent of the county.

Soils that are very severely limited by very poor drainage are those of the Bayboro, Johnston, and Pocomoke series. These soils make up about 12 percent of the county.

The remaining 11 percent of the county consists of areas not generally suitable for farming, regardless of drainage conditions.

Soil amendments

Most of the soils in the county are low in natural plant nutrients, and some are very low. All of the soils are acid; some are extremely acid. For these reasons, additions of fertilizer and lime are needed. The amount of lime and the kinds and amounts of fertilizer needed can be determined by soil tests.

Lime should be applied whenever soil tests indicate that the level of lime in the soil has fallen below the optimum for the kinds of crops to be grown. Applications are needed about every 3 years. Very sandy, well-drained soils, such as those of the Evesboro and Rumford series, need about 1 to 1½ tons per acre; but very wet soils with a high content of organic matter, such as those of the Bayboro, Johnston, and Pocomoke series, may need 3 to 5 tons or more. Different soils in the same field commonly need different amounts of lime.

Soils that are cultivated annually become deficient in nitrogen, phosphorus, and potassium if these elements are not replenished regularly. In some instances soils may also become defficient in other elements, such as sulfur, boron, manganese, and zinc. Soil tests reveal such deficiencies and indicate the kinds and amounts of fertilizer and the frequency of application needed.

Crop rotations

Using a good crop rotation helps to return organic matter to the soil and to control erosion. Level or nearly level soils do not need rotation for erosion control, but they benefit from green-manure crops or cover crops (fig. 12) grown between successive row-crop seasons.

The length of the rotation should increase, generally, as the hazard of erosion increases. Gently sloping, uneroded soils benefit from a 2-year rotation; steeper soils that are severely eroded need a 4-year or 5-year rotation for maximum protection. Assistance in planning suitable rotations for specific sites and soils can be obtained from

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[3] UNITED STATES DEPARTMENT OF AGRICULTURE. DELAWARE AGRICULTURAL DRAINAGE GUIDE. (In cooperation with Univ. of Del.) [Mimeographed] 1962.

Figure 12.—**Beef cattle grazing a rye cover crop that followed Irish potatoes. Such a cover protects the land between cropping seasons. The soil is Sassafras loam, 0 to 2 percent slopes, near Wyoming. It is in capability unit I-4.**

either the Kent County Soil and Water Conservation District or the Cooperative Extension Service.

In addition to checking erosion, a good rotation helps to slow the rate at which some plant nutrients are depleted. If insecticides, fungicides, or other chemicals have been applied, growing a different kind of crop for at least a year helps to rid the soil of the residual effects of the chemicals.

Tillage

Excessive tillage breaks down soil structure, causes loss of organic matter, and increases the hazard of erosion. All the soils of Kent County should be tilled only as much as necessary to insure quick germination of seeds, adequate growth of seedlings, and the maturing of a normal crop.

All sloping soils that are susceptible to erosion but suited to cultivation—soils in capability subclasses IIe, IIIe, and IVe—should be tilled on the contour if the topography permits. Stripcropping on the contour is even more effective in checking erosion. Effectiveness is increased when crops are rotated on each of the strips. Assistance in planning tillage practices can be obtained from the Kent County Soil and Water Conservation District.

Over a period of time, the heavy machinery used in cultivating corn, soybeans, and vegetable crops compacts soils and makes them difficult to work. Such damage is most severe if the soils are too wet when the machinery is used. Most likely to be damaged are poorly drained soils that have a loam or silt loam surface layer. These include most soils of the Bayboro, Elkton, Fallsington, Johnston, Keyport, Mattapex, Othello, Pocomoke, and Woodstown series. Soils of the same series that have a sandy loam surface layer are less seriously affected.

Use of crop residue

Leaving crop residue on the surface protects the soils from water erosion and soil blowing. If the residue later is turned under but kept near and partly on the surface, it supplies organic matter, improves structure, increases aeration, reduces runoff, and increases the intake of water.

Irrigation

Irrigation is important wherever soils are used intensively for crops and whenever the supply of available moisture drops to a critical level during dry seasons. The nature of the soils determines how much water can be applied efficiently and without wastage and the rate at which water can be applied without loss through runoff. The degree of natural drainage is also important. Soils that are not at least well drained should not be irrigated unless drained artificially.

Soil features that affect the suitability of individual soils for irrigation are listed in table 9 in the section "Engineering Uses of the Soils." Information concerning irrigation systems suitable for the soils of Kent County is given in the "Delaware Guide for Sprinkler Irrigation Design,"[4] which is available from the University of Delaware.

Estimated Yields

Nearly all the soils that are farmed in Kent County are intensively well managed. For this reason, there is little variation in estimates of yields of crops on well suited soils. Some soils, of course, are better suited to a particular crop than to others, and some soils are better suited to less intensive use than for cultivated crops.

Table 4 shows estimates of average yields per acre of field crops and production levels for orchard crops under improved management. Table 5 shows estimates of average yields per acre of truck crops under improved management. To obtain the yields estimated in table 4, most, if not all, of the following practices should be followed:

1. Contour tillage, stripcropping, minimum tillage, and crop rotations are used where needed to help control erosion; adequate drainage systems are installed and maintained where needed; excess water is disposed of safely; and irrigation water is applied as needed.
2. Winter cover crops are used to provide seasonal protection for soils that are intensively cropped during the regular growing season. (Besides furnishing protection against erosion in winter, cover crops help to improve or maintain soil structure, tilth, fertility, and organic-matter content when the cover crop is turned under.)
3. Manure and crop residue are turned under to supply nitrogen, other plant nutrients, and organic matter to improve the physical condition of the soil and to help reduce erosion.
4. Fertilizer and lime are applied according to the needs of the crop to be grown and the results of soil tests.
5. The soils are cultivated as little as possible, but suitable methods of plowing, preparing the seedbed, and cultivating are used.
6. Planting, cultivating, and harvesting are done at the proper time and in the proper way.
7. Weeds, diseases, and insects are controlled.

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[4] UNITED STATES DEPARTMENT OF AGRICULTURE. DELAWARE GUIDE FOR SPRINKLER IRRIGATION DESIGN. (In cooperation with Univ. of Del. Exp. Sta.) 9 pp. 1955.

TABLE 4.—*Estimated average yields per acre of field crops and production levels for orchard crops under improved management*

[Absence of figure indicates that the crop is not suited to the soil specified or is not commonly grown on it. Estimates are not given for Borrow pits, Coastal beaches, Made land, Swamp, and Tidal marsh, because these areas are generally unsuitable for crops]

Soil	Corn for grain	Corn for silage	Soybeans	Wheat	Barley	Rye	Alfalfa hay	Clover-grass hay	Tall grass and legume pasture	Production level	
										Apples	Peaches
	Bu	*Tons*	*Bu.*	*Bu*	*Bu.*	*Bu*	*Tons*	*Tons*	*Cow-acre-days* [1]		
Bayboro silt loam	100	20	35	30	60	30		3.5	200		
Elkton sandy loam, thin subsoil	105	21	40	30	40	30		3.5	200		
Elkton silt loam, thin subsoil	105	21	40	30	40	30		3.5	200		
Evesboro sand									100		
Evesboro loamy sand, 2 to 5 percent slopes	60	12	25	30	70	25	2.5	2.0	145	Poor	Poor.
Evesboro loamy sand, 5 to 15 percent slopes									120	Poor	Poor.
Evesboro loamy sand, clayey substratum	90	20	30	30	70	25	2.5	2.0	155	Fair	Fair.
Fallsington sandy loam	120	24	35	35	60	35		3.0	170		
Fallsington loam	120	24	35	35	60	35		3.0	170		
Johnston silt loam	120	24	35					3.0	170		
Keyport sandy loam	110	22	40	40	55	30	3.5	3.0	170	Fair	Fair.
Keyport silt loam	110	22	40	40	55	30	3.5	3.0	170	Fair	Fair.
Klej loamy sand	110	22	30	35	70	25		3.0	170		
Matapeake silt loam, 0 to 2 percent slopes	140	28	45	50	90	40	5.5	3.5	315	Good	Good.
Matapeake silt loam, 2 to 5 percent slopes	140	28	45	50	90	40	5.5	3.5	315	Good	Good.
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	130	26	40	45	90	40	5.0	3.5	285	Good	Good.
Mattapex silt loam	135	27	45	45	90	35	4.5	3.5	255	Fair	Fair.
Mixed alluvial land									170		
Othello silt loam	115	23	40	30	60	30		3.5	200		
Plummer loamy sand	60	12	20		40	25		2.0	115		
Pocomoke loam	110	22	40	30	60	30		3.5	200		
Pocomoke sandy loam	110	22	40	30	60	30		3.5	200		
Rumford loamy sand, 0 to 2 percent slopes	110	22	40	45	70	30	5.0	3.5	285	Fair	Fair.
Rumford loamy sand, 2 to 5 percent slopes	110	22	40	45	70	30	5.0	3.5	285	Fair	Fair.
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	100	20	35	40	70	30	4.5	3.0	255	Fair	Fair.
Rumford loamy sand, 5 to 10 percent slopes, severely eroded	80	16		35		30	4.0	3.0	230	Fair	Fair.
Rumford loamy sand, 10 to 15 percent slopes	80	16		35		30	4.0	3.0	230	Fair	Fair.
Sassafras sandy loam, 0 to 2 percent slopes	130	26	45	50	90	35	5.5	3.5	315	Good	Good.
Sassafras sandy loam, 2 to 5 percent slopes	130	26	45	50	90	35	5.5	3.5	315	Good	Good.
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	120	24	40	45	90	35	5.0	3.0	285	Good	Good.
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	100	20		40	70	30	4.5	3.0	255	Fair	Fair.
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	100	20		40	75	35	4.5	3.0	255	Good	Good.
Sassafras loam, 0 to 2 percent slopes	130	26	45	50	90	35	5.5	3.5	315	Good	Good.
Sassafras loam, 2 to 5 percent slopes	130	26	45	50	90	35	5.5	3.5	315	Good	Good.
Sassafras loam, 5 to 10 percent slopes, moderately eroded	120	24	40	45	90	35	5.0	3.0	285	Good	Good.
Sassafras and Evesboro soils, 15 to 40 percent slopes							3.5	2.5	200	Poor	Poor.
Woodstown sandy loam	130	26	40	40	80	35	4.5	3.5	255	Fair	Fair.
Woodstown loam	130	26	40	40	80	35	4.5	3.5	255	Fair	Fair.

[1] Cow-acre-days is a term used to express the carrying capacity of pasture It is the number of animal units carried per acre multiplied by the number of days the pasture can be grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for 2 cows has a carrying capacity of 60 cow-acre-days.

Table 5.—*Estimated average yields per acre of truck crops under improved management*

[Absence of figure indicates crop is not suited to the soil specified or is not commonly grown on it. Soils and land types not listed in this table are not suitable for truck crops]

Soil	Asparagus	Cabbage	Cantaloups	Carrots	Cauliflower	Cucumbers	Lima beans	Peas	Peppers	Snap beans	Squash and pumpkins	Sweet corn	Tomatoes	Irish potatoes
	Tons	*Crates*	*Bu*	*Tons*	*Tons*	*Bu*	*Tons*	*Tons*	*Tons*	*Bu*	*Tons*	*No of ears*	*Tons*	*Bu*
Elkton sandy loam, thin subsoil		300				400	1.2		5	185	10	14,000	15	
Elkton silt loam, thin subsoil		300				400	1.2		5	185	10	14,000	15	
Evesboro loamy sand, 2 to 5 percent slopes	2.0		250			450			4	150	10	10,000	15	
Evesboro loamy sand, 5 to 15 percent slopes	2.0		250			350					10		15	
Evesboro loamy sand, clayey substratum	2.0	350	275	15	8	500	1.0	1.5	5	175	10	12,000	18	
Fallsington sandy loam		300				400	1.2		5	200	10	14,000	15	
Fallsington loam		300				400	1.2		5	200	10	14,000	15	
Keyport sandy loam	2.0	500	250	18	10	650	1.5	2.0	6	200	15	18,000	22	
Keyport silt loam	2.0	500	250	18	10	650	1.5	2.0	6	200	15	18,000	22	
Klej loamy sand	2.0	350	250	12	7	450	1.0	1.5	5	185	10	12,000	18	
Matapeake silt loam, 0 to 2 percent slopes	2.5	500	275	20	12	700	1.7	2.0	8	225	15	18,000	22	650
Matapeake silt loam, 2 to 5 percent slopes	2.5	500	275	20	12	700	1.7	2.0	8	225	15	18,000	22	650
Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	2.5	500	275	18	10	650	1.7	2.0	8	225	15	18,000	22	625
Mattapex silt loam	2.0	500	250	18	10	650	1.5	2.0	8	200	15	18,000	20	575
Othello silt loam		300				400	1.0		5	185	10	14,000	14	
Plummer loamy sand		300				350	1.0		4	150	8	10,000	15	
Pocomoke loam												(1)	(1)	
Pocomoke sandy loam												(1)	(1)	
Rumford loamy sand, 0 to 2 percent slopes	2.0	400	275	15	8	500	1.0	1.5	5	175	10	12,000	18	550
Rumford loamy sand, 2 to 5 percent slopes	2.0	350	275	15	8	500	1.0	1.5	5	175	10	12,000	18	550
Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	2.0	350	250	12	7	350	1.0	1.5	5	175	10	10,000	18	500
Rumford loamy sand, 5 to 10 percent slopes, severely eroded	1.6	300	200	10		300		1.2	5	150	8	8,000	15	400
Rumford loamy sand, 10 to 15 percent slopes	1.8	300	250	12		350					10	10,000	15	450
Sassafras sandy loam, 0 to 2 percent slopes	2.5	500	325	20	12	750	1.7	1.7	8	250	14	18,000	25	600
Sassafras sandy loam, 2 to 5 percent slopes	2.5	500	325	20	12	750	1.7	1.7	8	250	14	18,000	25	600
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	2.5	450	300	15	10	700	1.5	1.7	8	225	14	18,000	25	600
Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	2.2	400	275			500	1.0	1.5	8	200	12	16,000	20	550
Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	2.5	400	275	15	10	600	1.0	1.7	6	225	12	16,000	20	575
Sassafras loam, 0 to 2 percent slopes	2.5	500	300	20	12	750	1.7	2.0	8	250	14	18,000	25	600
Sassafras loam, 2 to 5 percent slopes	2.5	500	300	20	12	750	1.7	2.0	8	250	14	18,000	25	600
Sassafras loam, 5 to 10 percent slopes, moderately eroded	2.5	450	300	15	10	700	1.5	1.7	8	225	14	18,000	25	600
Woodstown sandy loam	2.0	450	275	15	10	700	1.5	1.7	6	225	14	16,000	22	550
Woodstown loam	2.0	450	275	15	10	700	1.5	1.7	6	225	14	16,000	22	550

[1] Sweet corn and tomatoes are sometimes grown, but no reliable yield estimates are available.

