SOIL SURVEY OF PRINCE GEORGE COUNTY, MARYLAND.

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LOCATION AND BOUNDARIES OF THE AREA.

Prince George County, Md., comprises a land area of 480 square miles lying between the Potomac River and the District of Columbia on the west and the Patuxent River on the east. It is bounded on the north by Howard and Anne Arundel counties, on the east by Anne Arundel and Calvert counties, on the south by Charles County, on the west by Virginia, the District of Columbia, and Montgomery County. Upper Marlboro is the county seat; Laurel and Hyattsville are the largest towns in the county. (Fig. 6.)

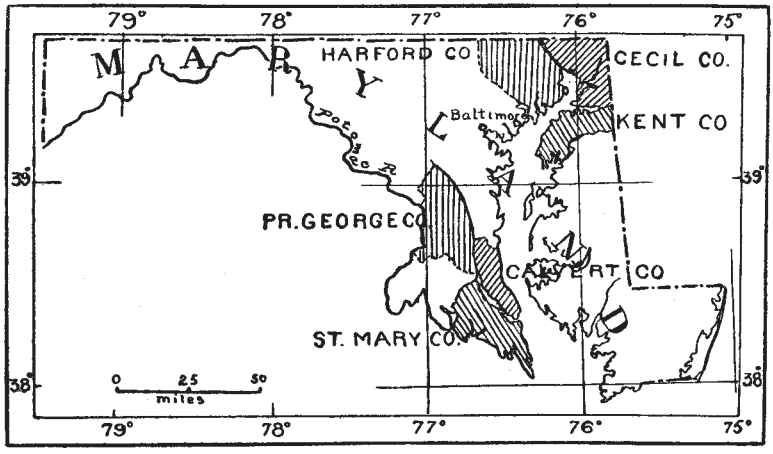


FIG. 6.—Sketch map showing areas surveyed in Maryland.

Prince George County is included between the parallels of 38° 33′ and 39° 8′ north latitude and the meridians of 76° 40′ and 77° 5′ west longitude. It lies almost entirely within the Coastal Plain region of Maryland, only the extreme northern portion extending into the Piedmont Plateau. The northern portion of Prince George County crosses a line joining the cities of Washington and Baltimore. In consequence of this location the northern part of the county, particularly along the District of Columbia line, is becoming the seat of many small suburban towns and country residences.

The markets afforded by the proximity of these cities have given rise to conditions favorable to market gardening and truck farming, which is much more profitable than general farming. The farms near the District of Columbia are of smaller size and are under a higher state of cultivation than in other portions of the county not so favorably located with regard to markets. Market gardening and the production of truck crops are industries which will gradually spread more widely over the entire county and lead to a much more specialized adaptation of crop to soil than is possible in most farming communities.

Prince George County is an important tobacco-growing region of Maryland. The tobacco produced is exported to French, Belgian, and German markets and constitutes the type known as the Maryland pipe-smoking tobacco. Since the earliest settlement of the State the region known as the "Forest of Prince George," lying along the Patuxent River, has constituted an important agricultural area, with tobacco as its staple crop. Aside from these special crops, corn and wheat are the principal products.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Prince George County, although settled about the middle of the seventeenth century, was not erected into a separate county until 1695. The lands were distributed among the settlers by grants from the Proprietary in tracts of 100 acres for each settler and for each member of his family, with smaller amounts for each indentured or other servant brought out at his expense. In this manner little colonies were established at the expense of the gentlemen to whom the various grants were given. In the case of grants of 1,000 acres or more, full manorial rights, including the holding of courts-baron and courts-leet, accompanied the grant. These rights were never fully exercised in Prince George County. Every freeholder was entitled to vote for members of the elective branch of the colonial government.

Under this system many large tracts of land came under the control of the heads of the wealthier families. On each of the large estates various manufacturing occupations were followed in addition to the regular activities of the plantation. Direct commerce was carried on with the mother country, consisting chiefly of the exchange of tobacco and other agricultural products for such manufactured articles as could not be produced upon the estates. The early ports of entry were Nottingham and Queen Anne, on the Patuxent River. Several other towns, among them the present Upper Marlboro, were leading ports.

The early products of the county consisted of tobacco, corn, and wheat, which were exported, and a considerable variety of other products designed for home consumption. Among the fruits, pears,

peaches, apples, apricots, pomegranates, and melons were cultivated, while grapes, strawberries, and cherries were found growing wild in the greatest profusion. This led to the cultivation of vineyards and to the manufacture of small quantities of domestic wine. The culture of maize and sweet potatoes was adopted from the Indian inhabitants, and their production still continues to be an important part of the agriculture of the community.

From the early days of the settlement of the colony to the time of the American Revolution indentured servants were employed upon the large estates. Negro and Indian slaves were also employed soon after the first settlement, and slave labor was generally and profitably employed, especially in the tobacco-raising portion of the county, until its use was terminated by the emancipation proclamation. During this period the tobacco crop, although experiencing many vicissitudes of production and of sale, remained the great staple product of the county.

The economic and social changes resulting from the civil war necessitated a complete readjustment of the agriculture of this region—a readjustment that was particularly difficult with the circumstances then existing, and that has not fully taken place even as yet. The unsettled condition at the close of the war caused many of the younger men to emigrate to the more fertile lands of the West, thus further draining the country of many whose youth and energy would have been of the greatest value in the recuperation of the agriculture of the region.

Much land was thrown out of cultivation on account of the scarcity of labor and the lack of capital. Many of the farms were mortgaged to support the owners or to continue farming operations. Less tobacco—the great staple of the area—was grown, and more wheat and other grains, because the latter crops could be produced with a minimum outlay for labor; but about this time the competition of the western grain-growing districts began to be felt, and soon seriously reduced the profit to be made in growing these crops. These factors have all tended to retard the development of the area.

CLIMATE.

There are at present but two Weather Bureau stations in the area under consideration, located within a few miles of each other. The records of one of these, Laurel, situated in the extreme northern part of the county, have been drawn upon for the data given in the tables below. For the other (Agricultural College) the records of Washington, D. C., have been substituted, covering as they do a longer period of observation, and perhaps more nearly representing conditions found in the portion of Prince George County bordering on the Potomac River. No statistics are available for the eastern or southern parts of

the county, but the figures returned by Jewell, a station about 2 miles beyond the eastern boundary, in Anne Arundel County, are given. There are no doubt some local peculiarities of climate in the southern part of the county and in sections more directly influenced by the proximity of large bodies of water. On the other hand the differences of altitude are slight and the climatic conditions fairly uniform. It is therefore assumed that the data given in the tables below are sufficiently representative for practical purposes.

Normal monthly and annual temperature and precipitation for Prince George County, Md.

Month.	Temperature.			Precipitation.		
	Washington, D. C.	Laurel, Prince George County, Md.	Jewell, Anne Arundel County, Md.	Washington, D. C.	Laurel, Prince George County, Md.	Jewell, Anne Arundel County, Md.
	°F.	°F.	°F.	Inches.	Inches.	Inches.
January	33.2	35.8	34.3	3.50	2.68	2.82
February	35.8	34.7	35.5	3.37	3.22	3.56
March	41.3	43.3	42.0	4.16	2.74	4.75
April	53.0	53.0	54.7	3.34	3.03	3.98
May	63.9	63.1	64.3	3.93	4.24	5.12
June	73.2	70.8	73.4	4.00	2.72	3.70
July	77.8	75.3	75.9	4.59	4.80	7.02
August	74.6	74.9	75.6	3.98	3.72	3.35
September	67.8	69.5	69.5	3.71	2.29	3.69
October	56.2	54.8	55.1	3.08	2.76	3.69
November	44.5	46.3	46.4	2.81	3.07	3.27
December	36.2	36.5	37.9	2.99	2.37	2.90
Annual	54.7	54.9	55.4	43.46	37.64	47.85

Prince George County has a healthful climate, an evenly distributed rainfall ample for all ordinary purposes of agriculture, generally mild winters, and a long and reasonably certain growing season. Killing frosts rarely occur between April 20 and October 15. The exact dates of occurrence, so far as reported for five years past, are tabulated below:

Dates of killing frosts.

Year.	First in fall.			Last in spring.		
	Washington.	Jewell.	Laurel.	Washington.	Jewell.	Laurel.
1896	Oct. 19	Oct. 19	.....	Apr. 9	.....	.....
1897	Oct. 18	Nov. 13	Oct. 18	Apr. 21	Apr. 20	Apr. 13
1898	Oct. 24	Oct. 28	Oct. 28	Apr. 6	Apr. 6	Apr. 4
1899	Oct. 2	Oct. 22	Oct. 1	Apr. 17	.....	.....
1900	Oct. 20	.....	Nov. 5	Apr. 15	.....	Apr. 11

The records of the State weather service show that Coastal Plain Maryland is less often visited by damaging general storms than any section of the country east of the Mississippi River. Local storms of

a degree of severity to cause loss are also infrequent. Hail, a most injurious form of disturbance where the culture of tobacco is concerned, is less often the cause of loss than in other tobacco areas.

In stating that the rainfall for this section of the State is sufficient for all ordinary purposes of agriculture it is not intended to convey the idea that systematic irrigation would not add greatly to the productiveness of some of the most important soil types of the area. On the contrary, all the more sandy types are apt to suffer from drought during the months of July, August, and September, many of them being cropped early and then left idle till the following season because of their inability to carry sufficient moisture through periods of possible drought. On these lands it is not a question of the desirability of irrigation, but of the profitableness of the practice under present social and agricultural conditions.

PHYSIOGRAPHY.

The surface of Prince George County consists of a hilly, rolling upland, rising to an extreme elevation of 420 feet in the northern part of the county and sloping toward the water courses that form its eastern and western boundaries. The southern portion of the county consists of a rolling plateau, which lies at an average altitude of about 250 feet above tide. The descent toward the Potomac River is steep and in some cases precipitous, and there is only a single, narrow strip of foreland lying between the river and the more elevated inland region. Along the Patuxent River the slope from the upland to tide water is more gradual. A series of narrow, flat-topped terraces have been formed along the Patuxent. They give rise to special soil types and to definite agricultural conditions.

The streams of Prince George County are tributary either to the Patuxent or Potomac drainage. Most of these streams flow directly into the large rivers, though a few of them empty into smaller tidewater embayments.

On account of the inclined position of the chief geological formations which form the basal structure of Prince George County, stream erosion has progressed more rapidly over some areas than others. This condition has given rise to a highly dissected and hilly upland topography in the northern central portion of the county, where the headwaters of the largest streams have been most actively engaged in their work of erosion. Farther southward the Pleistocene plateau area has been trenched into deep, narrow valleys through the activity of smaller streams, and as a result the county may be divided into three main physiographic areas.

The first of these comprises the extreme northern part of the county, where the topographic forms are influenced by the presence of consolidated crystalline rocks, which exist at the surface or are only slightly

covered by later unconsolidated sediments, which they support. The central portion of the county consists of an extremely hilly and broken area, underlain by the older sediments of the Potomac group, with occasional slight coverings formed by outliers of more recent formations. The southern portion of the county forms another plateau area whose level or gently rolling surface is almost entirely formed by slightly inclined marine and river terraces of Pleistocene age. These three areas differ from one another in agricultural adaptability as well as in geologic and physiographic structure. Differences of altitude in the county are so slight, including a range of only about 350 feet, as to have little effect upon climatic conditions. The presence of large tide-water areas, formed by the Potomac and Patuxent rivers, exerts some influence upon regions bordering those rivers.