The yields shown in table 4 have been coordinated across State and regional lines, insofar as they apply to specifically named soils. They are not presumed to be the highest yields obtainable, but they set a goal that is practical for most farmers to reach. Yields on the same soil can be expected to vary under the best management, because of local variation in the weather, in the crop varieties used, and in the variation in the degree of damage caused by insects and disease.

The yields shown in table 5 are based primarily on the experience of farmers in the county, and they indicate goals that should be readily attainable. In most cases the yield estimates for truck crops have not been coordinated across State or regional lines. Borrow pits, Coastal beaches, Made land, Swamp, and Tidal marsh are not listed in tables 4 and 5, because these areas are generally unsuitable for crops.

Woodland

According to the Conservation Needs Inventory, there were about 80,000 acres of woodland on farms in Kent County in 1968. The most heavily wooded areas are in the western part, on wet soils that have not yet been drained.

The woodland stands consist chiefly of hardwoods, including valuable oaks, sweetgum, and yellow-poplar. Other hardwoods are red maple or swamp maple, blackgum, holly, sweetbay, beech, birch, and dogwood. Some Virginia pine grows on well-drained uplands, and some pond pine on wetlands. Loblolly pine is scarce in natural stands, but it grows rapidly if planted (fig. 13) and is potentially the most valuable woodland species in the county.

Management of woodland

Table 6 lists all the soils of the county that are suited to wood crops and gives the factors that affect woodland management. It gives the subclass, or ordination, of each soil and the estimated site index for loblolly pine and other suitable species. It identifies the species that should be favored in existing stands and those suitable for planting.

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

Two other factors that sometimes affect woodland management are not listed in table 6. One is the hazard of windthrow. Since none of the soils of Kent County have characteristics that inhibit the development of roots of suitable trees, the windthrow hazard is not significant. The other factor is the hazard of erosion. In woodland, the erosion hazard is only slight if the slope is 15 percent or less. Thus, it is significant in relation to only one mapping unit in this county: Sassafras and Evesboro soils, 15 to 40 percent slopes. The hazard of erosion for this mapping unit is given as a footnote to the table.

***Figure 13.*—An 8-year-old plantation of loblolly pine near Marydel. This soil is Fallsington sandy loam, in woodland subclass 2w.**

Woodland classes and subclasses

The soils of Kent County have been evaluated and grouped according to a nationwide system put into use by woodland conservationists of the Soil Conservation Service. In this system, known as ordination, soils are placed in woodland classes according to their potential productivity for woodland species and in subclasses according to their inherent limitations, if any, for woodland management.

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

The woodland classification of the soils of Kent County is based mainly on the site indexes for loblolly pine. This is the only species for which a site index has been established for every soil. Site indexes for sweetgum have been established for many soils, and site indexes for upland oaks and Virginia pine for a few soils. The determinations were made in Delaware and in nearby parts of Maryland and New Jersey.

On the basis of their relative productivity for loblolly pine, the soils of Kent County have been placed in three of the five classes in the system: class 2, made up of soils of high productivity (site index for loblolly pine

TABLE 6.—*Factors affecting*

[Absence of data means

Soil series and map symbols	Woodland subclass	Limitations			
		Equipment limitations	Seedling mortality	Plant competition for— Conifers	Plant competition for— Hardwoods
Bayboro: Ba	2w	Severe: extreme wetness; poor bearing properties.	Moderate	Severe	Moderate
Borrow pits: Bo. No woodland classification.					
Coastal beaches: Co	5t	Severe: loose, unstable sand.	Severe	Slight	
Elkton: El, Em	3w	Severe: high water table, poor bearing properties.	Moderate	Severe	Moderate
Evesboro: Eo, EsB, EsD, Ev	3s	Moderate: loose, sandy	Moderate	Slight	Slight
Fallsington: Fa, Fs	2w	Severe: high water table	Moderate	Severe	Moderate
Johnston: Jo	2w	Severe: high water table; flooding	Moderate	Severe	Moderate
Keyport: Ka, Ke	3w	Severe: moderately high water table, poor bearing properties	Slight	Severe	Moderate
Klej: Kl	3s	Moderate: sandy	Slight	Moderate	Slight
Made land: Md. No woodland classification.					
Matapeake: MeA, MeB, MeC2	3o	Slight	Slight	Moderate	Moderate
Mattapex: Mt	3o	Slight	Slight	Severe	Moderate
Mixed alluvial land: Mv	2w	Severe: high water table, flooding.	Moderate	Severe	Moderate
Othello: Ot	3w	Severe: high water table	Moderate	Severe	Moderate
Plummer: Pl	3w	Severe: high water table	Moderate	Severe	Moderate
Pocomoke: Pm, Po	2w	Severe: high water table	Moderate	Severe	Moderate
Rumford: RuA, RuB, RuC2, RuC3, RuD	3o	Slight	Slight to moderate	Moderate	Slight
Sassafras: SaA, SaB, SaC2, SaC3, SaD2, SfA, SfB, SfC2	3o	Slight	Slight	Moderate	Moderate

See footnotes at end of table

woodland management

factor does not apply]

Site index [1]				Species suitability		
Loblolly pine	Mixed oaks	Sweetgum	Virginia pine	To favor in existing stands	To favor in planting	For Christmas trees
85–95		85–95		Sweetgum, red maple, and mixed oaks.	Loblolly pine and sweetgum.	Scotch pine and white pine.
45–55			35–55	Usually none.	Loblolly pine.	None.
75–85		75–85		Sweetgum, red maple, and mixed oaks.	Loblolly pine and sweetgum.	Scotch pine and white pine.
75–85			65–75	Virginia pine.	Loblolly pine and Virginia pine.	Scotch pine, white pine, and Virginia pine.
85–95		85–95		White oak, red maple, and sweetgum.	Loblolly pine, sweetgum, and white pine.	Scotch pine, white pine, and Norway spruce
85–95		85–95		Sweetgum, red maple, and mixed oaks.	Loblolly pine, sweetgum, and white pine	Scotch pine and white pine
75–85		75–85		White oak, sweetgum, and red maple.	Loblolly pine, white pine, and sweetgum	Scotch pine, Austrian pine, and white pine.
75–85	65–75	75–85		Sweetgum and mixed oaks.	Loblolly pine, white pine, and sweetgum.	Scotch pine, Norway spruce, Austrian pine, and white pine.
75–85	65–75			Yellow-poplar and mixed oaks	Loblolly pine, yellow-poplar, white pine, and sweetgum.	Scotch pine, Austrian pine, and white pine.
75–85		75–85		Yellow-poplar, sweetgum, mixed oaks, and red maple	Loblolly pine, yellow-poplar, and sweetgum	Scotch pine and white pine.
85–95		85–95		Sweetgum, red maple, and mixed oaks.	Loblolly pine, sweetgum, and white pine.	Scotch pine and white pine.
75–85		75–85		White oak, red maple, and sweetgum.	Loblolly pine, sweetgum, and white pine	Scotch pine and white pine.
75–85		75–85		Sweetgum and red maple.	Loblolly pine and sweetgum	Scotch pine and white pine.
85–95		85–95		Sweetgum, red maple, and mixed oaks.	Loblolly pine, white pine, and sweetgum	Scotch pine, white pine, and Norway spruce.
75–85			65–75	Virginia pine and mixed oaks.	Loblolly pine and Virginia pine	Scotch pine, white pine, and Virginia pine.
75–85	65–75			Yellow-poplar and mixed oaks	Loblolly pine, yellow-poplar, white pine, and sweetgum	Scotch pine, Austrian pine, and white pine

TABLE 6.—*Factors affecting*

Soil series and map symbols	Woodland subclass	Limitations: Equipment limitations	Seedling mortality	Plant competition for— Conifers	Hardwoods
Sassafras and Evesboro: SvE [2]					
Sassafras	3r	Moderate: slope	Slight	Moderate	Moderate
Evesboro	3s	Severe: loose sand, steep slopes.	Moderate	Slight	Slight
Swamp: Sw No woodland classification					
Tidal marsh: Tm No woodland classification					
Woodstown: Wo, Ws	3o	Slight	Slight	Severe	Moderate

[1] A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age, for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years

85 to 95); class 3, made up of soils of medium productivity (site index 75 to 85); and class 5, made up of soils of very low productivity (site index less than 65). None are in class 1, which would consist of soils of very high productivity (site index more than 95) or in class 4, which would consist of soils of low productivity (site index 65 to 75).

The soils of Kent County are in subclasses identified as follows: subclass *o*, no limitations; subclass *w*, limitations due to seasonal wetness or a high water table; subclass *s*, limitations due to excessive sandiness; subclass *r*, limitations due to relief or steep slope; and subclass *t*, limitations due to toxic substances in the soils.

The names of the soil series represented are mentioned in each description of the woodland subclasses, but the listing of the series name does not necessarily indicate that all the soils of a series are in the same woodland subclass. The woodland subclass of individual soils is shown at the end of each soil description and in the "Guide to Mapping Units."

Descriptions of the six woodland subclasses follow.

WOODLAND SUBCLASS 2w

This subclass is made up of soils that are high in productivity but have severe limitations on the use of heavy equipment because of seasonal wetness or a high water table. It consists of Mixed alluvial land and soils of the Bayboro, Fallsington, Johnston, and Pocomoke series. Most of these soils also have a moderate limitation of seedling mortality because of wetness. There is a hazard of flooding on the Johnston soils and on Mixed alluvial land.

In a normal stand 50 years of age, the average annual increase per acre is as follows: mixed oaks, 275 board feet of timber; yellow-poplar, 490 board feet of timber; loblolly pine, 680 board feet of timber or 0.7 cord of pulpwood.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 4,000 board feet of timber or 46 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 16,500 board feet of timber or 71 cords of pulpwood per acre. At 70 years of age, they yield about 26,000 board feet of timber or 82 cords of pulpwood. Yields of other species are less. There are no reliable estimates of yields of sweetgum.

WOODLAND SUBCLASS 3o

This subclass is made up of soils that are medium in productivity and have no major limitations for woodland management. It consists of soils of the Matapeake, Mattapex, Rumford, Sassafras, and Woodstown series. These soils are well drained to somewhat excessively drained and have slopes of not more than 15 percent.

In a normal stand 50 years of age, the average annual increase per acre is as follows: mixed oaks, 200 board feet of timber; yellow-poplar, 350 board feet of timber; loblolly pine, 470 board feet of timber or 0.6 cord of pulpwood.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber or 70 cords of pulpwood. Yields of other species are less.

WOODLAND SUBCLASS 3w

This subclass is made up of soils that are medium in productivity and have moderate to severe limitations on the use of heavy equipment because of seasonal wetness *woodland management*—Continued

Site index[1]				Species suitability		
Loblolly pine	Mixed oaks	Sweetgum	Virginia pine	To favor in existing stands	To favor in planting	For Christmas trees
75–85	65–75			Yellow-poplar and mixed oaks	Loblolly pine, yellow-poplar, white pine, and sweetgum.	Scotch pine, Austrian pine, and white pine
75–85			65–75	Virginia pine	Loblolly pine and Virginia pine.	Scotch pine, white pine, and Virginia pine.
85–95		85–95		Yellow-poplar, sweetgum, mixed oaks, and red maple.	Loblolly pine, white pine, yellow-poplar, and sweetgum.	Scotch pine, white pine, and Norway spruce.

[2] Slope range of 15 to 40 percent. Moderate hazard of erosion on slopes of 15 to 30 percent; severe hazard of erosion on slopes greater than 30 percent.

or a high water table. It consists of soils of the Elkton, Keyport, Othello, and Plummer series.

Yields and average annual growth are about the same as for woodland subclass 3o.

In a normal stand 50 years of age, the average annual increase per acre is as follows: mixed oaks, 200 board feet of timber; yellow-poplar, 350 board feet of timber; loblolly pine, 470 board feet of timber or 0.6 cord of pulpwood.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber or 70 cords of pulpwood. Yields of other species are less.