GEOLOGY.

The relationship existing between the geology and the soils of any given area constitutes an important phase of the agricultural investigation of the region. The influence exerted by the geology on the soils is of great importance in the theoretical consideration of the origin of the soils and of practical importance in determining the area, the characteristics, and the resources of each particular soil type. All of the geological formations of the world have been divided and subdivided into formations and groups of formations in accordance with their sequence of deposition, as indicated by their relative positions with regard to one another and in accordance with the stage of development of fossil life forms that have been buried in the different layers.

Geologists recognize five great periods—Archæan, Algonkian, Paleozoic, Mesozoic, and Cenozoic. The rocks which belong to these different periods exhibit great differences in mineral composition, in state of aggregation, and in condition of consolidation. They therefore give rise through the processes of weathering to widely different soil types.

Since the basis of geological classification is one of age and of place relationships, while the fundamental principle of soil classification depends upon differences of soil texture, a given geological formation may give rise to two or more soil types. On the other hand, since the mineral composition and rock texture of different geological formations may closely resemble each other though their age differs, so a single soil formation may be derived from two or more geological formations. Physiographic relations to stream drainage and to climate are also considered in the classification of the soils.

Prince George County lies almost wholly within the Coastal Plain region of the State, though its extreme northern boundary slightly overlaps upon the Piedmont Plateau. Only a single soil type, the Cecil mica loam, is derived from the crystalline rocks of the latter

region; all the other soils of the county are derived from the unconsolidated sediments belonging to the Mesozoic and Cenozoic portions of the geological column.

The names and relative positions of the geological formations which constitute the area of Prince George County, together with the relationships of the various soils to the different formations, are given in tabular form elsewhere. Only a brief review of the derivation of the soils from these various geological formations will be given here.

At the northern extremity of Prince George County one of the crystalline rocks of the Piedmont Plateau is exposed along the Patuxent River and some of its minor tributaries. The rock consists of a micaceous crystalline schist, which also contains quartz and feldspar. When subject to long-continued process of weathering this rock gives rise to a micaceous, loamy soil. It occupies less than 1 square mile along the banks of the streams.

This Cecil mica loam is a common type of soil throughout the Piedmont areas of the Atlantic Coast States. The rock formation from which it is derived was probably a sedimentary rock in Algonkian time, but it has been so altered by great pressure that its component minerals have been almost entirely changed from their original form. The resulting rock is a highly schistose, crystalline rock whose weathering product forms a residual soil in the commonly accepted meaning of that term.

Between the time of the original formation of this rock and the deposition of the sediments which constitute the next geological formation of this region a long period of time elapsed. This time lapse is indicated by the complete absence of all formations belonging to the Paleozoic and part of the Mesozoic periods. The Patuxent formation, probably of Jurassic age, lies just to the south of this ancient Algonkian rock. The Patuxent formation consists of about 150 feet of light-colored sand. The different particles are frequently composite fragments made up of quartz, feldspar, and mica, derived from the disintegration and redeposition in sedimentary form of granitic and other crystalline rocks. Such a sand is called an arkose or granitic sand, and where it overlies a partially decomposed granite it is sometimes difficult to distinguish between the original rock and its sedimentary derivative. Such sands are rich in potassium and calcium salts, which become slowly available as plant foods when exposed to atmospheric agencies. The Patuxent formation gives rise to no distinct soil type in Prince George County, although it contributes material to the Norfolk sand.

After the deposition of the Patuxent sands numerous detached lenticular masses of clay, known as the Arundel formation, were laid down immediately over the sands. The Arundel formation attains its greatest importance as the source of iron ores rather than as an

agricultural feature. In the limited areas where it reaches the surface in Prince George County it gives rise to soils that have not been differentiated from those derived from the next younger formation.

The Patapsco formation is found at times resting directly upon the Patuxent and again separated from it by intervening lenses of the Arundel. The Patapsco consists of about 200 feet of highly mottled and variegated clays, which form a conspicuous part of the landscape of the region, and are only with difficulty subjected to agricultural conditions. Unless covered by a thin layer of more recent sediments, or modified by occasional included lenses of sand, the Patapsco formation is as yet unsuited to agricultural purposes.

The soil derived directly from this formation is classed as Susquehanna clay, while that formed through the intervention of small amounts of later sediments is mapped as Susquehanna clay loam. It is farmed with some success, though requiring very careful treatment.

The Raritan formation consists of a thick-bedded, light-colored sand, slightly clayey toward the base. It attains a total thickness of about 50 feet, and in some localities has become indurated to a massive freestone through the deposition of siliceous cement. It also contains large amounts of sandy iron crust. This formation is frequently found overlying the Patapsco clays to a depth which varies from a few inches to many feet. It gives rise to a loose sandy soil and subsoil, mapped as Norfolk sand and classified as a typical truck soil.

The sedimentary formations thus far described belong to the Potomac group of Jurassic and Lower Cretaceous age. The next formation, the Matawan, is of Upper Cretaceous age. It consists of dark-colored micaceous sand and clay, having a thickness of less than 50 feet. The Matawan gives rise to a fine sandy soil with loam subsoil, which, though not typical, is classed with the Westphalia sand. It covers a small area in the northern central portion of the county near Buena Vista and Seat Pleasant. The Monmouth and Rancocas formations of the Upper Cretaceous are only a few feet in thickness, and exert little, if any, influence on the soil of Prince George County.

Above the strata of Upper Cretaceous age are found two subdivisions of the Eocene that exert a marked influence upon the agriculture of the county. The lower member, the Aquia, consists of about 100 feet of glauconitic and sandy material, commonly called greensand or greensand marl. This Aquia formation is exposed at the surface over a considerable area, chiefly along the Patuxent and its tributaries. Under the influence of atmospheric agencies this greensand gives rise to a soil best described as a loamy sand. This soil is underlain by a subsoil of sticky though sandy loam, which grades imperceptibly into greensand marl. It is described as the Collington sandy loam, and it forms one of the most productive of the Coastal Plain soil types. This is due to the large stores of plant food naturally

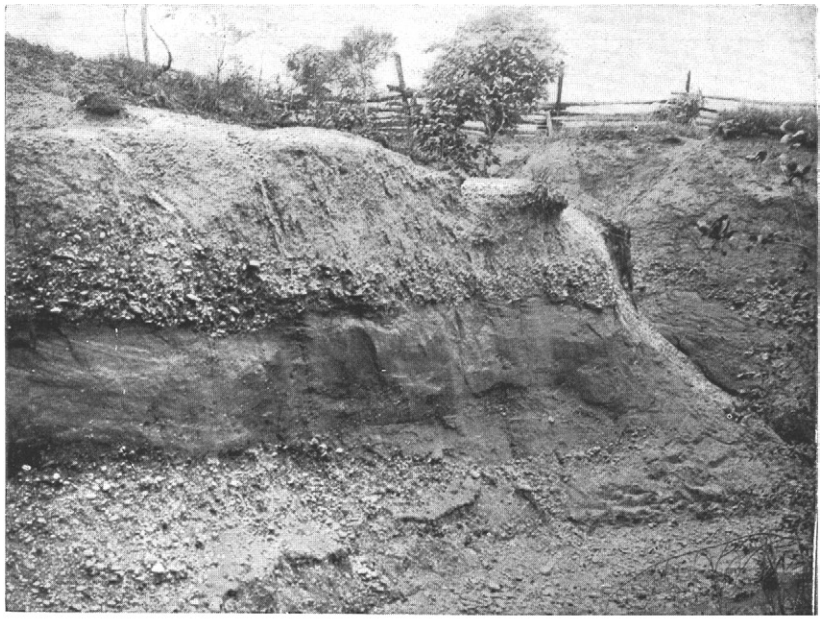


FIG. 1.—SECTION SHOWING DISTRIBUTION OF STRATA, ETC.

In the Coastal Plain region of Maryland the different strata of sand, gravel, and clay have been laid down as shown in the figure, giving rise on exposure at the surface to the different soil types of the area.

FIG. 2.—GENERAL VIEW OF LOW FORELANDS CLASSED AS MEADOW.

Most of these areas would be improved by underdrainage and when so improved they would make excellent grass lands and would be adapted to general farm crops, particularly corn.

supplied from the disintegration of the glauconite, a process outlined under description of the Collington sandy loam. This formation may be noted, also, as furnishing an example of the derivation of a single soil type from a given geological horizon. Other glauconitic strata in other areas give rise to the same soil, but in Prince George County the Collington sandy loam is only found as a residual product through the weathering of the outcrops of the Aquia formation.

The Aquia is succeeded by the Nanjemoy, also of Eocene age. At its base the Nanjemoy consists of about 25 feet of dense, shaly gray or yellow clay, whose outcrops are so scattered and so small that it has been found impossible to map them as a definite soil formation. They are found especially along small streams tributary to the Western and Collington branches of the Patuxent River in areas of from 1 to 10 acres of intractable, clayey soils. This clay is overlain by a micaceous, somewhat glauconitic mass of sand and clay included with it in the Nanjemoy formation. This mixture of sand and clay reaches the surface along the steeper walls of the smaller streams in the vicinity of Upper Marlboro, and the resulting fine sandy and loamy soil has been mapped as the Westphalia sand, which includes both these deposits and the similar ones derived from the Matawan and Calvert.

The Nanjemoy is succeeded in the extreme southern end of the county by the infusorial earth deposited at the beginning of Neocene time in Maryland, called the Calvert formation. This infusorial earth rarely reaches the surface in Prince George County and gives rise to no distinct soil type. The sandier portions near the top of the Calvert formation give rise to areas of Westphalia sand near Nottingham.

The more recent geological deposits of Pleistocene time occur as a series of river and marine terraces, known as the Columbia group.

This group has only recently become the subject of extended study by geological authorities. Throughout the entire Coastal Plain region of Maryland it has played an important part in the formation of the soils and therefore in the agricultural history of the region.

The present stream channels and the shifting materials deposited directly along the stream courses may be considered as the lowest incomplete terrace. It consists of marine and fresh-water marshes along the lower courses of the streams and of the partly drained meadow lands nearer their sources.

The lowest complete Columbia terrace, or, as it is frequently called, the second bottom, lies at an elevation of from 20 to 80 feet above tide level. This terrace is partly of river and partly of estuarine origin. Its continuation inland from tide water slopes with the slope of the prehistoric river courses which formed it, while the equivalent tide-water portion of the terrace maintains a fairly uniform altitude of about 30 feet above mean tide. Where gravel and sand were

deposited upon this terrace a coarse soil, classed as Windsor sand, has been formed. In places where the waters did not flow so swiftly the coarse materials of the Norfolk sand have formed an excellent truck soil. The clay and sandy loam deposited in still more quiet waters have given rise to the Sassafras sandy loam and Elkton clay.