WOODLAND SUBCLASS 3s

This subclass is made up of soils that are medium in productivity and have moderate limitations on the use of heavy equipment and moderate seedling mortality because of a loose, sandy surface layer and seasonal droughtiness. It consists of soils of the Evesboro and Klej series.

In a normal stand 50 years of age, the average annual increase per acre is as follows: Virginia pine, 1 cord of pulpwood; loblolly pine, 470 board feet of timber or 0.6 cord of pulpwood.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber or 70 cords of pulpwood. Yields of other species are less. The soils of this subclass are generally not well suited to the production of hardwoods for timber.

WOODLAND SUBCLASS 3r

This subclass is made up of one mapping unit: Sassafras and Evesboro soils, 15 to 40 percent slopes. These soils are medium in productivity. The Sassafras soil has a moderate limitation on the use of heavy equipment because of the slope. The Evesboro soil has a severe limitation because of the slope and the loose, sandy surface layer.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber or 70 cords of pulpwood. Yields of other species are less.

WOODLAND SUBCLASS 5t

This subclass consists only of Coastal beaches, a land type that is very low in productivity. The limitations result from salinity and the looseness and instability of the sand. Seedling mortality is severe. There are few trees except some scattered Virginia pines. Loblolly pine is to be preferred for planting, but it grows so slowly that no estimates of yields have been made.

Wildlife[5]

Food, cover, and water are the essentials of wildlife habitat. Habitat can be created, improved, or maintained by planting suitable vegetation, or by managing the existing vegetation, or both.

In table 7 the soils of the county are rated according to their suitability for plants and water developments

[5] THOMAS C CREBBS, JR, wildlife biologist, assisted in the preparation of this section.

TABLE 7.—*Suitability of the soils for elements of*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants
Bayboro: Ba	Not suited	Poor	Poor	Good
Borrow pits: Bo Properties variable				
Coastal beaches: Co	Not suited	Poor	Poor	Not suited
Elkton: El, Em	Poor	Fair	Fair	Good
Evesboro.				
Eo, EsB, Ev	Poor	Poor	Poor	Poor
EsD	Not suited	Poor	Poor	Poor
Fallsington: Fa, Fs	Poor	Fair	Fair	Good
Johnston: Jo	Not suited	Poor	Poor	Good
Keyport: Ka, Ke	Fair	Good	Good	Good
Klej: Kl	Poor	Fair	Fair	Fair
Made land: Md. Properties variable.				
Matapeake:				
MeA	Good	Good	Good	Good
MeB, MeC2	Fair	Good	Good	Good
Mattapex: Mt	Fair	Good	Good	Good
Mixed alluvial land: Mv	Poor	Fair	Fair	Good
Othello: Ot	Poor	Fair	Fair	Good
Plummer: Pl	Not suited	Poor	Poor	Good
Pocomoke: Pm, Po	Not suited	Poor	Poor	Good
Rumford:				
RuA, RuB, RuC2	Fair	Fair	Fair	Fair
RuC3, RuD	Poor	Poor	Fair	Fair
Sassafras:				
SaA, SfA	Good	Good	Good	Good
SaB, SaC2, SfB, SfC2	Fair	Good	Good	Good
SaC3, SaD2	Poor	Fair	Good	Good
SvE For Evesboro part, see Evesboro (EsD).	Not suited	Poor	Good	Good
Swamp: Sw	Not suited	Poor	Not suited	Fair
Tidal marsh: Tm	Not suited	Not suited	Not suited	Not suited
Woodstown: Wo, Ws	Fair	Good	Good	Good

wildlife habitat and kinds of wildlife

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

that are used by wildlife and as actual or potential habitat for three classes of wildlife. Readers interested in a more detailed explanation of the rating system can refer to a paper by Allan, Garland, and Dugan (*1*).

The following explains examples of the plants in the six plant categories in table 7 and tells something about the two kinds of water developments.

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

Grasses and legumes.—These include lespedeza, alfalfa, clover, tall fescue, bromegrass, bluegrass, and timothy, all of which are planted for forage crops but also provide food and cover for wildlife.

Wild herbaceous upland plants.—These include panicgrass and other native grasses, partridgepea, beggarticks, native lespedeza, and other native herbs that grow in upland areas.

Hardwood woodland plants.—This category consists of native or planted trees and shrubs that grow vigorously and usually produce good crops of seed or make good cover, or both. Included are dogwood, persimmon, sumac, sassafras, hazelnut, shrub lespedeza (fig. 14), autumn olive, multiflora rose, wild cherry, hickory, bayberry, blueberry, huckleberry, blackhaw, sweetgum, and various species of oak and holly.

Figure 14.—Bicolor lespedeza, used here as a border between woodland and cropland, is especially valuable for wildlife food and cover. The soil is Fallsington sandy loam. (Photo by Delaware Game and Fish Commission.)

Coniferous woodland plants.—These are cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover but may furnish browse and seeds. Included are Virginia pine, loblolly pine, pond pine, Scotch pine, Norway spruce, redcedar, and Atlantic white cedar.

Wetland food and cover plants.—This category consists of plants that provide food and cover for waterfowl and for furbearing animals. Included are smartweed, wildrice, barnyard grass, bulrush, pondweed, duckweed, duckmillet, arrow-arrum, pickerelweed, cattail, waterwillow, and various sedges, including especially three-square in marshy areas.

Shallow water developments.—These are impoundments in which the water level is kept at no more than 2 feet above the natural ground level. These shallow developments of impoundments are of special importance for waterfowl habitat.

Excavated ponds.—These are dug-out areas or excavated ponds that depend not on runoff, but on ground water. Farm ponds of the impounded type are not included in table 7, but they are important for producing fresh-water fish. Such ponds should be at least 6 feet deep.

Engineering Uses of the Soils [6]

This section provides information of special interest to engineers, contractors, farmers, landowners, and others who use or plan the use of soil as structural material or as foundation material upon which structures are built or special practices are carried out. In it are evaluations of soil properties that affect the construction and maintenance of pipelines, roads and highways, water storage facilities, drainage systems, irrigation systems, and erosion control structures. Among the soil properties most important to engineers are permeability to water, shear strength, density, compaction characteristics, shrink-swell characteristics, water-holding capacity, grain size, reaction, plasticity, and corrosivity as it affects steel and concrete structures. Information concerning these and related soil properties, features, and uses is furnished in tables 8, 9, and 10.

The estimates and interpretations of soil properties in these tables can be used in—

1. Planning and designing agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting locations for highways, airports, pipelines, and underground cables.
3. Locating sources of sand, gravel, or rock suitable for use as construction material.
4. Selecting industrial, commercial, residential, and recreational areas.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized, however, that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful in planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used in this publication have a special meaning to soil scientists and a different meaning to engineers. The Glossary defines many such terms as they are used in soil science.

Information useful in engineering can be obtained from the soil map and from other parts of this publication. By using the information in the soil map, the soil profile descriptions, and the tables in this section, engineers can plan detailed investigations of the soils at construction sites.

[6] Reviewed by THEODORE IFFT, assistant State conservation engineer, Soil Conservation Service, College Park, Md., and EMORY L. SCHMERTZLER, State engineering specialist, Soil Conservation Service, Dover, Del.

Estimated engineering properties

Table 8 gives estimates of some of the soil properties important in engineering. The estimates are based on field classification and descriptions, physical and chemical tests of selected representative samples, test data from the same soils or comparable soils in nearby counties and States, and detailed experience gained in working with the soils in Kent County and elsewhere.

Permeability, as used in table 8, relates only to the movement of water downward through undisturbed and uncompacted soil, and does not include lateral seepage. The estimates are based on the structure and porosity of the soil. Plowpans, surface crusts, and properties resulting from compaction by heavy machinery or by other means are not considered.

Available water capacity (available moisture capacity) is the capacity of a soil to hold water in a form available to plants. Reaction is the degree of acidity or alkalinity of a soil. It is expressed in table 8 as a pH value; the values apply to unlimed soils.

Optimum moisture is that moisture content, based on dry soil, at which a soil can be compacted to its greatest density by standard compaction methods. Maximum dry density is the maximum dry weight of 1 cubic foot of soil compacted by standard methods at the optimum moisture content.

The shrink-swell potential is an indication of the change in volume to be expected with a change in moisture content. A high shrink-swell potential indicates severe hazards to the maintenance of structures built in, on, or with such materials. A moderate shrink-swell potential indicates a significant but not severe degree of hazard.

Corrosivity indicates a potential danger to uncoated metal or concrete structures through chemical action that dissolves or weakens the structural material when installed in soils.

The plastic properties of soils are not given as such in table 8. Plasticity of a degree that is significant in engineering is indicated by the letter "H" in the Unified classification symbol (MH, CH, or OH).

Depth to bedrock is not shown in table 8. All the soils are underlain by unconsolidated sediments of great thickness and, consequently, depth to bedrock is not significant.

Engineering interpretations

Table 9 contains information useful to engineers and others who plan the use of soil material in conjunction with pipelines, highways, and various farm facilities. It also gives the relative suitability of each major soil for use as a source of topsoil, sand and gravel, and road fill and lists the major limitations for winter grading.

Detrimental or undesirable features are emphasized in this table, but very important desirable features also are listed. The ratings and other interpretations are based on the estimates of engineering properties given in table 8; on available test data, including those in table 10; and on field experience. Although the information applies only to the depths indicated in table 8, it can be considered reasonably reliable to depths of about 6 feet for most soils and more for a few soils.

Topsoil refers only to the surface layer, which is ordinarily rich in organic matter. The subsoil is generally unsuitable for use as topsoil and is not rated.

The ratings for sand and gravel indicate only the probable presence of deposits, not the quality or quantity of the material.

The ratings for road fill, which is material used to build road embankments, indicate the general performance of soil material moved from borrow areas for this purpose.

Pipeline and highway locations are influenced by soil features that affect construction and maintenance. In Kent County, the principal features are the depth to the water table and the stability of the soil material under load for highway construction and in trenches for pipeline construction. The probable severity of frost action is also important, particularly for highway location.

Reservoir sites are affected mainly by loss of water through seepage. This is especially important for impoundments. Dug-out ponds are dependent upon the height of the water table, and seepage into the pond is important as well as seepage out of it.

The most important features of soil materials used for embankments are stability, porosity, plastic properties, and ease of compaction. In general, any moderately to slowly permeable soil material that has good strength and stability when compacted can be used in the construction of embankments for dams. Dikes and levees, which are low embankments used to impound or divert water, are not listed separately in table 9, but the soil features that affect use in embankments also affect these structures. Dikes and levees usually do not require as great strength and stability as do the dams for ponds and reservoirs.

Terraces and diversions slow and divert runoff water. The stability of the soil material and the degree of slope are important for these structures. Grassed waterways are used to dispose of excess water. Available moisture capacity and fertility are important to growth of grass.

Winter grading is affected chiefly by the water table, the natural drainage, and the plastic properties of the soil, all of which are rated in table 9.

Engineering test data

Table 10 presents the results of tests made to determine properties significant in soil engineering.

The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The plastic limit (not given in table 10) is the moisture content at which the soil material changes from a semisolid to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit.

Table 10 also gives data on the relationship between the moisture content and the density of the soil when compacted by standard methods. If the soil material is compacted at successively higher moisture content, assuming that the same amount of force is used in compacting the soil, the density of the compacted material increases, until the "optimum moisture content" is reached. After that, the density decreases as the moisture content increases. The ovendry weight, in pounds per cubic foot, of the soil at the optimum moisture content is the "maximum dry density." Data on the relationship of moisture to density are important in planning earthwork, because generally the soil is most stable if it is compacted to about its maximum dry density when it is at approximately the optimum moisture content.