The next higher terrace, which ranges in altitude from about 80 feet in the southeastern part of Prince George County to 160 feet in the vicinity of Laurel, gives rise to a marked soil type, the Sassafras loam, which is peculiar to this terrace not only in southern Maryland, but also upon the Eastern Shore. This soil is a uniform loam, ranking among the best soils of the Coastal Plain region of Maryland.

There seem to be indications in Prince George County of a third stream terrace occurring at a slightly higher elevation and giving rise to the Norfolk loam, but this soil may have been derived from deposits of a marine origin, which constitute a phase of the oldest Columbia sedimentation.

This oldest Columbia stage was deposited over the greater part of Prince George County at a time when this area, together with the remainder of Coastal Plain Maryland, lay below the level of the sea. The first sediments deposited consisted of coarse sand and gravel; afterwards sand and nodular masses of clay were brought in and deposited through the instrumentality of wave action and tidal currents. The resulting mass is not homogeneous, but consists of flattened lenses of clay whose edges overlap one another. They are separated from one another by veins and pockets of sand and fine gravel. Water in circulating through this mass follows the line of easiest flow along the sandy seams, but its progress downward is much retarded on account of the circuitous route it must follow. Thus, although the entire mass constitutes a rather sandy loam, its effect upon the circulation and conservation of moisture more nearly approaches that of a clay. This singular structure also gives rise to a marked friability of the soils and subsoils of the main type it embraces. This peculiar loam usually attains a thickness of from 15 to 20 feet. When its surface is modified through the disintegrating effect of atmospheric agencies a yellow silty soil is produced, and this soil with its peculiar subsoil is described under the name of the Leonardtown loam. Where this formation attains a thickness of less than 5 or 6 feet the peculiar structure is almost entirely obliterated, and such areas, usually found along slopes, give rise to a soil consisting of clay, sand, and fine gravel described as Leonardtown gravelly loam. Such areas are limited in extent and usually intervene between areas of Leonardtown loam and Susquehanna gravel, especially in the northern and northern central portion of Prince George County.

Where this highest Pleistocene terrace has been partially removed through stream erosion, remnants of the underlying gravel frequently

survive, scattered through sandy layers of greater geologic age. This combination gives rise to the typical upland phase of the Windsor sand.

The Norfolk loam may also belong to this marine stage of Pleistocene deposition, though its occurrence on the uplands along the Patuxent River at a lower level than the greater portion of the Leonardtown loam found in Prince George County would seem to indicate that it belonged to a later river terrace not yet fully identified.

Almost all of the soil types found in Prince George County have been encountered in other areas along the Atlantic seaboard, and the statement of the capabilities of the different soils and the general recommendations for their treatment are based upon observations which extend beyond the limits of the area described in the present report.

The following scheme shows the relation between the soil types and the geological formations:

Era.	Period and group	Formation.	Soil type.
Cenozoic	Pleistocene, Columbia group.	Cape May	Elkton clay.
			Sassafras sandy loam.
			Norfolk sand, in part.
			Windsor sand, in part.
		Wicomico	Sassafras loam.
			Norfolk sand, in part.
			Susquehanna gravel.
		Dunkirk (provisional).	Norfolk loam.
			Leonardtown loam.
			Leonardtown gravelly loam.
			Susquehanna gravel
			Windsor sand.
	Neocene, Chesapeake group.	Choptank	Norfolk sand, in part.
		Calvert	Westphalia sand, in part.
	Eocene, Pamunkey group.	Nanjemoy	Westphalia sand, in part.
		Aquia	Collington sandy loam.
Mesozoic	Upper Cretaceous	Rancocas	No representation.
		Monmouth	
		Matawan	Westphalia sand, in part.
	Potomac group: Lower Cretaceous	Raritan	Norfolk sand, in part.
		Patapsco	Susquehanna clay, in part.
	Jurassic	Arundel	Susquehanna clay, in part.
		Patuxent	Contributes to Norfolk sand.
	Trias	No representation.	
Paleozoic		No representation.	
Algonkian		Pebble-bearing mica schist.	Cecil mica loam.
Archæan		No representation.	

SOILS.

The area of the several soil types occurring in Prince George County are given in the subjoined table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Leonardtown loam	45,770	14.9	Norfolk loam	9,660	3.1
Susquehanna gravel	41,470	13.5	Sassafras loam	9,090	3.0
Windsor sand	37,420	12.2	Sassafras sandy loam	4,830	1.6
Westphalia sand	36,190	11.8	Leonardtown gravelly loam	3,710	1.2
Meadow	30,870	10.0	Elkton clay	1,450	0.5
Norfolk sand	23,630	7.7	Cecil mica loam	600	0.2
Collington sandy loam	23,260	7.6	Total	307,160	.....
Susquehanna clay	22,360	7.0			
Susquehanna clay loam	16,850	5.5			

COLLINGTON SANDY LOAM.

The Collington sandy loam comprises an area of nearly 36 square miles lying entirely within the "Forest of Prince George." The surface is gently rolling or nearly flat and lies at an elevation of from 80 to 160 feet above sea level. The original forest growth has been removed over this soil area, and with a very few exceptions the land is under a high state of cultivation. The usual staple crops of corn, wheat, and tobacco are cultivated upon this soil type. Wheat produces about 10 bushels and corn from 25 to 35 bushels per acre, while the tobacco raised is of good quality, yielding from 700 to over 1,000 pounds per acre.

The Collington sand is derived through the natural process of weathering from the Aquia formation of the Eocene period. The material constituting this formation consists of the mineral glauconite, a complex silicate of the bases potassium, calcium, magnesium, and ferrous iron, containing also some phosphoric acid. It is mixed with medium to coarse grained quartz sand. This material still remains unconsolidated, except for a narrow band of siliceous rock only a few feet in thickness, which has very little influence upon the soil of the region.

The Collington sandy loam as a soil type has been directly derived from the outcroppings of this greensand. Upon exposure to the weather the dark-green glauconitic material is affected chemically by the action of rain water and the impurities which it carries in solution. The quartz grains contained in the greensand are only slightly dissolved during the chemical reactions which follow. On the other hand the glauconite, which is a very complex and unstable silicate, is altered in its chemical composition. Salts of potassium, magnesium, calcium, and iron are formed, and these, being soluble to different degrees, are

unequally leached away by the circulation of the soil waters. The iron salts, in particular, frequently accumulate in the form of pipes, tubes, and irregular concretions of hydrated carbonate of iron, binding together grains of quartz sand. These pipes are frequently filled with unweathered or partly weathered glauconite. The subject was referred to the chemical laboratory of the Bureau, and the following statements are based upon the report of Dr. Frank K. Cameron, in charge of the chemical work.

Glauconite, as is the case with the greater number of minerals, is a salt, but a very complex one, containing, as stated above, potassium, ferrous iron, calcium, and magnesium as bases, the bivalent elements replacing each other in somewhat indeterminate quantities. The complex silicic acid is very weak as compared with the bases. Although the mineral itself, perhaps, does not possess a large solubility, in as far as it is soluble at all it will be dissociated and greatly hydrolized.[a] The result will be the formation of large quantities of hydrates of potassium, calcium, and magnesium, which will in turn be converted to the corresponding carbonates, or, more probably, hydrogen carbonates, better known as bicarbonates, through the absorption of and combination with the carbon dioxide contained in considerable quantities in the atmosphere of all soils.

The ferrous iron will also be largely converted into the hydrate by the hydrolytic action of the water. But it will be further acted upon by both the oxygen and carbon dioxide in the soil atmosphere, so that the final product which it yields will be a more or less highly carbonated ferric hydrate, and it is this material which forms the cement of the pipes described above. As the analyses show, this glauconitic material is unusually rich in potassium.

Analyses are given in the following table of a greensand marl obtained from an outcrop of the fresh material near Upper Marlboro, in Maryland, as well as of two soils and three subsoils. The method of analysis chosen was the official one of the Association of Official Agricultural Chemists—that is, the digestion in concentrated hydrochloric acid of specific gravity 1.115. This method was selected principally because it would enable the results obtained on these samples to be compared with those of other agricultural chemists, and probably it furnishes as clear an idea as any other method would of the agricultural values of the samples.

It may be said in general that the results of this chemical examination show the chief value of the greensand marls of Maryland to be due to the potash they contain, and which they slowly release as they dissolve and break down in the process of weathering. To a

[a] For a general discussion of this subject the reader is referred to Bull. 17, Division of Soils, U. S. Department of Agriculture, 1901.

much less extent probably are they of value for their content of lime and phosphoric acid. In this latter respect they do not compare favorably with the similar marl deposits of New Jersey and some other regions, which, while valuable for the potash they contain, are more so on account of the very large content of phosphoric acid and soluble lime. It is probable that the New Jersey greensand marls would on the average have a phosphoric acid content fifty times as great as the corresponding marls from Maryland. It is, therefore, very questionable whether many of the greensand marls of Maryland can have any important economic future as a fertilizer when compared with other products now on the market.

Chemical analyses of greensand and Collington sandy loam.

Constituent.	6034.[a]	5454.[b]	5455.[c]	5456.[d]	5459.[e]	5460.[f]
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Potash (K_2O)	2.565	0.858	0.888	0.445	0.910	0.376
Soda (Na_2O)	.391	.980	.718	2.401	.418	.692
Lime (CaO)	.170	.140	.155	.110	.155	.210
Magnesia (MgO)	.740	.136	.396	.474	.185	.336
Manganese oxide (MnO)	.....	.037	.030	.....	.035	.037
Iron (Fe_2O_3)	16.306	9.488	4.011	9.067	3.632	6.248
Alumina (Al_2O_3)	.130	4.011	2.448	4.097	2.856	4.742
Phosphoric acid (P_2O_5)	.065	.088	.054	.104	.053	.076
Sulphuric acid (SO_3)	.012	.132	.116	.096	.110	.056
Insoluble	74.049	.....	.....	.....	.....	.....
Moisture	2.130	.....	.....	.....	.....	.....
Volatile organic matter	1.975	.....	.....	.....	.....	.....

[a] Greensand deposit, Upper Marlboro, Md.
[b] Subsoil, 8 to 36 inches, Oak Grove, Md.
[c] Soil, 0 to 7 inches, Mullikin, Md.
[d] Subsoil of 5455, 7 to 36 inches.
[e] Soil, 0 to 9 inches, Mullikin, Md.
[f] Subsoil of 5459, 9 to 36 inches.

An inspection of the table will show that the soils and subsoils derived from glauconitic material are rich in potassium, as compared with agricultural soils in general, although a proportionally large amount of this element disappeared in the weathering process during soil formation. On the other hand, neither the lime nor phosphoric-acid content of these soils is materially different from that of the original material and both are lower than is considered desirable for good soils. The indications of this examination are that these soils are lacking in lime, phosphoric acid, and humus, and efforts to improve them in these respects are desirable.