378-763—71——4

TABLE 8.—*Estimated engineering*

Soil series and map symbols	Depth to water table	Depth from surface	Classification			Percentage passing sieve—	
			USDA texture	Unified	AASHO	No 4 (4 7 mm)	No 10 (2.0 mm.)
	Ft	*In*					
Bayboro: Ba	0	0–10	Silt loam	ML, MH, OL, OH	A–4, A–5, A–7	95–100	95–100
		10–32	Silty clay loam, silty clay	CL or CH	A–6, A–7	95–100	95–100
		32–42	Sandy clay loam	SC or CL	A–2, A–6	95–100	95–100
Borrow pits: Bo No estimates of properties.							
Coastal beaches: Co	1–10+	0–96	Sand	SP	A–3, A–2	95–100	95–100
Elkton: El, Em	0–1	0–9	Silt loam, sandy loam	SM, ML, ML–CL	A–2, A–4, A–6	95–100	95–100
		9–21	Silty clay	CL–CH, MH–CH	A–6, A–7	95–100	95–100
		21–84	Sand, silt	SM or ML	A–4, A–2	95–100	85–100
Evesboro: Eo, EsB, EsD	10+	0–60	Loamy sand	SM or SP–SM	A–2	95–100	95–100
Ev	4+	0–45	Loamy sand	SM or SP–SM	A–2	95–100	95–100
		45–60	Sandy loam	SM or SC	A–2	95–100	95–100
Fallsington. Fa, Fs	0–1	0–11	Loam or sandy loam	SM, ML, SM–SC	A–2, A–4	95–100	95–100
		11–27	Sandy clay loam, sandy loam.	SM, SC, CL	A–2, A–4	95–100	95–100
		27–46	Sandy loam	SM, SP	A–2, A–3	95–100	95–100
Johnston. Jo	[2] 0	0–14	Silt loam	OL, OH, MH	A–4, A–5, A–7	95–100	95–100
		14–26	Fine sandy loam	SM or ML	A–4	95–100	95–100
		26–42	Sand	SP	A–3	95–100	90–100
Keyport: Ka, Ke	1½–2	0–7	Silt loam, sandy loam	SM, ML, ML–CL	A–2, A–4	95–100	95–100
		7–42	Silty clay	CL, CH, MH–CH	A–6, A–7	95–100	95–100
		42–54	Sandy loam to clay	SM, SC, ML, CL	A–2, A–4, A–6, A–7	95–100	90–100
Klej: Kl	1–2½	0–20	Loamy sand	SM or SP–SM	A–2	95–100	95–100
		20–48	Sand	SP or SP–SM	A–3	95–100	95–100
Made land: Md. No estimates of properties.							
Matapeake. MeA, MeB MeC2.	5+	0–17	Silt loam	ML or ML–CL	A–4	95–100	95–100
		17–32	Silt loam or loam	CL or ML–CL	A–4, A–6, A–7	95–100	95–100
		32–42	Sandy loam	SM or SP–SM	A–2, A–4	90–100	85–100
Mattapex Mt	2	0–8	Silt loam	ML or ML–CL	A–4	95–100	95–100
		8–28	Silty clay loam	CL or ML–CL	A–4, A–6	95–100	95–100
		28–48	Sandy loam	SM or SP–SM	A–2, A–3	95–100	95–100
Mixed alluvial land Mv No estimates of properties.	[2] 0						
Othello: Ot	0–1	0–15	Silt loam	ML or ML–CL	A–4	95–100	95–100
		15–21	Silty clay loam	CL or ML–CL	A–4, A–6	95–100	95–100
		21–28	Silt loam	ML or ML–CL	A–4, A–6	95–100	95–100
		28–72	Sandy loam, loamy sand	SM or SP–SM	A–2, A–4	85–100	80–100
Plummer: Pl	0	0–36	Loamy sand	SM or SP–SM	A–2, A–3	95–100	95–100
		36–50	Sand	SP or SP–SM	A–3	95–100	95–100

See footnotes at end of table

properties of the soils

Percentage passing sieve—Continued: No. 40 (0.42 mm.)	Percentage passing sieve—Continued: No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction (unlimed)	Moisture-density data: Optimum moisture	Moisture-density data: Maximum dry density	Shrink-swell potential	Corrosivity: Uncoated steel	Corrosivity: Concrete
		In. per hr.	*In. per in. of soil*	*pH*	*Pct.*	*Lb./cu. ft.*			
90-100	70-100	0.20-2.0	0.18-0.27	4.0-5.0	(1)	(1)	High	High	High.
95-100	80-100	<0.20	0.18-0.24	4.0-5.0	17-26	90-110	High	High	High.
80-90	30-55	0.20-0.63	0.18-0.24	4.0-5.0	10-17	111-125	Moderate	High	High.
40-90	0-5	>6.3	<0.06	5.0-8.0	9-15	91-110	Very low	High	High.
90-100	30-90	0.20-2.0	0.12-0.27	4.0-5.0	9-15	101-115	Low to moderate	High	High.
90-100	85-95	<0.20	0.18-0.24	4.0-5.0	16-24	101-110	Moderate	High	High.
60-100	20-100	0.20-6.3	0.12-0.24	4.0-5.0	10-20	101-125	Low to moderate	High	High.
65-80	10-25	>6.3	<0.06	4.0-5.0	10-14	111-120	Very low	Low	High.
65-80	10-25	>6.3	<0.06	4.0-5.0	10-14	111-120	Very low	Low	High.
65-85	20-35	0.20-2.0	0.12-0.18	4.0-5.0	10-14	111-125	Low	Low	High.
70-95	30-55	2.0-6.3	0.12-0.18	4.0-5.0	12-18	105-115	Low	High	High.
65-100	30-55	0.63-2.0	0.18-0.24	4.0-5.0	10-14	111-125	Low	High	High.
50-90	5-35	2.0-6.3	0.06-0.12	4.0-5.0	10-14	101-125	Low	High	High.
85-100	55-90	0.20-0.63	0.18-0.27	4.0-5.0	25-40	71-100	Moderate to high	High	High.
70-85	40-55	0.63-6.3	0.12-0.18	3.5-4.5	12-18	101-115	Low	High	High.
50-90	5-10	>6.3	<0.06	3.5-4.5	10-14	95-110	Very low	High	High.
60-100	30-90	0.20-2.0	0.12-0.27	4.0-5.5	(1)	(1)	Low	High	High.
95-100	80-100	<0.20	0.18-0.27	4.0-5.5	14-24	101-110	Moderate	High	High.
60-100	25-100	0.20-2.0	0.18-0.24	4.0-5.0	10-24	95-125	Low to moderate	High	High.
60-90	10-25	>6.3	0.06-0.08	4.0-5.5	10-14	101-115	Very low	Moderate	High.
50-80	0-10	>2.0	<0.06	4.0-5.0	8-12	91-110	Very low	Moderate	High.
90-100	70-90	0.63-2.0	0.18-0.27	4.5-5.5	14-18	101-110	Low	Low	Moderate.
85-100	55-90	0.10-2.0	0.18-0.24	4.5-5.5	10-18	101-120	Low to moderate	Moderate	Moderate.
60-100	10-45	0.63-6.3	0.10-0.18	4.5-5.5	8-12	111-130	Low	Low	High.
90-100	55-90	0.20-2.0	0.18-0.27	4.5-5.5	(1)	(1)	Low	Moderate	Moderate.
90-100	70-95	0.20-0.63	0.18-0.24	4.5-5.5	12-18	101-120	Low to moderate	High	High.
75-90	10-35	0.63-6.3	0.06-0.18	4.0-5.5	10-15	111-125	Low	High	High.
80-100	60-100	0.20-2.0	0.18-0.27	4.0-5.0	12-18	105-120	Low	High	High.
85-100	70-100	0.20-0.63	0.18-0.24	4.0-5.0	12-18	111-120	Low to moderate	High	High.
85-100	65-100	0.20-0.63	0.18-0.24	4.0-5.0	12-18	105-120	Low	High	High.
55-95	15-45	0.63-6.3	0.06-0.12	4.0-5.0	10-14	111-130	Low	High	High.
60-90	5-20	>6.3	0.06-0.08	4.0-5.0	8-12	101-110	Very low	High	High.
60-90	0-10	>2.0	<0.06	3.5-5.0	8-12	91-100	Very low	High	High.

TABLE 8.—*Estimated engineering*

Soil series and map symbols	Depth to water table	Depth from surface	Classification			Percentage passing sieve—	
			USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
	Ft.	*In*					
Pocomoke: Pm, Po	0	0–12	Loam or sandy loam	SM, ML, OL, MH, OH	A–2, A–4, A–5, A–7	95–100	95–100
		12–27	Sandy clay loam	SC, SM–SC, CL, ML–CL	A–2, A–4, A–6	95–100	95–100
		27–45	Sandy loam	SM, SC, CL	A–4, A–6	95–100	95–100
		45–60	Gravelly coarse sand	SM or SP–SM	A–2	90–100	75–85
Rumford: RuA, RuB, RuC2, RuC3, RuD.	5+	0–19	Loamy sand	SM	A–2	95–100	95–100
		19–42	Sandy loam	SM, SC, SM–SC	A–2, A–4	95–100	95–100
		42–49	Loamy sand or sand	SP or SP–SM	A–2, A–3	95–100	95–100
Sassafras: SaA, SaB, SaC2, SaC3, SaD2, SfA, SfB, SfC2, SvE. For Evesboro part of SvE, see Evesboro series (EsD).	5+	0–15	Loam or sandy loam	SM or ML	A–2, A–4	95–100	95–100
		15–33	Sandy clay loam	SM, SC–SM, SC, CL, ML	A–2, A–4, A–6	95–100	95–100
		33–54	Loamy sand or sand	SP, SP–SM, SM	A–2, A–3	95–100	85–100
Swamp: Sw. No estimates of properties.	0						
Tidal marsh: Tm. No estimates of properties.	0						
Woodstown: Wo, Ws	1½–2½	0–11	Loam or sandy loam	SM, ML, ML–CL	A–2, A–4	95–100	95–100
		11–25	Sandy clay loam or sandy loam	SC, SM–SC, CL	A–4, A–6	95–100	95–100
		25–31	Loamy sand, sandy loam	SP–SM, SM–SC	A–2, A–4	95–100	95–100

[1] Supporting data for Bayboro, Keyport, Mattapex, and Sassafras soils are inadequate for reliable estimates.
[2] Soils are subject to flooding. All properties variable.

properties of the soils—Continued

Percentage passing sieve—Continued		Permeability	Available water capacity	Reaction (unlimed)	Moisture-density data		Shrink-swell potential	Corrosivity	
No 4 (0 42 mm.)	No 200 (0 074 mm)				Optimum moisture	Maximum dry density		Uncoated steel	Concrete
		In per hr	*In per in of soil*	*pH*	*Pct.*	*Lb /cu ft*			
80–100	25–90	0 63–2 0	0 12–0 27	4 0–5 0	12–40	71–110	Moderate to high	High	High.
80–100	30–90	0 63–2. 0	0 12–0. 18	4 0–5 0	7–17	105–125	Low	High	High.
70–100	35–85	0 63–6 3	0 12–0. 18	4 0–5 0	10–14	111–125	Low	High	High.
45–90	10–25	2 0–6. 3	0 06–0 12	4 0–5 0	10–15	101–120	Very low	High	High.
50–85	15–30	2 0–6. 3	0 06–0 08	4 0–5 0	8–12	111–130	Very low	Low	High.
65–90	25–40	0 63–2 0	0 12–0 18	4 0–5 0	7–18	111–130	Low	Low	High.
35–75	0–15	>6 3	<0 06	4 0–5 0	8–12	91–120	Very low	Low	High
55–85	30–70	0 63–6 3	0. 12–0 24	4 0–5 5	(1)	(1)	Low	Low	High.
65–90	25–70	0. 63–2 0	0 18–0 24	4. 0–5 0	7–18	111–130	Low	Low	High
30–75	10–25	2 0–6 3	<0 08	4 0–5 0	9–15	101–125	Very low	Low	High.
75–95	30–65	0 63–2 0	0 12–0 24	4 0–5 0	10–18	101–110	Low	Low	High.
75–95	35–65	0 63–2. 0	0 18–0. 24	4 0–5 0	7–18	111–125	Low	Moderate	High.
40–70	10–40	2 0–6 3	0. 06–0 12	4. 0–5 0	9–15	101–120	Low	Moderate	High.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Suitability as source of— Sand and gravel	Suitability as source of— Road fill	Soil features affecting— Pipeline and highway location	Soil features affecting— Farm ponds: Reservoir areas
Bayboro: Ba	Fair [1]	Unsuitable	Very poor	High water table; very poor stability, severe frost action.	Low to very low seepage.
Borrow pits: Bo. No interpretations made for purposes listed.					
Coastal beaches: Co	Unsuitable	Fair for sand; unsuitable for gravel.	Poor	Tidal saline water table, poor stability, wave action.	Excessive seepage
Elkton: El, Em	Poor	Unsuitable	Poor	High water table, poor stability; severe frost action.	Low to very low seepage.
Evesboro: Eo, EsB, EsD, Ev	Poor	Fair for sand; unsuitable for gravel.	Good, if soil binder is added.	Loose; fair stability.	High to excessive seepage.
Fallsington: Fa, Fs	Fair	Fair for sand; unsuitable for gravel.	Fair to good	High water table, fair to good stability, severe frost action.	Moderate seepage in subsoil, high seepage in substratum.
Johnston: Jo	Fair [1]	Poor for sand; unsuitable for gravel.	Unsuitable	High water table; very poor to fair stability, severe frost action, flood hazard.	Low to high seepage, constant source of water.
Keyport: Ka, Ke	Fair	Unsuitable	Poor	Moderately high water table, poor to fair stability, severe frost action.	Low to very low seepage.
Klej: Kl	Poor	Fair for sand; unsuitable for gravel	Fair to good. Soil binder may be needed.	Moderately high water table, fair stability; moderate frost action	High seepage
Made land. Md. No interpretations made for purposes listed.					
Matapeake: MeA, MeB, MeC2	Good	Poor for sand, unsuitable for gravel.	Fair to good	Fair to good stability, moderate frost action.	Moderately low seepage in subsoil, high seepage in substratum.