In the field the results of the chemical processes of weathering are shown by nearly every soil boring taken within the area of the Collington sandy loam. The surface soil, which has a depth varying from 9 to 20 inches under different conditions of cultivation, consists of a loose, loamy, brown sand, usually containing considerable coarse sand and small amounts of intermediate grades of soil particles down to silt and

clay. The loamy nature differs from that of ordinary soils in the fact that the rather coarse materials are bound together by much finer materials, which are sticky rather than plastic. Even this fine material when dry crumbles easily to the touch into a powdery brown mass. The immediate subsoil differs from the soil in texture and composition. The glauconite is passing through intermediate stages of weathering, and has been sufficiently transformed to constitute a sticky, claylike mass, in which dark-green specks of glauconite can still be distinguished. The partly weathered glauconite includes a considerable percentage of quartz sand within its mass. The hydration of the iron salts produces a yellowish or greenish-yellow color in the subsoil. Usually at a depth of 30 or 40 inches the greensand can be found in almost its original state of purity. It has been much less attacked by the processes of weathering than either the soil or the immediate subsoil. It still maintains a considerable supply of potash, phosphoric acid, and lime—three plant foods commonly purchased at considerable expense in the form of commercial fertilizers. The presence of this plant food underneath the soil is manifested by the general productivity of the entire area of the Collington sandy loam.

In the Prince George area this greensand marl, which occurs along the numerous stream cuttings and natural cliffs, has only been used to a slight extent as a source of fertilizer. In one case, it is said, its copious application over an already sandy soil produced a crop of wheat averaging 25 bushels per acre, and its effect was noticed in several succeeding crops. In other areas, both in the United States and foreign countries, the greensand marl has long been utilized as an inexpensive though effective medium for restoring impoverished soils. Its application upon heavy loam or clay lands should be particularly beneficial, since the sandy nature of this marl would improve the texture of the soil while its chemical elements supplied essential plant foods.

The Collington sandy loam is justly recognized as a good soil for general farming operations, but its adaptability to special crops is only partly realized. It is an area excellently adapted to market gardening and medium and late truck crops. It produces fruits of excellent quality and its special adaptation to the production of nursery stock is already utilized. It should also furnish excellent crops for canning factory purposes.

The present system of general farming practiced on this soil type should give place to a much more specialized type of agriculture, accompanied by a decrease in the average size of the land holdings and by much greater profits per acre.

The following table gives mechanical analyses of typical samples of soils and subsoils of Collington sandy loam:

Mechanical analyses of Collington sandy loam.

No.	Locality.	Description.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5457	1¼ miles SW. of Woodmoor, Md.	Medium, loose green sand, 0 to 11 inches.	1.70	Tr.	4.52	10.34	59.18	10.10	7.22	5.10
5459	Mullikin, Md.....	Fine, mealy sand, 0 to 9 inches.	4.78	0.00	1.10	4.24	33.94	11.14	36.52	8.08
5451	Oakgrove, Md	Loose, fine greenish sand, 0 to 7 inches.	1.92	Tr.	1.94	9.04	50.12	16.76	9.54	10.74
5455	1½ miles SE. of Mullikin, Md.	Fine glauconite sand, 0 to 7 inches.	4.42	0.00	2.38	6.16	54.64	16.96	4.22	10.96
5458	Subsoil of 5457....	Medium glauconite sand, sticky, 11 to 36 inches.	1.86	Tr.	6.86	16.44	48.50	5.38	8.40	12.26
5460	Subsoil of 5459....	Fine to medium sand, 9 to 36 inches.	2.30	0.00	Tr.	5.18	33.62	17.10	20.70	20.68
5452	Subsoil of 5451....	Glauconite sand, sticky, 7 to 36 inches.	2.92	0.00	2.84	6.76	46.22	14.72	6.78	19.92
5456	Subsoil of 5455....	Heavy sand, rather sticky, 7 to 36 inches.	2.82	0.00	2.44	5.14	50.26	13.52	4.92	21.16

NORFOLK SAND.

The Norfolk sand occupies a total area of 23,630 acres in Prince George County. It covers low-lying, flat-topped terraces along the larger stream courses, and caps the highest hills in the northern central portion of the county. It is derived from various sandy strata found in the Coastal Plain portion of Maryland, either by the direct weathering of the outcrops or by stream erosion, transportation, and redeposition in other localities.

The uncleared areas of Norfolk sand are occupied by forest growths of pitch pine and several varieties of oak. A large portion of the area occupied by this soil type is cleared and utilized in general farming or truck growing.

The terrace areas are flat-topped or only gently inclined, while those areas derived from the outcrop of older strata are rolling or gently inclined.

FIG. 1.—GENERAL CHARACTER OF NORFOLK SAND.

This is a very light sandy soil, which, when highly fertilized, is adapted to early truck and to the Maryland type of smoking tobacco.

FIG. 2.—TYPICAL TOBACCO BED COVERED WITH PLANT CLOTH.

These seed beds are usually made in clearings on new land.

The soil consists of a medium to coarse orange or yellow sand, having a depth of about 10 inches. It is underlain by a coarse sandy subsoil which usually becomes loamy at a depth of about 3 feet. The loose, open character of this soil prevents it from maintaining a large water supply, and thus precludes the successful production of such crops as require a long growing season.

This soil is especially adapted to the production of early truck crops, which can be forced to an early maturity and prepared for a profitable market. This soil is largely utilized for trucking and market gardening along the Atlantic seaboard. Early strawberries, melons, potatoes, and sweet potatoes can all be raised with profit, while small crops of high-grade tobacco can also be produced.

The soil requires careful treatment under highly specialized conditions of farm practice. It requires the incorporation of large amounts of organic matter in order to produce the best results. The plowing under of leguminous crops and the addition of stable manure improve the texture of the soil.

The following analyses exhibit the sandy nature of this soil:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5487	2 miles NW. of Priest Bridge.	Coarse sand, truck soil, 0 to 9 inches.	0.01	0.80	0.00	7.56	34.78	37.86	9.60	6.34	2.33
5485	2 miles NE. of Bowie.	Medium fine yellow sand, 0 to 10 inches.	.01	1.90	2.10	11.78	24.54	32.12	7.16	13.32	5.79
5489	½ mile N. of Hyattsville.	Brown sand, 0 to 7 inches.	.01	3.00	9.08	23.62	19.50	13.76	7.16	16.60	6.03
5488	Subsoil of 5487....	Coarse yellow sand, 9 to 40 inches.	.01	0.60	0.00	7.56	42.64	32.16	8.18	6.40	2.25
5486	Subsoil of 5485....	Medium sand, 10 to 30 inches.	.01	1.90	Tr.	8.98	22.56	31.50	6.42	15.72	12.03
5490	Subsoil of 5489....	Loamy red sand, 7 to 36 inches.	.03	2.56	8.50	22.64	13.16	18.56	5.18	16.00	12.87

WESTPHALIA SAND.

The Westphalia sand occupies the gently sloping valley walls and the low, rolling hilly areas of eastern Prince George County. The

type is derived from the weathering of the surface outcrops of several sandy geological formations. Small areas of Westphalia sand near Buena Vista are derived from the loamy micaceous sands of the Matawan, but the greater number of the areas are derived from the clayey, somewhat glauconitic sands of the Nanjemoy formation. In the southwestern part of the county the sandier upper portions of the Calvert also give rise to Westphalia sand areas. These lie as low hills along the slope to the Patuxent River, and the soil type here attains its greatest agricultural value.

The natural forest growth of this soil includes oak, sycamore, tulip, and chestnut. No large forest areas exist, but scattered clumps of trees abound.

The soil consists of a fine sand or slightly loamy sand, yellow in color and friable and powdery when dry, but slightly sticky and easily compacted when wet. It is underlain at a depth of 9 to 16 inches by a loamy, fine-grained sand, slightly more cohesive and sticky. This is sometimes succeeded by loose gray sand, but not universally.

The Westphalia sand is finer-grained, less porous, and less friable than the Norfolk sand. It is well adapted to the production of the Maryland type of export tobacco, especially where its surface is level or only gently sloping. On the steeper slopes it is liable to be washed destructively. It is also a good producer of Irish potatoes and corn. Though somewhat loamy, its water-holding capacity is not sufficient to constitute it a desirable grass or grain soil. These crops are cultivated in the regular crop rotation, but without securing profitable yields. Peaches, small fruits, strawberries, and melons could be raised to advantage on this soil type, and its physical properties fit it for the production of these and later truck crops. It could not compete with the Norfolk sand in the production of early truck.

The smaller areas of Westphalia sand, especially those lying on the steeper slopes, are not well adapted to agricultural purposes. The removal of the surface soil is so rapid that underlying material is not prepared for crop production by weathering with enough rapidity to maintain annual crops. Such areas should become orchard lands or should be reforested.

FIG. 1.—GENERAL CHARACTER OF THE TOPOGRAPHY IN THE WESTPHALIA SAND AREA.

The surface is gently rolling, the soil is finer than that of the Norfolk sand, and it is adapted to tobacco, but is not particularly valuable for this or for other crops.

FIG. 2.—PEACH ORCHARD ON THE WINDSOR SAND.

This is a loose sand with fine gravel, requiring thorough cultivation and high fertilization for peaches and small fruits. Little valued for other crops. The old pine barrens of southern Maryland.

The following table shows the texture of this type:

Mechanical analyses of Westphalia sand.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5475	1 mile S. of Marlboro.	Very fine, mealy yellow sand, 0 to 10 inches.	0.01	2.44	0.00	Tr.	0.70	14.42	56.04	17.00	8.29
5477	2 miles N. of Marlboro.	Fine, mealy brownish sand, 0 to 10 inches.	.01	2.52	Tr.	1.50	1.94	17.22	44.40	23.20	9.21
5479	2 miles S. of Aquasco.	Fine, mealy yellow sand, 0 to 12 inches.	.01	3.14	.00	.00	2.82	24.98	34.74	19.80	13.49
5476	Subsoil of 5475....	Very fine mealy sand, 10 to 30 inches.	.01	1.92	.00	.00	Tr.	7.18	65.50	20.22	5.13
5480	Subsoil of 5479....	Fine, sticky sand, 12 to 36 inches.	.01	2.86	.00	.00	1.14	10.08	48.72	25.60	10.67
5478	Subsoil of 5477....	Fine to sticky sand, 10 to 30 inches.	.01	2.14	Tr.	2.22	2.56	22.23	41.38	15.32	14.63

WINDSOR SAND.

This type of soil, which is found in many other localities along the Atlantic coast, occupies an area of about 58 square miles, chiefly in the upland area of central and southern Prince George County. It is usually found along the gently sloping valleys of streams or where the headwaters of two drainage systems approach each other. The surface is thus gently sloping or more steeply inclined, with the change of circumstances of stream erosion.

This soil in its natural condition is the one most preferred by the pitch pine, and the extensive forests of this tree found on the Windsor sand have led to its being called "pine barrens" in some localities. This name is misleading, for although unsuited to the production of grain and grass crops, the Windsor sand constitutes a type of soil adapted to early truck crops, to fine early peaches, and, under favorable climatic conditions, to fine grades of tobacco.

The Windsor sand consists of a medium to coarse sandy soil that contains about 10 per cent of fine gravel. The soil is loose and friable and very unretentive of moisture. It reaches to the depth of about

8 or 10 inches and is underlain by a coarse sandy subsoil, which differs from the soil chiefly in its smaller content of organic matter. The depth of the subsoil depends largely upon the location of the area. The higher-lying, flatter areas have the deeper and sandier subsoils, and are more typically developed. The areas along the stream slopes, being subject to wash from above and also themselves arising from local soil creep and migration, are more irregular in texture and are usually of a less depth.

The Windsor sand also occurs along the Patuxent River and some of the other larger streams as a low-lying flat-topped stream terrace. The soil texture is the same as that of the upland areas, and the vegetation and crop value are closely similar, but the position near tide level gives an advantage to the areas in two ways. In the first place, the products of the area are nearer to water transportation. In the second place, many of the areas are so situated that whenever it becomes desirable the waters of upland streams can be turned upon them for irrigation purposes.

The Windsor sand produces a good grade of tobacco in several regions where it occurs, but it is uncertain, from the fact that its loose, porous character makes it particularly hard to manage during a protracted drought. The same difficulty is encountered in the production of truck crops. For this reason an intensive system of cultivation is required, including the incorporation of considerable amounts of organic matter with the soil to form a spongy, moisture-holding mass, as well as to furnish needed plant foods. When, in addition, it is possible to irrigate, and the value of the crops produced is sufficient to warrant it, the water supply can be controlled and a crop produced every year instead of once in two or three years. As yet the conditions are not such as would warrant so expensive a treatment in the Prince George areas, but many of them can be irrigated when it becomes desirable to do so.

The texture of this soil and subsoil is shown by the following table:

Mechanical analyses of Windsor sand.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5511	3 miles NE. of Bowie.	Coarse sand, 0 to 9 inches.	0.01	0.72	11.92	40.36	21.50	11.38	2.86	7.48	3.09
5509	1 mile S. of Queen Anne.	Coarse sand and gravel, 0 to 8 inches.	.01	.94	9.18	23.36	19.10	17.42	7.36	15.28	4.57
5512	Subsoil of 5511.	Coarse sand and gravel, 9 to 24 inches.	.01	1.12	11.36	35.38	21.90	13.36	4.82	7.68	3.65
5510	Subsoil of 5509.	Coarse sand and gravel, 8 to 30 inches.	.01	1.54	9.30	24.76	21.42	15.18	5.06	14.68	7.73

SUSQUEHANNA GRAVEL.

Scattered areas and long, narrow bands of distinctly stony or gravelly soil have been indicated as a special type. The different areas are usually found along steeply inclined slopes or near stream divides. In both cases active stream erosion has removed the surface covering, consisting of other soils, and the heavy gravel bands which underlie several of the upland soil types are thus exposed.

The natural timber growth of these gravelly areas consists of chestnut, pine, and oak, while the cultivated crops are usually the same as those found on better soils. Where a single narrow gravel band crosses a cultivated field no difference is made in the adaptation of crop to this exceptionally gravelly condition, although the yield of the crop is invariably much less than upon the other soil. Where the larger areas are found, the Susquehanna gravel if cleared should be reforested, not only because of its small value as farm land, but also to prevent further washing and destruction of adjoining areas of more valuable soil.

The Susquehanna gravel consists of 30 to 60 per cent of coarse gravel mixed with sand and loam. It is underlain by various subsoils, usually loamy or sandy. In addition to presenting great difficulties in the way of cultivation, it is unsuited both by texture and attitude to the production of ordinary farm crops. Similar soils in other

regions have proved valuable for the production of grapes, but reforestation is recommended for the majority of the areas found in Prince George County.

LEONARDTOWN LOAM.

The Leonardtown loam comprises a total area of about 70 square miles. It lies entirely within the upland portion of the county, occupying the highest levels in the southern part of the county and covering the gentle slopes along the border of the Piedmont Plateau. In the southern part of the county the surface of this soil type is flat or only gently rolling, while in the northern part it occurs somewhat less typically developed as a rolling or sloping surface. In all cases this soil type is bordered by areas of stony or gravelly soil. In other portions of the Coastal Plain this soil was originally occupied by extensive forests of white oaks. When this timber is removed the areas occupied by the Leonardtown loam usually grow up to pitch pine unless cultivated. A considerable portion of this soil type in the southern part of Prince George County is still covered by white-oak forest, but in the northern part of the county it is almost entirely under cultivation.

The soil itself consists of a yellow silty loam having an average depth of about 10 inches. It is underlain by a heavier yellow loam, which usually grades into a mottled loam at a depth of from 28 to 32 inches. At this depth the subsoil becomes brittle and crumbly, and a close examination shows that it consists of thin layers or lenses of clayey loam, which are separated from one another by thin seams or pockets of sand. Where the entire thickness of the soil formation does not exceed 5 or 6 feet the subsoil may also contain some fine gravel. Along the borders of this soil type the sand and gravel become more prominent as the soil becomes thinner, and the Leonardtown loam grades off into more stony or gravelly types. The entire area of the Leonardtown loam is underlain at varying depths by a bed of coarse gravel mingled with sand, which reaches the surface along the margins of stream valleys. This gravel and sand give rise to another type of soil, elsewhere described, and also play an important part in the natural underdrainage of the Leonardtown loam.

The Leonardtown loam constitutes one of the heaviest types of soil cultivated in Prince George County. It is silty rather than clayey in its texture, while the subsoil, on account of its composition and peculiar lenticular structure, offers a resistance to the circulation of water comparable to that of a heavy clay soil. This type of soil is capable of retaining a considerable supply of moisture during the entire growing season. It is, therefore, adapted to the production of grass, wheat, and corn where general farming is practiced, and to cabbage, cucumbers, and late strawberries in the trucking areas.

This soil is only producing to its full capacity in the northern part of Prince George County, where, through the use of green manures and lime, from 15 to 18 bushels of wheat per acre are frequently raised upon it. Elsewhere this soil type is generally lacking in organic matter. The Leonardtown loam should furnish an excellent soil upon which to introduce stock raising and dairying at points where market gardening can not be undertaken.

The mechanical analyses of this soil are given below:

Mechanical analyses of Leonardtown loam.

No.	Locality	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5467	2⅛ miles NW. of Muirkirk.	Yellow silty loam, 0 to 11 inches.	0.01	2.78	0.96	10.92	9.08	5.86	3.04	51.00	16.69
5471	Fort Foote.....	Loam, 0 to 12 inches.	.01	3.30	.00	Tr.	1.32	3.58	12.86	61.44	17.47
5465	1 mile S. of Bryant's Point.	Yellow loam, 0 to 7 inches.	.01	2.76	.00	Tr.	4.16	12.70	15.28	43.36	21.35
5469	1 mile SE. of Oxon.	Yellow silty loam, 0 to 9 inches.	.01	3.30	.00	1.04	1.18	4.42	4.56	61.72	21.93
5468	Subsoil of 5467....	Heavy mottled loam, 11 to 36 inches.	.01	2.98	Tr.	11.38	9.30	5.96	10.42	40.42	19.99
5466	Subsoil of 5465....	Mottled loam, 7 to 24 inches.	.01	2.50	.00	Tr	3.74	13.16	11.98	41.58	26.19
5472	Subsoil of 5471....	Heavy loam, 12 to 36 inches.	.01	3.22	.00	.00	1.04	3.46	4.78	56.38	28.37
5470	Subsoil of 5469....	Mottled loam, 9 to 36 inches.	.....	2.06	.00	Tr.	1.58	4.64	6.16	53.98	30.00

LEONARDTOWN GRAVELLY LOAM.

The Leonardtown gravelly loam occupies an area of about 6 square miles, occurring chiefly along the Montgomery County line. The surface is usually gently sloping and well drained, and this soil type is cultivated over the greater part of its area.

The original plant growth on the Leonardtown gravelly loam has been quite generally removed, but the areas now in forest show a second growth of oak and pine in about equal quantities. This soil is farmed to corn, wheat, and grass. It is more typically a corn soil than a wheat or grass soil, though these crops are produced to a fair advantage in the regular rotation.

The soil consists of a gravelly loam, containing from 15 to 30 per cent of fine and medium gravel mingled with some sand and larger amounts of fine material. The soil usually extends to a depth of 9 inches, and is underlain by a more compact yellow loam, which also contains considerable amounts of sand and gravel. At a depth of about 30 inches the subsoil is underlain by a bed of gravel and sand usually several feet in thickness.

The soil thus constituted forms an intermediate grade between the heavy, grain-producing soils and the light tobacco and truck soils. It is thus adapted to a variety of crops. At present it is used for general farming. In addition to the corn, wheat, and grass now raised, the Leonardtown gravelly loam is capable of producing good crops of tomatoes, peas, sugar corn, and similar crops in demand for canning purposes. It requires careful farming and a more general use of stable and green manures to secure the best results from this type of soil.

SASSAFRAS LOAM.

The Sassafras loam covers an area of about 14 square miles in Prince George County. It is found in flat-topped terraces along the Potomac and Patuxent rivers and their major tributaries. It is distinctly a terrace formation, occurring here and elsewhere in Maryland as one of the stages of the Columbia group of Pleistocene age. It is essentially flat-topped or gently sloping, and the different areas are often widely separated from one another by areas of soil derived from underlying and older geological formations. The Sassafras loam terraces are underlain at a depth of from 4 to 5 feet by a considerable layer of medium-sized gravel, which generally reaches the surface along their frontal slopes in the shape of Susquehanna gravel.

The Sassafras loam is occupied by areas of cleared and well-cultivated fields, well suited to general farming and producing wheat, corn, and grass in greater quantities than the general average of the county. This soil is found in several areas within the Coastal Plain of Maryland, and it has been proved to be of great agricultural value in all these regions. Besides the common crops already mentioned peaches, pears, asparagus, late melons, late strawberries, tomatoes, and cucumbers are adapted to this soil.

The soil itself consists of a brown or deep-yellow loam, having an average depth of about 9 inches. It is uniformly underlain by a heavy yellow loam subsoil from 3 to 10 feet thick, which in turn rests upon an underlying gravel bed. The soil is capable of maintaining a good supply of moisture, and unless exposed to exceptional conditions of rain wash it is easily maintained in a good condition of productivity. It forms one of the most desirable types of soils for general farming operations, but does not produce tobacco or early truck crops to advantage.

The following mechanical analyses show the texture of this soil to differ little from the Leonardtown loam, but in the field they appear quite different:

Mechanical analyses of Sassafras loam.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5491	¾ mile S. of Queen Anne.	Silty loam, 0 to 12 inches.	0.01	2.48	Tr.	3.08	3.64	9.76	21.50	50.40	8.33
5495	3 miles S. of Piscataway.	Brown loam, 0 to 8 inches.	.01	2.92	0.52	1.18	1.68	12.66	7.94	61.88	10.91
5493	2¼ miles N. of Bowie.	Yellow loam, 0 to 12 inches.	.01	3.44	.00	1.36	2.74	8.46	6.38	65.12	11.53
5494	Subsoil of 5493....	Heavy yellow loam, 12 to 36 inches.	.01	2.74	.00	1.46	3.84	12.36	9.78	52.08	17.97
5496	Subsoil of 5495....	Yellow loam, 8 to 36 inches.	.01	3.16	.30	.50	.64	8.10	14.56	49.72	21.83
5492	Subsoil of 5491....	Heavy yellow loam, 12 to 36 inches.	.01	4.06	.00	3.16	2.70	4.62	7.88	50.98	26.33

SASSAFRAS SANDY LOAM.