See footnote at end of table

interpretations of the soils

Soil features affecting—Continued					
Farm ponds—Con Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading
Very poor stability, plastic.	Slow permeability, very poor drainage	High available moisture capacity, slow infiltration, very poor drainage	Nearly level, very poor stability	High available moisture capacity, low fertility.	High water table, very poor drainage, plastic.
Poor stability, highly porous.	Excessive drainage___	Extremely low available moisture capacity, very rapid infiltration	Poor stability, very loose	Extremely low available moisture capacity, extremely low fertility	No serious problems.
Poor stability, plastic	Slow permeability; poor drainage	High available moisture capacity, slow infiltration, poor drainage	Nearly level, poor stability	High available moisture capacity, low fertility.	High water table; poor drainage; plastic.
Fair stability, porous	Excessive drainage___	Very low available moisture capacity; rapid infiltration.	Fair stability, loose__	Very low available moisture capacity, low fertility.	No serious problems.
Fair to good stability, compacts easily.	Moderate permeability, poor drainage.	High available moisture capacity, moderate infiltration, poor drainage	Nearly level, fair to good stability.	High available moisture capacity, low fertility.	High water table; poor drainage.
Surface layer unsuitable, substratum very porous.	Moderately slow permeability, very poor drainage, subject to flooding	High available moisture capacity, moderately slow infiltration, very poor drainage	Nearly level, very poor stability above substratum.	High available moisture capacity, low fertility.	High water table; very poor drainage, flood hazard.
Poor to fair stability, plastic	Slow permeability, moderately good drainage	High available moisture capacity, slow infiltration, moderately good drainage.	Nearly level, poor to fair stability.	High available moisture capacity, low fertility.	Moderately high water table, moderately good drainage; plastic.
Fair stability; porous.	Moderately rapid to rapid permeability, moderately good drainage.	Low available moisture capacity, moderately rapid to rapid infiltration; moderately good drainage.	Nearly level, fair stability, loose.	Low available moisture capacity, low fertility.	Moderately high water table; moderately good drainage, loose.
Fair stability_____	Good drainage______	High available moisture capacity, moderate infiltration.	Fair to good stability.	High available moisture capacity, moderate fertility.	Wet for short periods.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Pipeline and highway location	Farm ponds: Reservoir areas
Mattapex Mt	Good	Poor for sand, unsuitable for gravel	Fair	Moderately high water table, fair stability, severe frost action	Low seepage in subsoil, high seepage in substratum.
Mixed alluvial land Mv	Variable	Variable	Variable	Mostly high water table and severe frost action, flood hazard	Variable seepage, constant source of water
Othello Ot	Fair	Poor for sand, unsuitable for gravel.	Fair	High water table; poor stability, severe frost action	Low seepage in subsoil, high seepage in substratum.
Plummer Pl	Poor	Fair to good for sand, unsuitable for gravel.	Fair, soil binder may be needed	High water table, poor stability, severe frost action.	High seepage
Pocomoke: Pm, Po	Fair [1]	Fair for sand, poor for gravel	Fair to good	High water table, fair stability, severe frost action	Moderate seepage in subsoil, high seepage in substratum
Rumford RuA, RuB, RuC2, RuC3, RuD	Fair	Fair for sand, unsuitable for gravel.	Fair to good	Fair stability, slight frost action	Moderate seepage in subsoil high seepage in substratum.
Sassafras SaA, SaB, SaC2, SaC3, SaD2, SfA, SfB, SfC2, SvE (For Evesboro part of SvE, see Evesboro series)	Good	Fair for sand, poor to unsuitable for gravel	Good	Good stability, moderate frost action	Moderate seepage in subsoil. high seepage in substratum
Swamp. Sw	Unsuitable	Unsuitable	Unsuitable	High water table commonly ponded, extremely poor stability; severe frost action	Variable
Tidal marsh. Tm	Unsuitable	Unsuitable	Unsuitable	High saline water table, tidal flooding, extremely poor stability.	Not applicable
Woodstown: Wo, Ws	Good	Fair for sand, poor to unsuitable for gravel	Good	Moderately high water table, good stability, severe frost action	Moderate seepage in subsoil high seepage in substratum

[1] Surface layer high in organic-matter content, may be more desirable for topsoil than indicated if topsoil of high organic-matter content is desired.

interpretations of the soils—Con

Soil features affecting—Continued					
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading
Fair stability	Moderately slow permeability, moderately good drainage.	High available moisture capacity, moderate infiltration, moderately good drainage	Nearly level, fair stability	High available moisture capacity, moderate fertility.	Moderately high water table, moderately good drainage
Variable	Variable, subject to flooding	Variable	Nearly level, otherwise variable.	Variable	Mostly high water table, flood hazard, otherwise variable
Fair stability	Moderately slow permeability, poor drainage	High available moisture capacity, slow to moderate infiltration, poor drainage.	Nearly level, poor stability	High available moisture capacity, moderate fertility.	High water table, poor drainage
Fair to poor stability, porous.	Rapid permeability, poor drainage	Very low available moisture capacity, rapid infiltration, poor drainage	Nearly level, poor stability, loose	Very low available moisture capacity, very low fertility.	High water table, poor drainage, loose
Fair stability, compacts easily.	Moderate permeability, very poor drainage	High available moisture capacity, moderate infiltration; very poor drainage	Nearly level, fair stability	High available moisture capacity, moderate fertility	High water table, very poor drainage
Fair stability, compacts very easily	Somewhat excessive drainage.	Moderate available moisture capacity, rapid infiltration.	Fair stability	Moderate available moisture capacity, low fertility	No serious problems
Good stability; compacts very easily.	Good drainage	High available moisture capacity, moderate to moderately rapid infiltration.	Good stability	High available moisture capacity, moderate fertility	No serious problems
Extremely poor stability.	Not feasible	Not applicable	Not applicable	Not applicable	High water table, commonly ponded, extremely poor drainage
Extremely poor stability, otherwise variable.	Not feasible	Not applicable	Not applicable	Not applicable	High saline water table, tidal flooding
Good stability, compacts easily.	Moderate permeability; moderately good drainage.	High available moisture capacity, moderate infiltration; moderately good drainage.	Nearly level, good stability.	High available moisture capacity, moderate fertility.	Moderately high water table, moderately good drainage.

TABLE 10.—*Engineering*

[Tests performed by Soil Consultants, Inc., McLean, Va., in accordance with standard

Soil name and location	Report No.	Depth	Moisture-density data [1]: Maximum dry density	Moisture-density data [1]: Optimum moisture	Mechanical analysis [2] — Percentage passing sieve—: ¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
		In.	*Lb./cu. ft.*	*Pct.*			
Bayboro silt loam: 1.5 miles west of Petersburg; 100 feet east of Route 253, 0.5 mile south of State Route 10	63-7-1	0-6	72	37	---	100	99
	63-7-2	10-19	89	26	---	100	99
	63-7-3	19-32	109	17	---	100	99
Elkton sandy loam: 0.8 mile north of Blackiston, 65 feet east of Route 129.	63-8-1	0-7	111	13	---	100	99
	63-8-2	13-22	106	19	---	---	100
Elkton silt loam: 3.5 miles north of Leipsic, 48 feet east of Route 326, 400 feet south of Route 83	63-2-1	0-7	108	15	---	---	100
	63-2-2	9-21	104	20	---	---	100
	63-2-3	21-84	124	11	---	---	100
Evesboro loamy sand: 2.5 miles northwest of Houston, 2,000 feet north of junction of Routes 429 and 430 (clayey substratum)	67-1-1	0-9	115	11	---	---	100
	67-1-2	9-27	119	10	---	---	100
	67-1-3	45-59	123	11	100	97	96
Fallsington sandy loam: 1.5 miles north of Harrington, 0.1 mile south of Route 289, 60 feet west of Route 290.	63-9-1	0-7	108	16	100	99	98
	63-9-2	11-18	124	12	100	99	98
	63-9-3	18-27	124	10	[5] 99	99	98
Matapeake silt loam: 2.5 miles southeast of Leipsic, 1,300 feet south of Route 335, 50 feet east of Route 86	67-4-1	0-12	109	16	---	---	100
	67-4-2	17-32	120	10	---	---	100
	67-4-3	32-42	129	8	---	---	100
Othello silt loam: 2.75 miles northeast of Dover, 36 feet north of Route 336, 460 feet east of State Highway 9 (Modal)	63-4-1	0-8	121	18	---	---	100
	63-4-2	8-19	112	14	---	---	100
	63-4-3	25-36	113	13	---	---	100
Othello silt loam: 1.2 miles north of Whitehall Crossroad, 115 feet south of Route 83, 0.15 mile east of Route 11.	63-1-1	0-8	108	15	---	---	100
	63-1-2	15-21	115	14	---	---	100
	63-1-3	28-72	127	10	---	---	100
Othello silt loam: 1.3 miles north of Leipsic, 60 feet north of State Highway 9, 45 feet east of Route 11.	63-3-1	0-8	116	12	---	---	100
	63-3-2	12-15	113	15	---	---	100
	63-3-3	17-32	114	14	100	99	98
Pocomoke loam: 1 mile west of Petersburg, 60 feet south of State Highway 10, 265 feet west of farm lane.	63-6-1	0-7	85	27	---	100	99
	63-6-2	12-18	115	13	---	100	99
	63-6-3	27-45	121	12	100	98	96
Pocomoke loam: 2.5 miles southwest of Cheswold, 900 feet south of Route 167.	63-5-1	6-10	71	39	---	---	100
	63-5-2	14-25	108	17	---	---	100
	63-5-3	25-36	103	15	---	---	100

See footnotes at end of table

test data

procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Mechanical analysis [2]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—						AASHO	Unified
No 40 (0 42 mm)	No. 200 (0 074 mm.)	0 05 mm.	0 02 mm.	0.005 mm	0 002 mm				
						Pct			
90	80	79	60	30	18	69	15	A-7-5	MH or OH
90	81	79	61	40	31	50	16	A-7-5	ML or OL
95	92	91	78	44	33	39	16	A-6	CL
91	75	74	62	34	20	28	7	A-4	[3] ML-CL
95	87	87	78	55	45	52	24	A-7-6	MH-CH
96	85	83	68	32	17	28	6	A-4	ML-CL
98	92	90	81	55	45	53	28	A-7-6	CH
90	56	54	45	28	24	20	3	A-4	ML
65	14	12	8	5	3	[4] NP	NP	A-2-4	SM
67	17	15	10	4	3	NP	NP	A-2-4	SM
68	21	20	19	17	14	22	5	A-2-4	SM-SC
72	36	34	27	18	13	34	6	A-4	SM
70	33	32	29	22	18	25	10	A-2-4	SC
68	55	53	46	37	31	26	10	A-4	CL
91	73	71	53	25	16	29	6	A-4	ML-CL
87	59	57	45	24	18	26	8	A-4	CL
81	43	40	28	16	13	17	3	A-4	SM
99	94	91	63	32	20	33	6	A-4	ML
99	96	94	75	40	29	29	6	A-4	ML-CL
99	95	92	64	28	20	30	6	A-4	ML-CL
99	93	91	67	27	17	27	5	A-4	ML-CL
99	94	91	74	47	38	28	8	A-4	ML-CL
92	43	40	37	28	26	19	3	A-4	SM
99	95	92	65	29	21	29	5	A-4	ML-CL
99	95	93	73	47	38	29	8	A-4	ML-CL
96	87	83	51	26	22	32	8	A-4	ML-CL
88	65	63	42	19	13	48	12	A-7-5	ML or OL
89	68	66	54	28	21	23	4	A-4	ML-CL
82	55	53	44	27	23	29	12	A-6	CL
98	89	87	63	27	16	60	9	A-5	MH or OH
98	89	88	75	43	34	34	11	A-6	ML-CL
97	84	82	62	31	23	35	11	A-6	ML-CL

TABLE 10.—*Engineering*

Soil name and location	Report No	Depth	Moisture-density data [1]		Mechanical analysis [2]		
			Maximum dry density	Optimum moisture	Percentage passing sieve—		
					¾ in	No 4 (4 7 mm)	No 10 (2 0 mm)
		In	*Lb /cu ft*	*Pct*			
Rumford loamy sand:							
2 miles south of Frederica; 50 feet southeast of Route 390, 3,000 feet west of Route 119.	67-2-1	0-10	120	10			100
	67-2-2	10-19	128	8			100
	67-2-3	19-27	128	9			100
	67-2-4	27-36	126	9			100
	67-2-5	42-49	116	10			100
Woodstown sandy loam:							
1.3 miles north of Sandtown; 0 1 mile west of Route 208, 170 feet north of Route 211	67-3-1	0-8	107	16		100	99
	67-3-2	11-22	119	13	100	98	97
	67-3-3	31-36	113	15	100	98	95

[1] Based on AASHO Designation T 99-57(*2*)

[2] Mechanical analysis according to AASHO Designation T 88 Results by this procedure frequently differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS) In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all of the material, including that coarser than 2 millimeters in diameter. In the SCS procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data reported in this table are not suitable for use in naming textural classes for soil

Engineering classification of the soils

Two systems of classifying soils for engineering purposes are used in this survey, the AASHO system and the Unified system. Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*2*). Some engineers prefer the Unified soil classification system (*8*), which was developed by the Waterways Experiment Station, Corps of Engineers, U.S. Army.

The AASHO system is used to classify soils according to those properties that affect use in highway construction. In this system soils are placed in seven basic groups. The groups range from A-1, which consists of gravelly soils of high bearing capacity (the best soils for subgrade) to A-7, which consists of clayey soils that have low bearing strength when wet. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. If a soil is near a classification boundary, it is given a symbol showing both classes, for example, A-2 or A-4. The AASHO classification for tested soils is shown in table 10. The estimated AASHO classification for all soils mapped in Kent County is given in table 8.

In the Unified system, soils are classified according to particle size distribution, plastic properties, and organic matter. Soils are grouped in 15 classes. They are identified as coarse grained (GW, GP, GM, GC, SW, SP, SM, SC), fine grained (ML, CL, OL, MH, CH, OH), and highly organic (Pt). If a soil is on the borderline between two classifications, a joint classification symbol is used, for example, ML-CL. The Unified classification for tested soils in Kent County is given in table 10. The estimated Unified classification of all soils mapped in Kent County is given in table 8.

Community Development

This section consists of two main parts. The first part discusses residential and related uses of the soils and provides a table that gives the degree and kind of limitation of each soil in the county for specified uses. The second part discusses the use of soils for several recreational activities and gives, in a table, the limitations of each soil for specified recreational uses.

Use of the soils in community development

Kent County is still largely a rural area, but its population is growing and nonfarm use of the land is expanding. In recent years there has been a rapid increase in residential and commercial use of land, especially along some of the highways. Accompanying this change in use is a growing demand for information about soil conditions that affect nonfarm uses. Table 11 gives the degree and kind of limitation of each soil in Kent County for specified uses. This table can be used as a general guide by those who are concerned with many uses of the soils in community development. It should be particularly helpful to planning and zoning boards and to those who develop areas for residential and other community uses (fig. 15, page 58).

The degree of limitation reflects the most significant single limitation, but more than one kind of limitation *test data*—Continued

Mechanical analysis [2]—Continued						Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—						AASHO	Unified
No. 40 (0 42 mm)	No 200 (0 074 mm)	0 05 mm	0 02 mm.	0 005 mm	0.002 mm				
						Pct			
69	18	17	13	8	5	NP	NP	A–2–4	SM
69	23	21	18	13	9	NP	NP	A–2–4	SM
67	27	26	23	18	15	21	6	A–2–4	SM–SC
73	30	29	25	18	15	21	6	A–2–4	SM–SC
70	11	10	8	5	3	NP	NP	A–2–4	SP–SM
94	56	54	44	21	12	24	4	A–4	ML–CL
78	52	50	42	31	23	32	13	A–6	CL
68	40	38	36	33	28	45	21	A–7–6	SM–SC

[3] Soil Conservation Service and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification Examples in this table are ML–CL, MH–CH, SM–SC, and SP–SM

[4] Nonplastic

[5] 100 percent passed the 1-inch sieve.

may be listed. For example, a soil may have a moderate limitation for sewage lagoons because of permeability, but a steeper soil of the same series may have a severe limitation because of slope alone.

A severe limitation for a particular use does not mean that the soil cannot be put to that use. For example, a soil that has a high water table is considered severely limited for streets and parking lots, but it can be used for streets and parking lots if drainage is improved and the water table is lowered. Also, a soil with a slowly permeable subsoil is considered severely limited for disposal of effluent from septic tanks, but some special means of effluent disposal may be utilized if the expense is justified.

Following are the soil properties that affect the uses specified in table 11.

- Disposal of sewage effluent from septic tanks: permeability, depth to seasonally high water table, natural drainage, slope, and hazard of flooding.
- Sites for sewage lagoons: permeability, slope, and hazard of flooding.
- Foundations for homes of three stories or less: depth to water table, natural drainage, stability of the subsoil, slope, and hazard of flooding. For industrial and commercial buildings and for homes or apartments of more than three stories, a special investigation should be made at each site.
- Roads, streets, and parking lots: depth to water table, stability, slope, and hazard of flooding.
- Sites for sanitary land fill: permeability, depth to water table, slope, hazard of flooding, texture of materials, and shrink-swell potential.
- Cemeteries: permeability of the subsoil, depth to water table, texture of the surface soil, degree of erosion, stability, slope, and hazard of flooding.
- Home gardens: natural drainage, texture of the surface soil, permeability of the subsoil, available moisture capacity, natural fertility, slope, degree of erosion, and hazard of flooding.

Use of the soils for recreational facilities

Table 12 shows the degree and kind of limitation of each soil in the county for specified recreational uses. The ratings were based on depth to water table, natural drainage, permeability, texture of the surface soil, soil stability, slope, and hazard of flooding. No one property limits a soil for all recreational uses or necessarily to the same degree for different uses. A slope of 5 percent or more severely limits the use of a soil for an athletic field because so much land leveling is required. On the other hand, only slopes of more than 15 percent severely limit the use of a soil for tenting or picnicking.

A soil may be severely limited for some specified use, and yet may be put to that use. For example, soils severely limited for trailer parks may be used for trailer parks if drainage is improved or the surface is leveled or the site is otherwise altered as may be necessary. Such treatment usually entails expensive preparation and maintenance.

Service buildings are needed in connection with some recreational facilities. Since such buildings generally are not large, the limitations are approximately the same as for homes.

TABLE 11.—*Limitations of*

Soil series and map symbols	Disposal fields for septic tank systems	Sewage lagoons [1]	Foundations for homes of three stories or less
Bayboro: Ba	Severe: high water table, slow permeability.	Slight	Severe: high water table
Borrow pits: Bo. Extremely variable.			
Coastal beaches: Co	Severe: fluctuating water table, tidal flooding.[3]	Severe: very rapid permeability, tidal flooding.[3]	Severe: fluctuating water table, tidal flooding; poor stability.
Elkton: El, Em	Severe: high water table; slow permeability.	Slight	Severe: high water table
Evesboro: Eo, Ev	Slight [3]	Severe: rapid permeability [3]	Slight
EsB	Slight [3]	Severe: rapid permeability [3]	Slight
EsD	Moderate: 5 to 15 percent slope.[3]	Severe: rapid permeability, 5 to 15 percent slope.[3]	Moderate: 5 to 15 percent slope.
Fallsington: Fa, Fs	Severe: high water table	Moderate: moderate permeability.	Severe: high water table
Johnston: Jo	Severe: high water table, flood hazard.[3]	Severe: flood hazard [3]	Severe: high water table, flood hazard.
Keyport: Ka, Ke	Severe: slow permeability	Slight	Moderate: moderately high water table.
Klej: Kl	Moderate: moderately high water table.[3]	Severe: rapid permeability [3]	Moderate: moderately high water table.
Made land: Md. Extremely variable.			

See footnotes at end of table.

soils for community development

Roads in open areas	Streets and parking lots	Sites for sanitary land fill	Cemeteries	Home gardens [2]
Severe. high water table.	Severe high water table	Severe: high water table, slow permeability; plastic materials; high shrink-swell potential	Severe high water table, slow permeability	Severe very poor natural drainage
Severe fluctuating water table, tidal flooding, poor stability.	Severe fluctuating water table, tidal flooding, poor stability	Severe. fluctuating water table, tidal flooding [3]	Severe. fluctuating water table, tidal flooding, poor stability.	Severe extreme droughtiness, low fertility, salinity, cutting by windblown sand.
Severe high water table	Severe: high water table.	Severe high water table, slow permeability; plastic materials, moderate shrink-swell potential	Severe high water table, slow permeability.	Severe poor natural drainage
Slight	Slight	Slight [3]	Severe very sandy, loose	Severe very low available moisture capacity, very low fertility
Slight	Moderate 2 to 5 percent slope.	Slight [3]	Severe very sandy, loose.	Severe very low available moisture capacity, very low fertility
Moderate 5 to 15 percent slope	Severe 5 to 15 percent slope	Moderate: 5 to 15 percent slope [3]	Severe very sandy, loose.	Severe very low available moisture capacity, very low fertility, 5 to 15 percent slope
Severe high water table	Severe high water table.	Severe: high water table	Severe high water table.	Severe poor natural drainage
Severe: high water table, flood hazard.	Severe: high water table, flood hazard	Severe high water table; flood hazard [3]	Severe: high water table, flood hazard.	Severe very poor natural drainage, flood hazard
Moderate moderately high water table	Moderate: moderately high water table	Severe slow permeability; plastic material, moderate shrink-swell potential.	Severe: slow permeability	Moderate: impeded natural drainage
Moderate moderately high water table	Moderate moderately high water table	Moderate: moderately high water table.[3]	Severe very sandy, loose.	Severe: low available moisture capacity; impeded natural drainage.

TABLE 11.—*Limitations of*

Soil series and map symbols	Disposal fields for septic tank systems	Sewage lagoons [1]	Foundations for homes of three stories or less
Matapeake:			
MeA	Moderate: moderate to moderately slow permeability.	Moderate: moderate to to moderately slow permeability.	Slight
MeB	Moderate: moderate to moderately slow permeability.	Moderate: moderate to moderately slow permeability, 2 to 5 percent slope	Slight
MeC2	Moderate: moderate to moderately slow permeability	Severe: 5 to 10 percent slope	Slight
Mattapex: Mt	Severe: moderately slow permeability	Slight	Moderate: moderately high water table
Mixed alluvial land: Mv	Severe: variable water table; variable permeability, flood hazard.[3]	Severe: flood hazard [3]	Severe: variable water table, flood hazard.
Othello: Ot	Severe: high water table, moderately slow permeability.	Slight	Severe: high water table
Plummer: Pl	Severe: high water table [3]	Severe: rapid permeability [3]	Severe: high water table
Pocomoke: Pm, Po	Severe: high water table	Moderate: moderate permeability	Severe: high water table
Rumford:			
RuA	Slight	Moderate: moderate permeability	Slight
RuB	Slight	Moderate: moderate permeability, 2 to 5 percent slope.	Slight
RuC2	Slight	Severe: 5 to 10 percent slope.	Slight
RuC3	Slight	Severe: 5 to 10 percent slope	Slight
RuD	Moderate: 10 to 15 percent slope	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope

See footnotes at end of table.

soils for community development—Continued

Roads in open areas	Streets and parking lots	Sites for sanitary land fill	Cemeteries	Home gardens [2]
Slight	Slight	Slight	Slight	Slight.
Slight	Moderate 2 to 5 percent slope.	Slight	Slight	Moderate: 2 to 5 percent slope
Moderate 5 to 10 percent slope.	Severe 5 to 10 percent slope	Slight	Slight	Severe 5 to 10 percent slope
Moderate: moderately high water table	Moderate: moderately high water table	Moderate moderately high water table, moderately slow permeability	Moderate. moderately high water table, moderately slow permeability	Moderate. impeded natural drainage
Severe variable water table, flood hazard.	Severe: variable water table, flood hazard	Severe: variable water table; variable permeability, flood hazard.[3]	Severe variable water table, variable permeability; flood hazard	Severe impeded to very poor natural drainage, flood hazard
Severe high water table	Severe. high water table	Severe high water table.	Severe high water table	Severe poor natural drainage
Severe: high water table	Severe high water table	Severe high water table [3]	Severe high water table, very sandy, loose	Severe very low available moisture capacity; very low fertility; poor natural drainage
Severe high water table.	Severe high water table	Severe: high water table	Severe high water table	Severe very poor natural drainage.
Slight	Slight	Slight	Moderate loamy sand surface layer	Moderate moderate available moisture capacity.
Slight	Moderate. 2 to 5 percent slope.	Slight	Moderate: loamy sand surface layer	Moderate. moderate available moisture capacity; 2 to 5 percent slope.
Moderate. 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Moderate: loamy sand surface layer.	Severe 5 to 10 percent slope
Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Moderate loamy sand surface layer, severely eroded.	Severe 5 to 10 percent slope, severely eroded
Moderate 10 to 15 percent slope.	Severe 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: loamy sand surface layer, 10 to 15 percent slope	Severe: 10 to 15 percent slope

TABLE 11.—*Limitations of*

Soil series and map symbols	Disposal fields for septic tank systems	Sewage lagoons [1]	Foundations for homes of three stories or less
Sassafras:			
SaA	Slight	Moderate: moderate permeability.	Slight
SaB	Slight	Moderate: moderate permeability; 2 to 5 percent slope.	Slight
SaC2	Slight	Severe: 5 to 10 percent slope.	Slight
SaC3	Slight	Severe: 5 to 10 percent slope.	Slight
SaD2	Moderate: 10 to 15 percent slope.	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.
SfA	Slight	Moderate: moderate permeability.	Slight
SfB	Slight	Moderate: moderate permeability, 2 to 5 percent slope.	Slight
SfC2	Slight	Severe: 5 to 10 percent slope	Slight
Sassafras and Evesboro: SvE			
Sassafras	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope.
Evesboro	Severe: 15 to 40 percent slope.[3]	Severe: rapid permeability, 15 to 40 percent slope.[3]	Severe: 15 to 40 percent slope.
Swamp: Sw	Severe: ponded	Severe: variable material, ponded.	Severe: ponded
Tidal marsh: Tm	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding
Woodstown: Wo, Ws	Moderate: moderately high water table.	Moderate: moderate permeability.	Moderate: moderately high water table.

[1] It is assumed that any surface layer or other horizons that contain appreciable amounts of organic matter will be removed and that the floor of the sewage lagoon will be constructed on the least permeable layer in the profile. If it is constructed on a more permeable layer, the limitation will be greater.

soils for community development—Continued

Roads in open areas	Streets and parking lots	Sites for sanitary land fill	Cemeteries	Home gardens [2]
Slight	Slight	Slight	Moderate: sandy loam surface layer.	Slight.
Slight	Moderate: 2 to 5 percent slope.	Slight	Moderate: sandy loam surface layer.	Moderate: 2 to 5 percent slope.
Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Moderate: sandy loam surface layer.	Severe: 5 to 10 percent slope.
Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Moderate: severely eroded.	Severe: 5 to 10 percent slope, severely eroded.
Moderate: 10 to 15 percent slope.	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Severe: 10 to 15 percent slope.
Slight	Slight	Slight	Slight	Slight.
Slight	Moderate: 2 to 5 percent slope.	Slight	Slight	Moderate: 2 to 5 percent slope.
Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Slight	Severe: 5 to 10 percent slope.
Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope	Severe: 15 to 40 percent slope.
Severe: 15 to 40 percent slope	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope [3]	Severe: very sandy; loose; 15 to 40 percent slope.	Severe: very low available moisture capacity, very low fertility, 15 to 40 percent slope.
Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded
Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding	Severe: tidal flooding.
Moderate: moderately high water table.	Moderate: moderately high water table.	Moderate: moderately high water table	Moderate: moderately high water table.	Moderate: impeded natural drainage.