The Sassafras sandy loam is developed over considerable areas along the second bottoms of the main river courses at an elevation of from 60 to 90 feet above tide. The greater part of the area of this soil type found in Prince George County occurs in such a position, but several small areas occur in the low uplands of the northern central part of the county at an elevation of about 180 feet. In both cases the surface of the formation is nearly level and so situated as to be well drained and in good condition for agricultural purposes. Almost the entire area of the Sassafras sandy loam is under cultivation to general farm crops. Corn, wheat, and grass—particularly clover—produce well upon this soil. Good crops of Irish potatoes and medium crops of tobacco can be raised upon it.

This soil type owes its origin to the deposition of sedimentary materials in late Pleistocene time. The soil itself consists of a brown sandy loam of medium to fine-grained texture. It is easy to cultivate, and responds well to careful treatment. It has an average depth of about 10 inches. The soil proper is underlain by a slightly sandy or rather heavy yellow loam, usually more than 5 feet in depth. While not so retentive of moisture as heavier types of soil, the Sassafras sandy

loam is easily cultivated and its manipulation is perhaps better understood than that of the heavier soils. It is capable of producing a wider range of crops than it now supports in Prince George County. Green peas, sugar corn, and peaches are cultivated with success upon this soil in other localities. The texture of its soil and subsoil is exhibited by the following analyses:

Mechanical analyses of Sassafras sandy loam.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5499	2¼ miles NE. of Hyattsville.	Brown sandy loam, 0 to 8 inches.	0.2	3.56	4.38	13.02	9.96	11.10	6.96	24.76	17.08
5497	1 mile SW. of Collington.	Fine sandy loam, 0 to 9 inches.	.1	3.10	.....	.....	2.76	14.30	13.42	43.90	24.27
5500	Subsoil of 5499....	Micaceous yellow loam, 8 to 30 inches.	.2	3.84	6.70	12.98	9.56	9.42	6.16	27.72	23.38
5498	Subsoil of 5497....	Heavy yellow loam, 9 to 36 inches.	.1	4.32	.....	.....	1.60	13.66	4.88	48.74	26.61

NORFOLK LOAM.

The Norfolk loam occupies about 15 square miles, chiefly in the "Forest of Prince George." It occurs upon the uplands along the western and main branches of the Patuxent River. The surface of the soil is rolling or hilly. It rarely descends below an altitude of 100 feet, and only in a few cases rises above 160 feet.

Almost the entire area of the Norfolk loam has been under cultivation since the early settlement of the county. The original forest was long ago removed and little second growth has been allowed to spring up. The fact that this part of the county is referred to as the "Forest of Prince George" would indicate that it was originally heavily timbered.

The Norfolk loam consists of a very fine sandy loam soil, having a depth of from 12 to 20 inches. The subsoil consists of a reddish, sticky loam, commonly considered a clay throughout the region. This is underlain in turn by a fine, mealy gray sand at a depth that varies from 32 inches to 5 or 6 feet from the surface.

The rolling character of the area occupied by this soil type gives

rise to considerable variation in the texture of soil within single fields. Upon level or slightly inclined hilltops the sandy soil attains its greatest thickness and the gray sand, which constitutes the deepest subsoil, rarely reaches within 40 inches of the surface. Where the country is more rolling the surface sandy loam is thinner, and on the steeper slopes the sticky subsoil is barely covered by a thin layer of sandy loam. Frequently the gray sand reaches the surface lower down the slope and becomes stained to a light yellow color upon exposure to the atmosphere.

The small streams which have their headwaters in this area are continually transporting small amounts of the sand and sandy loam down their courses. This material, together with the outcroppings of gray and yellow sand along the hill slopes, has been mapped as a separate soil type. The Norfolk loam constitutes one of the soil types best adapted to the production of the Maryland pipe-smoking tobacco. For two hundred years this tobacco has been exported from southern Maryland, and the Norfolk loam, in Prince George County and adjoining areas, has produced the best grades of this tobacco from the beginning to the present time. From 750 to 900 pounds of tobacco are produced to the acre. Under weather conditions favorable to the maturing and curing of the crop a bright "colory" leaf is produced, which is noted in the foreign market for its free-burning qualities.

The tobacco crop matures in about eighty or ninety days from the time it is transplanted into the field. It is cut, removed to the barn, and cured by natural processes without the intervention of artificial heat. The value of the crop is therefore dependent upon the weather conditions not only during its growth, but also throughout the long process of curing and preparation for market. A more uniform grade of tobacco has been produced by a few growers through the use of open fires in the tobacco barns. A few attempts have also been made at flue curing, but no definite results have yet been reached.

Aside from tobacco, corn, wheat, and grass are produced upon the Norfolk loam. Wheat yields from 7 to 15 bushels, corn from 20 to 35 bushels, and hay from three-fourths of a ton to 1½ tons per acre. Some difficulty has been experienced in recent years in the production of clover. Cattle and sheep raising are carried on to some extent, but the uncertainty of the grass crop and the lack of practical experience in dairying have largely prevented the introduction of these desirable industries. The Norfolk loam, though exhibiting some differences in character over small areas, presents a constant type of soil adapted to the production of Maryland tobacco, and gives fair returns in general farming operations.

The soil and subsoil in the Prince George area are of a somewhat finer-grained texture than elsewhere in southern Maryland.

The following mechanical analyses show the texture of both soil and subsoil:

Mechanical analyses of Norfolk loam.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5481	2 miles NE. of Leeland.	Fine sandy loam, 0 to 10 inches.	0.01	3.10	.....	0.44	0.46	16.60	25.50	45.08	7.35
5483	2 miles N. of Upper Marlboro.	Fine sandy loam, 0 to 8 inches.	.01	2.08	.....	.....	1.18	30.74	41.82	13.22	10.41
5484	Subsoil of 5483....	Fine to medium sand, 8 to 36 inches.	.01	1.84	.....	.....	1.12	37.64	40.28	12.48	6.17
5482	Subsoil of 5481....	Heavy yellow loam, 10 to 32 inches.	.01	2.46	.....	.....	Tr.	12.18	28.94	34.72	20.25

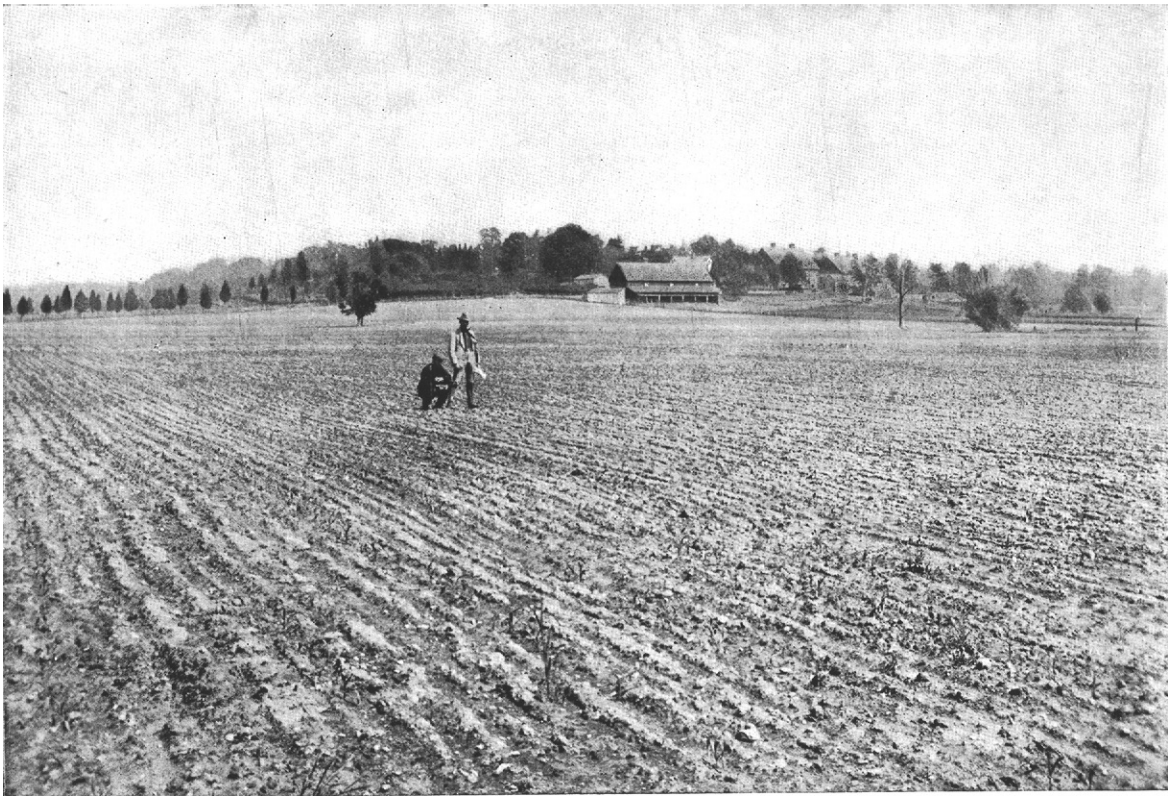
SUSQUEHANNA CLAY.

The Susquehanna clay covers more than 35 square miles of territory, lying along the main railroad lines connecting Washington and Baltimore. The greater part of the area remains uncultivated, and is widely known on account of the vivid red and purple coloring of the subsoil. The peculiar properties of this subsoil have formed the subject of extended chemical and physical research. This soil type occupies steep valley walls, irregular hills, and stream bottoms alike. It is usually deeply gullied by small stream courses, and frequently bears no vegetation whatever. Where the natural processes of weathering have produced a shallow soil, a sparse and scattering growth of oak and pine is found.

The scanty soil covering in this area consists of 4 or 5 inches of a yellow clay loam. It is underlain by a stiff, plastic mottled clay, which is red, gray, or purple in color. This clay has been used extensively for the manufacture of brick, sewer pipe, and drain tile. The very properties which adapt it for this purpose make it unsuitable for cultivation.

The numerous mechanical analyses that have been made of this soil show that it differs but slightly in texture from the rich and fertile clays found in the limestone areas.[a]

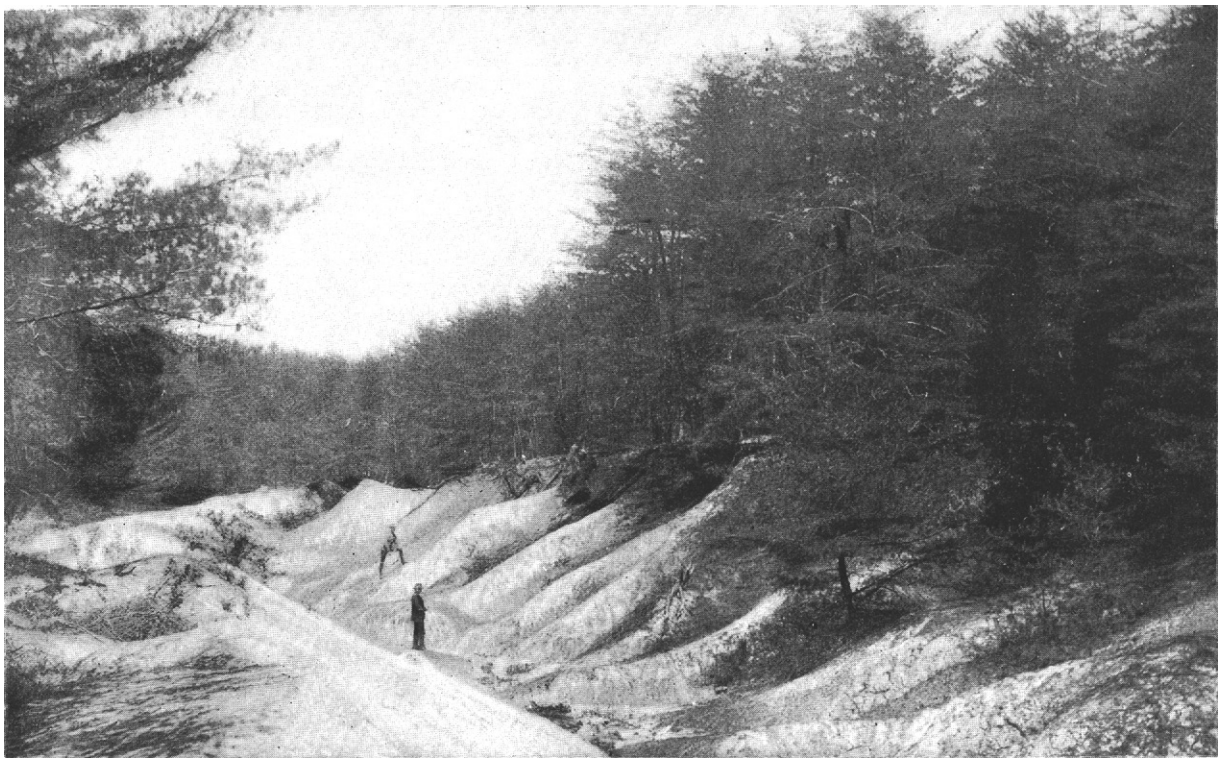
[a] Texture of Some Important Soil Formations, Bulletin 5, Division of Soils, U. S. Department of Agriculture, 1896.



GENERAL CHARACTER OF THE SASSAFRAS SANDY LOAM OCCURRING AS LEVEL TERRACES.

One of the most valuable soils of the area, easily cultivated, and adapted to a great variety of crops. It is not so strong a soil as the sassafras loam or the Leonardtown loam.

Report of Bureau of Soils, U. S. Dept Agr., 1901.



GENERAL CHARACTER OF THE SUSQUEHANNA CLAY.

An intractable, varicolored clay, usually much eroded, with scant soil covering, and unproductive. Supports a thick but small growth of pine with some scrub oak. Chemically and physically resembles the fertile limestone soils, and the cause of its low agricultural value is not thoroughly understood.

It seems probable that the structure of this soil plays a more important part in the determination of its character than is the case with most soils. The fine particles which make up the greater percentage of this soil seem to be so evenly distributed that whatever moisture penetrates it is distributed evenly through a great number of very minute pores. The circulation of soil moisture is thus impeded, and while a large supply of water is maintained, it is so immovably held as to be of little use to growing crops.

The Susquehanna clay, where it is exposed at the surface with no covering of any other material, produces very little vegetation of any value. The scattered timber found upon this type is cut for railroad ties or for the production of charcoal. The few cultivated areas found upon the Susquehanna clay are not successfully farmed. In every known case where crops are produced to advantage within the Susquehanna area the immediate soil is formed by Pleistocene or other extraneous material that covers the clay to a depth of 8 or 10 inches. Even when so covered the successful production of crops depends upon careful and skillful farm management. Certain portions of the area fall within another soil type (Susquehanna clay loam), and these portions are distinguished from the Susquehanna clay by marked features of origin and soil texture.

That some remedy for the unproductive condition of the Susquehanna clay can be devised is firmly believed. The present structure of the soil and subsoil must be changed by the application of substances which will tend to flocculate the soil particles. In this manner the circulation of the soil moisture and the soil atmosphere should be facilitated and the stores of plant food, which have been shown by chemical analysis to exist in this soil, should be made available. Lime is one of the substances that produces such a flocculating effect upon puddled soils, and it not only improves the soil texture, but also aids in the chemical reactions necessary to make available the reserve supplies of plant food. It also acts directly as a plant food itself. Lime has already been used upon a soil formed by a surface layer of about 8 inches of Pleistocene loam overlying the Susquehanna clay subsoil. In this case good clover and fair grain crops have been produced. While the conditions differ from those pertaining to the most marked type of Susquehanna clay, the beneficial results would seem to indicate that the experiment of liming should be thoroughly tried upon that type. The transformation of the semibarren areas of Susquehanna clay to a productive soil is a result greatly to be desired, and thorough experimentation along scientific lines may yet accomplish it

The following table shows the texture of typical samples of Susquehanna clay:

Mechanical analyses of Susquehanna clay.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5503	½ mile N. of Ardwick.	Yellow silty loam, 0 to 6 inches.	0.01	1.70	0.00	0.00	5.56	24.78	14.10	43.28	9.93
5501	1 mile N. of Agricultural College.	Clay, gravel, and iron crust forest land, 0 to 4 inches.	.01	4.70	9.38	12.90	5.36	8.56	7.42	16.16	35.71
5504	Subsoil of 5503.	Mottled clay, 6 to 36 inches.	.01	3.26	0.00	2.20	1.98	8.70	5.42	42.78	36.55
5502	Subsoil of 5501.	Mottled clay, 4 to 30 inches.	.01	4.90	1.20	2.62	2.16	11.68	19.16	21.12	36.55

SUSQUEHANNA CLAY LOAM.

Throughout the region occupied by the clays of the Potomac group there are found areas which, owing to the presence of lenses of sand or to the partial covering of Pleistocene material, do not fall within the limits of the Susquehanna clay. These areas, approximating an area of 26 square miles in Prince George County, are irregularly scattered through the western part of the county. They are found on hilltops, on slopes, and in the valleys alike, and are frequently cleared, though considerable areas still support a forest growth of oak and pine.

The surface covering of the Susquehanna clay loam consists of about 10 inches of sand or sandy loam, though its depth may be somewhat less, but the distinguishing feature of this soil type is the heavy mottled clay subsoil, which is identical with the Susquehanna clay.

The surface covering of sandy loam, however, furnishes an easily tilled seed bed which is of sufficient depth to germinate seeds and nourish the young plants. The heavy clay subsoil, covered by this loose-textured soil, serves as a reservoir for maintaining a good moisture supply, and its imperviousness aids in the retention of plant foods, which would be leached readily from the soil alone. As a result this modification of the Susquehanna clay, by the intervention of other materials to form the soil, gives rise to a type adapted to general farming, and especially to grain and grass crops. This

type of soil requires very careful farming. Lime is used to good advantage, and with its use some excellent clover crops have been produced.

The following table gives the mechanical analyses of soils and subsoils of this type of soil:

Mechanical analyses of Susquehanna clay loam.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5505	2⅛ miles NW. of Piscataway.	Yellow loam, 0 to 9 inches.	0.01	3.52	Tr.	2.10	3.62	7.96	12.68	57.14	12.29
5507	1½ miles S. of Agricultural College.	Brown loam, 0 to 6 inches.	.01	6.18	0.98	2.80	4.16	8.82	3.96	43.34	29.17
5506	Subsoil, of 5505...	Mottled clay, 9 to 40 inches.	.01	3.72	.....	Tr.	2.62	5.06	5.90	55.26	26.31

ELKTON CLAY.

The Elkton clay occurs locally in several small areas adjacent to stream courses in the northern portion of Prince George County. Its surface is low lying, usually flat, and rather poorly drained.

The soil consists of a brown or gray silty loam having an average depth of about 9 inches. It grades down into a heavy yellow loam which is underlain at about 28 inches by a mottled yellow and gray clay loam. On account of its low-lying position this soil is apt to be wet and difficult to cultivate. For the same reason the circulation of the soil moisture and the soil atmosphere is impeded.

In its natural state this soil is occupied by the sweet gum and willow oak. When cleared it affords good grazing, and is capable of producing excellent crops of wheat and grass. The small areas of this soil occurring in Prince George County can be made to produce from 25 to 35 bushels of wheat or 2 tons of hay per acre by proper underdrainage and intelligent cultivation.

The texture of representative samples is shown in the following table:

Mechanical analyses of Elkton clay.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5461	1¼ miles NW. of Marlboro.	Fine gray loam, 0 to 8 inches.	0.01	3.74	Tr.	1.56	1.24	7.90	33.08	41.54	9.73
5463	3 miles S. of McKendree.	Mealy gray loam, 0 to 10 inches,	.01	6.02	1.64	2.30	2.24	4.22	4.98	47.84	30.63
5462	Subsoil of 5461....	Heavy grayish clay, 8 to 36 inches.	.01	3.14	0.00	0.00	2.58	6.24	34.10	35.00	18.59
5464	Subsoil of 5463....	Sticky mottled clay, 10 to 36 inches.	.01	3.78	0.00	Tr.	.96	1.64	5.68	50.88	36.43

CECIL MICA LOAM.

The Cecil mica loam is a residual soil, occupying an area less than 1 square mile in extent in the extreme northern portion of Prince George County. It is found along the steeper stream courses where overlying sedimentary materials have been removed by erosion. The surface of this soil type is rolling or steeply sloping, and it usually descends to rocky, uncultivated areas along the streams. This soil has been derived from underlying crystalline rocks through the mechanical and chemical processes of weathering. The circulation of atmospheric water charged with various chemicals has broken down the minerals of which the rock was composed. The action of frost and encroaching vegetation has further modified the composition and the texture of the surface material. In this way a soil has been formed which is composed of disintegrated and decomposed rock materials. Certain minerals have resisted this weathering process, and still survive in the soil in their original condition.

The soil of the Cecil mica loam consists of a friable yellow loam which contains considerable quantities of unweathered muscovite mica, existing in small flakes. When dry this soil is loose and almost sandy; when wet it feels slippery and greasy—a property due to the presence of a large quantity of polished mica scales. The subsoil, occurring at a depth of about 9 inches, is a reddish-yellow loam, which also contains a large proportion of mica flakes. This grades down at various depths into partly decomposed crystalline rock. Both soil and subsoil contain broken fragments of quartz and undecomposed rock.

This soil, like most residual soils, contains fair supplies of most of the essential plant foods. Its texture is also favorable to the retention of moderate amounts of soil moisture. The Cecil mica loam is suitable for the production of corn, wheat, and grass, and is capable of attaining a high state of cultivation as a soil adapted to general farm crops.

The texture of the soil and subsoil is shown by the following mechanical analyses:

Mechanical analyses of Cecil mica loam.

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5449	2 miles northwest of Laurel.	Micaceous brown loam, 0 to 12 inches.	0.01	4.24	4.54	15.04	12.36	26.52	10.28	17.60	10.67
5450	Subsoil of 5449....	Micaceous reddish loam, 12 to 40 inches.	.01	4.50	4.72	11.24	10.56	25.08	7.24	19.02	18.43

MEADOW.