[2] Refers to intensively managed small vegetable or flower gardens and to concentrations of shrubbery or other ornamentals.
[3] Probability of polluting nearby wells, springs, ponds, streams, or other sources of water.

***Figure 15.*—Schoolhouse constructed on Woodstown sandy loam, a soil that has a high water table. The standing water covers the area intended as a playground.**

Use of the Soil Survey in Community Planning

Reliable information about the soils is needed in planning the use of soils for different kinds of community development, so that efficient use of each area can be determined. Generally, the soils well suited to farming are also the soils well suited to building and other nonfarm uses.

Among the soils that are well suited to farming without artificial drainage are the nearly level and gently sloping soils of the Matapeake, Rumford, and Sassafras series. Such soils make up more than a third of the county. An even larger proportion, about 48 percent of the county, is made up of soils well suited to farming if adequately drained or well protected.

The Evesboro, Rumford, and Sassafras soils that have a slope of less than 10 percent (see table 11) have only slight limitations for disposal of effluent from septic tanks. These soils make up about 36 percent of the county.

Some of the slowly permeable soils or those that have a high water table have severe limitations for disposal of effluent from septic tanks. They have only slight limitations, however, for use as sewage lagoons.

The Matapeake, Rumford, and Sassafras soils that have slopes of no more than 2 percent have only slight limitations for use as athletic fields and other nearly level intensive play areas. These soils occupy slightly more than 13 percent of the county, and most communities have some areas of them. Many other soils of the county have moderate limitations for use as intensive play areas because they are sandy or are seasonally wet or have a slope range of 2 to 5 percent (see table 12). Such soils make up about a third of the land area of the county.

Most of the well-drained soils that have a slope range of 10 percent or less have only slight limitations for use as parks and general recreational and picnic areas. The only soils that are severely limited for these uses are those that have very high water tables, those subject to flooding, and those that have a slope range of more than 15 percent.

Artificial ponds and small lakes are desirable for recreational uses and for their esthetic value. Soils of the Bayboro, Elkton, Fallsington, Othello, Plummer, and Pocomoke series are generally suitable for excavated ponds. Soils of the Johnston, Keyport, Klej, Mattapex, and Woodstown series and Mixed alluvial land are generally suitable for either excavated ponds or impoundments (fig. 16). Soils of the Evesboro, Matapeake, Rumford, and Sassafras series are generally suitable only for impoundments, not for excavated ponds. In impoundments, both the dam and the floor of the pond must con-

TABLE 12.—*Limitations of soils for recreational uses*

Soil series and map symbols	Campsites for tents and trailers	Athletic fields and intensive play areas	Parks and extensive play and picnic areas	Lawns, fairways, and landscaping	Paths and trails
Bayboro: Ba	Severe: high water table, slow permeability.	Severe: high water table; slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Borrow pits: Bo. Extremely variable.					
Coastal beaches: Co	Severe: fluctuating water table, tidal flooding, extreme sandiness.	Severe: fluctuating water table, tidal flooding, extreme sandiness.	Severe: tidal flooding, extreme sandiness.	Severe: tidal flooding, extreme sandiness.	Severe: extreme sandiness.
Elkton: El, Em	Severe: high water table, slow permeability.	Severe: high water table, slow permeability.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Evesboro: Eo	Severe: loose sand	Severe: loose sand	Severe: loose sand	Severe: loose sand	Moderate: loose sand.
EsB	Moderate: loose loamy sand.	Moderate: loose loamy sand, 2 to 5 percent slope.	Moderate: loose loamy sand.	Severe: loose loamy sand.	Moderate: loose loamy sand.
EsD	Moderate for tents, severe for trailers: loose loamy sand, 5 to 15 percent slope.	Severe: 5 to 15 percent slope.	Moderate: loose loamy sand, 5 to 15 percent slope.	Severe: loose loamy sand.	Moderate: loose loamy sand.
Ev	Moderate: loose loamy sand.	Moderate: loose loamy sand.	Moderate: loose loamy sand.	Severe: loose loamy sand.	Moderate: loose loamy sand.
Fallsington: Fa, Fs	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Johnston: Jo	Severe: high water table, flood hazard.[1]	Severe: high water table, flood hazard.[2]	Severe: high water table, flood hazard.[2]	Severe: high water table, flood hazard.[2]	Severe: high water table; flood hazard.
Keyport: Ka	Severe: slow permeability.	Severe: slow permeability.	Slight	Moderate: sandy loam surface layer.	Slight.
Ke	Severe: slow permeability.	Severe: slow permeability.	Slight	Slight	Slight.
Klej: Kl	Moderate: moderately high water table, loose loamy sand.	Moderate: moderately high water table, loose loamy sand.	Moderate: loose loamy sand.	Severe: loose loamy sand.	Moderate: loose loamy sand.
Made land: Md. Extremely variable.					
Matapeake: MeA	Slight	Slight	Slight	Slight	Slight.
MeB	Slight	Moderate: 2 to 5 percent slope.	Slight	Slight	Slight.
MeC2	Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Slight	Slight.

See footnotes at end of table.

TABLE 12.—*Limitations of soils for recreational uses*—Continued

Soil series and map symbols	Campsites for tents and trailers	Athletic fields and intensive play areas	Parks and extensive play and picnic areas	Lawns, fairways, and landscaping	Paths and trails
Mattapex: Mt	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table, moderately slow permeability.	Slight	Slight	Slight.
Mixed alluvial land: Mv	Severe: variable water table, variable permeability, flood hazard.[1]	Severe: variable water table, variable permeability, flood hazard.[2]	Severe: variable water table, flood hazard.[2]	Severe: variable water table, flood hazard.[2]	Severe: variable water table, flood hazard.
Othello: Ot	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Plummer: Pl	Severe: high water table	Severe: high water table.	Severe: high water table.	Severe: high water table, loose loamy sand.	Severe: high water table.
Pocomoke: Pm, Po	Severe: high water table	Severe: high water table.	Severe: high water table	Severe: high water table	Severe: high water table
Rumford:					
RuA	Slight	Slight	Slight	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer
RuB	Slight	Moderate: 2 to 5 percent slope	Slight	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer
RuC2	Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope	Slight	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer
RuC3	Moderate: 5 to 10 percent slope	Severe: 5 to 10 percent slope.	Slight	Moderate: loamy sand surface layer, severely eroded.	Moderate: loamy sand surface layer
RuD	Moderate: 10 to 15 percent slope	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: loamy sand surface layer, 10 to 15 percent slope	Moderate: loamy sand surface layer
Sassafras:					
SaA	Slight	Slight	Slight	Moderate: sandy loam surface layer.	Slight
SaB	Slight	Moderate: 2 to 5 percent slope.	Slight	Moderate: sandy loam surface layer	Slight
SaC2	Moderate: 5 to 10 percent slope	Severe: 5 to 10 percent slope.	Slight	Moderate: sandy loam surface layer	Slight.
SaC3	Moderate: 5 to 10 percent slope	Severe: 5 to 10 percent slope.	Slight	Moderate: sandy loam surface layer, severely eroded.	Slight.
SaD2	Moderate: 10 to 15 percent slope	Severe: 10 to 15 percent slope	Moderate: 10 to 15 percent slope.	Moderate: sandy loam surface layer, 10 to 15 percent slope.	Slight.
SfA	Slight	Slight	Slight	Slight	Slight.

See footnotes at end of table

TABLE 12.—*Limitations of soils for recreational uses*—Continued

Soil series and map symbols	Campsites for tents and trailers	Athletic fields and intensive play areas	Parks and extensive play and picnic areas	Lawns, fairways, and landscaping	Paths and trails
Sassafras—Continued					
SfB	Slight	Moderate: 2 to 5 percent slope	Slight	Slight	Slight.
SfC2	Moderate: 5 to 10 percent slope.	Severe: 5 to 10 percent slope.	Slight	Slight	Slight.
Sassafras and Evesboro: SvE					
Sassafras	Severe: 15 to 40 percent slope	Severe 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe 15 to 40 percent slope.	Moderate to severe on slopes of more than 25 percent.
Evesboro	Severe. 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe: 15 to 40 percent slope.	Severe. loose loamy sand, 15 to 40 percent slope.	Moderate to severe on slopes of more than 25 percent
Swamp: Sw	Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded	Severe ponded.
Tidal marsh: Tm	Severe: tidal flooding.	Severe: tidal flooding.	Severe: tidal flooding.	Severe: tidal flooding.	Severe. tidal flooding
Woodstown:					
Wo	Moderate: moderately high water table.	Moderate. moderately high water table.	Slight	Moderate sandy loam surface layer.	Slight
Ws	Moderate: moderately high water table.	Moderate: moderately high water table.	Slight	Slight	Slight.

[1] Flooded during the season of heavy use more than once in 5 years.

[2] Flooded during the season of heavy use more than once in 2 years.

sist of soil material that does not permit excessive seepage. Chemical treatment or other special treatment may be needed to seal the material and prevent excessive seepage.

An onsite investigation should be made before constructing a pond in any of the soils.

Formation and Classification of the Soils

This section discusses the major factors of soil formation, the processes of soil formation as they relate to Kent County, and the system of classifying soils into categories broader than the series.

Factors of Soil Formation

Soils form as a result of the interaction of five major factors: climate, plant and animal life, parent material, relief, and time. All five affect the formation of every soil, but the importance of each varies from place to place. Sometimes one is more important, and sometimes another, and in some places the influence of each is about equal.

Climate

Kent County has the temperate, rather humid climate that is typical of most coastal areas of the Middle Atlantic States. The climate is fairly uniform throughout the county, and no important differences among soils can be attributed to it. There are, however, some differences in microclimate. For example, in a narrow band along Delaware Bay, the humidity is higher than in other parts of the county and, consequently, plants lose less moisture through transpiration. Also, the temperature changes more gradually along the Bay and the weather is warmer in winter and cooler in summer than it is farther inland.

Precipitation exceeds evapotranspiration in Kent County. Because of this, the soils have been leached of most of their soluble materials and are strongly acid and generally low in plant nutrients. Besides leaching soluble material, water percolating through a soil moves clay particles from the surface layer to a lower layer. The effects of leaching and translocation of clay have been fairly uniform throughout the county. Some flood-plain deposits, however, are too recent to have been affected much, and some older deposits are very sandy and contain too little clay. Alternate wetting and drying and alternate freezing and thawing are responsible for the blocky structure in clay-enriched subsoils.

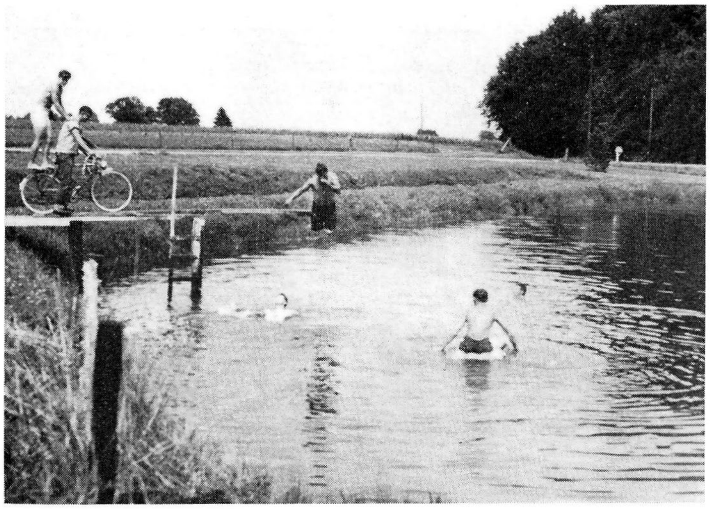

Figure 16.—**Excavated pond in an area of Mixed alluvial land, near Hickman. The water level is maintained by subsurface recharge. The pond is used for fishing and swimming. It is stocked with bass and bluegills.**

Plant and animal life

In general, there is no evidence that any differences among the soils in this county result from differences in plant or animal life, but the original vegetation was a major influence in soil development. The original vegetation, except on the coastal marshes, was a dense forest of hardwoods. Hardwoods use large amounts of calcium and other bases, if these are available, and return some to the soils each year when the leaves fall. The soils of the county were never high in bases, and except for this return through leaf fall, many would now be more acid than they are. Pines, which need fewer bases than hardwoods, have invaded some of the cutover and second-growth woodlands.

The activities of man have had an influence and will continue to have. Clearing and cultivating the soils, introducing new kinds of crops and other plants, and improving drainage have affected development of the soils and will more strongly affect their development in the future. The most important changes brought about by man are the mixing of the upper horizons of the soil to form a plow layer; the tilling of sloping soils, which results locally in accelerated erosion and the deposition of debris on flood plains and other areas: and liming and fertilizing, which change the reaction and the content of plant nutrients, especially in the upper horizons. The most obvious change made by man has been the replacement of the native vegetation.

Parent material

The parent material from which the soils of this county developed consisted entirely of sediments, most transported into the area by water but some probably transported by wind and some by ice floes carried by glacial melt water. These sediments ranged in size from clay particles to pebbles and include cobblestones and small stones. They were deposited in a shallow sea and later emerged to form the Delmarva Peninsula, of which Kent County is a part.

The texture of the present soils is directly related to the texture of the original parent material. Soils of the Evesboro, Klej, and Plummer series, for example, developed in coarse-textured sediments that consisted chiefly of silica sand but contained minor quantities of silt and clay. There is evidence that the parent material of these soils, especially that of the Evesboro soils, was reworked by wind or water or both.

Over about 71 percent of the county, the sediments that made up the parent material consisted mainly of sand but contained significant amounts of clay and silt. These deposits were not uniform, and in many places they were stratified. Soils of the Fallsington, Pocomoke, Sassafras, and Woodstown series formed in this kind of material. The differences among these soils are those caused by differences in natural drainage.

Soils of the Matapeake, Mattapex, and Othello series formed in a relatively thin mantle of silt deposited over sandier materials.

In small areas that make up a little more than 1 percent of the county, the sediments consisted chiefly of clay and silty clay and included some fine to very fine sand. These finer textured deposits overlie sandier materials and are not very thick. Soils of the Bayboro, Elkton, and Keyport series formed in these relatively thin, clayey deposits.

Several kinds of sediments have been deposited more recently. Soils of the Johnston series formed in recent deposits of variable alluvium that is still being deposited on flood plains. Tidal marsh consists of recent sediments that have been influenced by salt water and the action of tides. Coastal beaches are water-deposited and wave-worked sands; and Swamp consists of unclassified sediments that are permanently waterlogged.

Relief

Most of the county is a plain that slopes gently upward and westward from Delaware Bay to the Chesapeake watershed and even more gently downward beyond that line. Local differences in elevation are only a few feet at most. In most of the county, the gradient is only a few feet per mile. The highest elevation in the county is about 80 feet.

Even though the local differences in elevation are slight, they have a strong influence on natural drainage. In most places the moderately well drained Woodstown soils are only slightly lower than the well drained Sassafras soils. The poorly drained Fallsington soils and the very poorly drained Pocomoke soils are generally only slightly lower than the Woodstown soils.

Time

Time is also important in soil formation and morphology. The most recent deposits in the county are those on alluvial flood plains and in marshy areas affected by tides. In such areas soil material is still being added whenever the areas are flooded. Most deposits, however, have been in place long enough for distinct development and differentiation of soil horizons to have taken place. The highly siliceous materials in the most sandy areas are resistant to change, even over very long periods of time.

Processes of Soil Formation

The differentiation of horizons in soils is the result of one or more of the following processes: (1) accumulation of organic matter; (2) leaching of carbonates and more soluble salts; (3) chemical weathering (chiefly by hydrolysis) of primary minerals into silicate clay minerals; (4) translocation of the silicate clays, and probably some silt-sized particles, from one horizon to another; and (5) reduction and transfer of iron.

Several of these processes have been active in the formation of most soils of this county. The interaction of the first four processes is reflected in the strongly expressed horizons of the Sassafras soils, and all five processes have been active in the development of the moderately well drained Keyport, Mattapex, and Woodstown soils. Only the processes of accumulation of organic matter and the reduction and transfer of iron had much effect on the Johnston and Plummer soils. In most soils, the leaching of carbonates and more soluble salts probably took place in the soil materials before they were deposited, and some of the other processes may have been active.

Some organic matter has accumulated in all the soils to form an A1 horizon. The organic-matter content ranges from very little in the A1 horizons of the Evesboro soils to 15 percent or more in the prominent A1 horizons of the Bayboro, Johnston, and Pocomoke soils. The A1 horizon becomes part of the Ap horizon through tillage and loses its identity.

The translocation of clay minerals is largely responsible for the development of horizons in most of the soils. Silicate clay minerals removed from the A horizons have been immobilized, at least in part, in the Bt horizons. This is characteristic of soils of the Bayboro, Elkton, Fallsington, Keyport, Matapeake, Mattapex, Othello, Pocomoke, Rumford, Sassafras, and Woodstown series, which occupy about 84 percent of the county.

The reduction and transfer of iron has occurred in all the soils that do not have good natural drainage. This process, known as gleying, has been especially important in the formation of Bayboro, Elkton, Fallsington, Othello, Plummer, and Pocomoke soils. A part of the iron is commonly reoxidized and segregated, forming the yellowish-brown, strong-brown, or other bright-colored mottles on an essentially gray matrix in the subsoils.

When silicate clay forms from primary minerals, some iron is usually freed as hydrated oxide. These oxides are more or less red and, even when present in rather small amounts, will give at least a brownish color to the soil materials. They are largely responsible for the colors that dominate the subsoils of the Matapeake, Rumford, and Sassafras soils and the upper part of the subsoils of the Keyport, Mattapex, and Woodstown soils.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationships to each other and to the whole environment, and develop principles that will help us to understand their behavior and response to use. First through classification and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Two systems of classifying soils above the series level are now in general use in the United States. The older system was adopted in 1938 (*3*) and was later revised (*5*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 (*7*) and was supplemented in 1967 and in 1968. This system is under continual study. Readers interested in the development of the system should refer to the latest literature available (*4*).

The current system consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 13 shows the classification of the soil series of

TABLE 13.—*Classification of soil series of Kent County*

Series	Current classification			1938 classification by great soil groups
	Family	Subgroup	Order	
Bayboro	Clayey, mixed, thermic	Umbric Paleaquults	Ultisols	Humic Gley soils.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Evesboro	Mesic, coated	Typic Quartzipsamments	Entisols	Regosols.
Fallsington	Fine-loamy, siliceous, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Johnston	Coarse-loamy, siliceous, acid, thermic	Cumulic Humaquepts	Inceptisols	Humic Gley soils.
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Klej	Mesic, coated	Aquic Quartzipsamments	Entisols	Regosols.
Matapeake	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Mattapex	Fine-silty, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Othello	Fine-silty, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Plummer	Loamy, siliceous, thermic	Grossarenic Paleaquults	Ultisols	Regosols
Pocomoke	Coarse-loamy, siliceous, thermic	Typic Umbraquults	Ultisols	Humic Gley soils.
Rumford	Coarse-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Sassafras	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Woodstown	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils.

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Kent County according to both the current system and the great soil group of the 1938 system. The categories of the current system are defined briefly in the following paragraphs.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Three of the ten soil orders occur in Kent County: Ultisols, Entisols, and Inceptisols.

Ultisols are mineral soils that contain a clay-enriched B horizon that has less than 35 percent base saturation. The base saturation decreases with increased depth. This order is represented in Kent County by soils of the Bayboro, Elkton, Fallsington, Keyport, Matapeake, Mattapex, Othello, Plummer, Pocomoke, Rumford, Sassafras, and Woodstown series.

Entisols are recent soils in which there has been no horizon development. This order is represented in the county by soils of the Evesboro and Klej series.

Inceptisols occur mostly in young land surfaces. This order is represented in the county by soils of the Johnston series.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The soil properties used are mainly those that reflect either the presence or absence of waterlogging, or differences in climate or vegetation. The climatic range of the suborders is narrower than that of the orders.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in the kinds and sequence of major horizons and soil features. The horizons considered are those in which clay, iron, or humus has accumulated and those that have pans that interfere with the growth of roots or the movement of water. The features considered are the self-mulching properties of clays, soil temperature, chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 13, because it is the second word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the group, and other groups, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY.—Families are established within each subgroup, primarily on the basis of properties that affect the growth of plants or the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

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Glossary

AC soil. A soil that has an A and a C horizon but no B horizon. Commonly such soils are immature, as those developing from alluvium or those on steep, rocky slopes

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Clay. As a soil separate, the mineral soil particles less than 0 002 millimeter in diameter As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose—Noncoherent when dry or moist; does not hold together in a mass when dry or moist.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky—When wet, adheres to other material and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Gravelly soil material. Material in which 15 to 50 percent, by volume, is rounded or angular fragments of rock that are not prominently flattened and are up to 3 inches in diameter. A single piece is a *pebble*. *Gravel* is a mass of pebbles.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes These are the major horizons:

O horizon—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides)

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon is the solum

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Miscellaneous land type. A mapping unit for areas of land that have little or no natural soil; or that are too nearly inaccessible for orderly examination; or that occur where, for other reasons, it is not feasible to classify the soil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few*, *common*, and *many;* size—*fine*, *medium*, and *coarse;* and contrast—*faint*, *distinct*, and *prominent* The size measurements are these: *fine*, less than 5 millimeters (about 0 2 inch) in diameter along the greatest dimension: *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0 6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural soil drainage. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets Seven different classes of natural soil drainage are recognized

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils

Very poorly drained soils are wet nearly all the time They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile

Nutrient, plant. Any element that is taken in by a plant, is essential to its growth, and is used by the plant in the production of food and tissue Among the elements obtained from the soil are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc Plant nutrients obtained largely from air and water are carbon, hydrogen, and oxygen.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7 0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4 5	Mildly alkaline	7 4 to 7.8
Very strongly acid	4 5 to 5 0	Moderately alkaline	7 9 to 8 4
Strongly acid	5.1 to 5 5	Strongly alkaline	8.5 to 9.0
Medium acid	5 6 to 6 0	Very strongly alkaline	9 1 and higher
Slightly acid	6 1 to 6 5		
Neutral	6.6 to 7.3		

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be any mineral composition As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0 05 millimeter). As a textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular* *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland. Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers

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

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Dashes indicate that assignment to that particular interpretive group was not made. An outline of the capability classification of soils is given on pages 26 and 27. For a discussion of the suitability of a given soil for crops and pasture, see the discussion of the mapping unit. Other information is given in tables as follows:

Acreage and extent, table 3, page 9.
Estimated average yields, tables 4 and 5, pages 29 and 30.
Woodland, table 6, pages 32-35.
Wildlife, table 7, pages 36-37.
Engineering uses of the soils, tables 8, 9, and 10, pages 40-51.
Community development, table 11, pages 52-57.
Recreational uses, table 12, pages 59-61.

Map symbol	Mapping unit	Described on page	Capability unit	Woodland subclass	
			Symbol	Symbol	Page
Ba	Bayboro silt loam	10	IIIw-9	2w	34
Bo	Borrow pits	10	VIIIs-4	--	--
Co	Coastal beaches	10	VIIIs-2	5t	35
El	Elkton sandy loam, thin subsoil	11	IIIw-11	3w	34
Em	Elkton silt loam, thin subsoil	11	IIIw-9	3w	34
Eo	Evesboro sand	12	VIIs-1	3s	35
EsB	Evesboro loamy sand, 2 to 5 percent slopes	11	IVs-1	3s	35
EsD	Evesboro loamy sand, 5 to 15 percent slopes	11	VIIs-1	3s	35
Ev	Evesboro loamy sand, clayey substratum	11	IIIs-1	3s	35
Fa	Fallsington sandy loam	12	IIIw-6	2w	34
Fs	Fallsington loam	13	IIIw-7	2w	34
Jo	Johnston silt loam	14	IIIw-7	2w	34
Ka	Keyport sandy loam	14	IIw-9	3w	34
Ke	Keyport silt loam	15	IIw-8	3w	34
Kl	Klej loamy sand	15	IIIw-10	3s	35
Md	Made land	15	----	--	--
MeA	Matapeake silt loam, 0 to 2 percent slopes	16	I-4	3o	34
MeB	Matapeake silt loam, 2 to 5 percent slopes	16	IIe-4	3o	34
MeC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	16	IIIe-4	3o	34
Mt	Mattapex silt loam	17	IIw-1	3o	34
Mv	Mixed alluvial land	17	VIw-1	2w	34
Ot	Othello silt loam	18	IIIw-7	3w	34
Pl	Plummer loamy sand	18	IVw-6	3w	34
Pm	Pocomoke sandy loam	19	IIIw-6	2w	34
Po	Pocomoke loam	19	IIIw-7	2w	34
RuA	Rumford loamy sand, 0 to 2 percent slopes	20	IIs-4	3o	34
RuB	Rumford loamy sand, 2 to 5 percent slopes	20	IIs-4	3o	34
RuC2	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	20	IIIe-33	3o	34
RuC3	Rumford loamy sand, 5 to 10 percent slopes, severely eroded	20	IVe-5	3o	34
RuD	Rumford loamy sand, 10 to 15 percent slopes	20	IVe-5	3o	34
SaA	Sassafras sandy loam, 0 to 2 percent slopes	22	I-5	3o	34
SaB	Sassafras sandy loam, 2 to 5 percent slopes	22	IIe-5	3o	34
SaC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	22	IIIe-5	3o	34
SaC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	22	IVe-5	3o	34
SaD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	23	IVe-5	3o	34
SfA	Sassafras loam, 0 to 2 percent slopes	23	I-4	3o	34
SfB	Sassafras loam, 2 to 5 percent slopes	23	IIe-4	3o	34
SfC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	23	IIIe-4	3o	34
SvE	Sassafras and Evesboro soils, 15 to 40 percent slopes	23	VIe-2	3r	35
Sw	Swamp	23	VIIw-1	--	--
Tm	Tidal marsh	23	VIIIw-1	--	--
Wo	Woodstown sandy loam	25	IIw-5	3o	34
Ws	Woodstown loam	25	IIw-1	3o	34