All soils in this area are classed as Meadow whose chief characteristics are a level, low-lying position and a poorly drained or semimarshy condition. Nearly all of the areas thus mapped are at times subject to overflow by flood waters, and over most of them an intermittent deposition of gravel, sand, and silt takes place at such times.

The meadows are largely forested by water birch, sycamore, sweet gum, and willow oak, interspersed with a rank vegetation of running vines and coarse grass. They are usually uncultivated, and are used only to furnish grazing during the drier portions of the year.

Over these areas the process of soil formation is still in progress, and the meadow areas constitute incomplete stream terraces which are not yet adapted to cultivation. Some portions of the meadow area mapped in Prince George County could be transformed into agricultural lands by underdrainage or by inexpensive diking.

AGRICULTURAL CONDITIONS.

At the present time the land holdings of Prince George County vary in size from 100 or 200 acres up to 1,000 acres or more in a single tract. The larger farms are worked under a tenant system, the tenants making payment either in cash or in farm products, under

varying conditions of contract. Near the boundary of the District of Columbia many of the larger farms have been subdivided into small parcels and sold to persons desirous of engaging in market gardening. Upon these smaller tracts are produced radishes, lettuce, tomatoes, cucumbers, melons, green peas, sugar corn, and berries, which are transported to Washington by team and there either sold from market stalls or peddled from house to house. Upon these market-garden farms an intensive system of cultivation has been practiced in order to produce a steady supply of the various crops in season. The labor upon these small tracts is largely performed by the owner, the members of his family, and a few hired hands. Large amounts of lime, gas lime, and stable manure are obtained from the city to maintain the fertility of the market-garden farms.

The trucking industry, which is carried on to some extent in northern Prince George County, differs from market gardening in that larger tracts are cultivated under a single management and larger areas of single crops are produced, to be sold on commission in the various markets. The chief trucking crops of Prince George County are green peas, strawberries, and sugar corn. To these should be added early Irish potatoes and sweet potatoes, which are also produced in connection with the general farming crops.

The trucking and market-gardening areas of Prince George are confined to the northern and northwestern portions of the county. Tobacco, while not confined to any particular locality, is most successfully produced in the area known as the "Forest of Prince George," which extends from Bowie southward along the Patuxent to the extreme limits of the county. Of the general farm crops corn ranks next to tobacco in importance. Wheat is the only other grain produced extensively, though considerable areas of rye are sown, largely for the pasturage furnished, the grain entering as an incidental profit. The raising of cattle and sheep is being reintroduced into the county, although attended by some practical difficulties.

Upon those farms where tobacco is raised lime is little used, since its application injures the burning quality of the leaf. Commercial fertilizers, however, have been used in large quantities for many years to increase the production of tobacco and the grain crops. They have been considered a complete fertilizer in many cases, and too little attention has been paid to the restoration of organic matter to the soil. Recently leguminous crops in the form of cowpeas and crimson clover have been introduced and the system of agriculture improved through this means. The production of good forage crops can only be resumed by a more generous use of lime and the leguminous green manures. The cowpea seems better adapted to this end than any other leguminous crop. The restoration of the soils to conditions favoring grazing must necessarily be slow. Many of the

farmers of the region recognize the desirability of raising more stock and are seeking to enlarge their facilities by raising redtop and other grasses suited to the industry.

Among the soils of Prince George County the Cecil mica loam is notable as the only residual soil. It occurs in many other areas along the Atlantic coast, and is usually cultivated to corn, wheat, grass, tomatoes, and orchard fruits. Under favorable conditions of season it is capable of producing 15 to 25 bushels of wheat, 45 to 60 bushels of corn, and 1 or 2 tons of hay per acre. It is not a heavy soil and therefore, while quickly responsive to applications of commercial fertilizers or stable manure, it requires frequent applications of fertilizer and careful farming to maintain the yields quoted.

The Elkton clay is a strong productive soil when properly drained, and with careful management is capable of producing 30 bushels of wheat or 2 tons of hay per acre. Liming and underdrainage are the chief requirements of this soil type.

The Leonardtown gravelly loam is better adapted to the production of peaches, pears, and other orchard fruits than to general farming. Its texture, location, and drainage fit it for the fruits named. The yield of wheat ranges from 15 to 18 bushels per acre; of corn, from 30 to 35 bushels.

The Sassafras sandy loam is one of the most valuable of Coastal Plain soils. In addition to its good texture it contains large stores of plant food, is well drained and possesses a level, easily tilled surface and usually an advantageous location with regard to transportation facilities. Its full capabilities as a general crop soil have not been reached in Prince George County. With proper fertilization, including the use of stable manure and of green crops plowed under, the Sassafras sandy loam should produce 25 bushels of wheat, 50 to 60 bushels of corn, and 2 tons of hay per acre. It is also well adapted to the production of tomatoes, green peas, sugar corn, broom corn, cabbages, and cucumbers. It is not a typical early truck soil, but is capable of yielding good results when devoted to market gardening.

The Sassafras loam is found in many localities along the Atlantic Coastal Plain. It is uniformly a medium to heavy loam, capable of a high development as a general farming soil. In southwestern New Jersey large areas of this soil produce 30 to 35 bushels of wheat, 45 to 60 bushels of corn, 8 or 9 tons of tomatoes, and 2 tons of grass per acre. It is the soil most preferred for stock raising and dairying, and possesses an average value of $50 to $65 per acre. On the Eastern Shore of Maryland extensive tracts of Sassafras loam are devoted to peach and pear orchards, while tomatoes, sugar corn, and green peas are raised for canning. The type there is valued at $35 to $60 per acre. In southern Maryland, including Prince George County, a much smaller range of crops is cultivated on this type, though the climatic,

soil, and market conditions are nearly identical in the three regions. The type is valued at only $12 to $25 per acre on the average in Prince George County. It is thus seen that the opportunities for improvement in agricultural methods, for the introduction of new crops, for the development of new industries, and for the profitable investment of capital are many and great.

The Leonardtown loam constitutes the nearest approach among Maryland Coastal Plain soils to the heavy wheat and grass producing soils of the limestone regions. In spite of its level surface and its advantages of drainage this type has been allowed to grow up to pine and oak forest to a considerable extent since the civil war. It is not adapted to the production of tobacco, and its capabilities in other directions have remained unknown or unappreciated. This soil type needs extensive applications of lime and green manures to make it highly productive. It should produce good crops of wheat, corn, and grass, and form the basis of dairying or stock-raising activities. It is the most extensive of the soil types in Prince George County, and it can be bought for $1.50 to $5 per acre in the unimproved state or for $5 to $10 per acre improved, within a few miles of the District of Columbia line. Experiments in other areas have shown that proper management will make this soil produce from 15 to 20 bushels of wheat, from 35 to 50 bushels of corn, and from 1 ton to 1½ tons of hay per acre. The only means employed to secure these yields has been the application of lime and stable manure.

The Norfolk sand is a typical Atlantic coast truck soil. It is a mealy, porous, warm sand, well drained and easily cultivated. In regions where trucking forms an important part of agriculture this soil is sought out as best adapted to the production of watermelons, canteloupes, sweet potatoes, early Irish potatoes, strawberries, early tomatoes, early peas, peppers, eggplant, rhubarb, and even for cabbage and cauliflower, though the latter crops produce better yields on a heavier soil. The Norfolk sand in Prince George County is well situated with regard to the markets of Baltimore, Washington, and Philadelphia. Its climatic surroundings are favorable and the prices of land low. It should serve as the basis for a strong development of the truck industry in the county.

In texture the Westphalia sand is considerably finer grained than the Norfolk sand. On the other hand, it is not so distinctly loamy as the Sassafras sandy loam. It furnishes a type not so well adapted to the production of the early truck crops as to the raising of Irish potatoes, peaches, small fruits, and tomatoes. It is too sandy and porous to produce good yields of grain or grass, even when well fertilized. The more level, sheltered portions of this type in Prince George County produce a fair yield of tobacco, while the steeper slopes are almost barren of any crop.

The Westphalia sand is deficient in organic matter, and its texture and fertility can be considerably improved by the use of green and stable manures.

The Windsor sand is the loosest, most incoherent soil of the area. It does not retain sufficient moisture to mature the grain crops to advantage, but is well adapted to small fruits, such as raspberries and currants. Peach orchards located on this type are noted for their long life and for the size and beauty of the fruit produced.

The Susquehanna gravel exists only in narrow bands and small isolated areas. It is totally unfitted for most agricultural purposes, and should remain in forest wherever possible. Grapes are raised on soils of similar texture in other regions, and the possibility of their culture on Susquehanna gravel should be experimentally determined.

The Norfolk loam has long occupied a commanding position in the production of the Maryland type of smoking tobacco. The hilltops throughout the forest of Prince George are capped by this soil type, and the yield of tobacco and the prices commanded have been uniformly good in this region. In other areas of the type the same conditions hold. This type is commonly fertilized by the use of the commercial products, though lately cowpeas have been employed in conjunction with the manufactured fertilizers. It is a fundamental principle with the tobacco growers that the application of lime on fields where the crop is to be raised injures the burning quality for which the tobacco is esteemed. In consequence, where tobacco is to form part of the crop rotation the other crops of the rotation suffer for lack of lime for the sake of the one year's growth of tobacco. The soils of this region all require lime for the production of grain and grass, and the present rotation, based on tobacco, does not permit the Norfolk loam to produce other crops to its best ability.

The Collington sandy loam is a peculiar soil derived from the decomposition in place of a greensand stratum. The resulting soil is a medium sandy loam underlain by a sticky, heavy sandy loam. The physical texture of this soil gives a warm seed bed, producing quick germination, and a good subsoil reservoir to maintain a water supply during the period of growth, while its chemical composition insures a good supply of potash salts, one of the most expensive plant foods when purchased as a fertilizer. The complete commercial fertilizer is not required on this soil so much as an application of phosphate rock, coupled with the production of cowpeas to supply nitrogen. These should be plowed under, in order to furnish additional organic matter. This soil type produces good crops of wheat, corn, tobacco, and grass, and is also adapted to Irish potatoes and fruit. In its sandier portions it raises good truck crops.

The Susquehanna clay constitutes one of the most intractable soils of the region. It is a sticky, plastic mass, difficult to cultivate, liable

to excessive baking in dry times, and comparatively unproductive over a greater part of its area. Little has so far been accomplished toward the solution of the agricultural problem it presents. The extensive use of lime corrects its textural faults to some extent, and good crops of wheat and clover have been produced under this treatment.

The Susquehanna clay loam possesses a loose sandy or loamy soil capable of cultivation and of forming a natural mulch over the dense clay of the subsoil. As a consequence it forms a fair seed bed and yields medium crops of grain and grass.

The great variety of soils found in Prince George County, the moderate climate and general healthfulness of the greater part of the county, its accessibility by rail and by water, all favor a greater specialization of agriculture and increased profits from the cultivation of the soil.

The location of Prince George County is such that the further extension of the suburban residence section may be reasonably expected. Market gardening will also cause the further subdivision of the larger tracts of land, particularly those located near the District line. The area used in trucking operations is also increasing and should ultimately occupy the entire extent of the sandier types of soil. The canning industry should be introduced, for the climatic conditions and the great diversity of soils in the county would permit of a continual succession of canning crops during the usual growing season.

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