

Issued March 25, 1916.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE MARYLAND GEOLOGICAL SURVEY,
WM. BULLOCK CLARK, STATE GEOLOGIST.

SOIL SURVEY OF MONTGOMERY COUNTY,
MARYLAND.

BY

WILLIAM T. CARTER, JR., OF THE U. S. DEPARTMENT OF
AGRICULTURE, AND J. P. D. HULL, OF THE MARY-
LAND GEOLOGICAL SURVEY.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1914.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1916.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., October 2, 1915.

SIR: Under the cooperative agreement with the Maryland Geological Survey, Wm. Bullock Clark, State geologist, a soil survey of Montgomery County was carried to completion during the field season of 1914.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1914, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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MAP.

Soil map, Montgomery County sheet, Maryland.

SOIL SURVEY OF MONTGOMERY COUNTY, MARYLAND.

By WILLIAM T. CARTER, Jr., of the U. S. Department of Agriculture, and
J. P. D. HULL, of the Maryland Geological Survey.

DESCRIPTION OF THE AREA.

Montgomery County lies along the central part of the southwestern boundary of Maryland. One tier of counties separates it from the State of Pennsylvania on the north. The eastern boundary is approximately 30 miles west of Chesapeake Bay, and the southern part adjoins the District of Columbia. The extreme eastern corner is about 20 miles southwest of the city of Baltimore. The county is bounded on the north by Frederick and Howard Counties, on the east by Howard and Prince Georges Counties, on the south by the District of Columbia and on the south and west by the State of Virginia. It is separated from Howard County by the Patuxent River and from Virginia by the Potomac River. The county has an area of 484 square miles, or 309,760 acres.

Physiographically, Montgomery County is a plateau, dissected by numerous streams which have cut narrow valleys, resulting in considerable difference in the surface configuration of various parts of the area. The topography of the greater part of the county is gently rolling to strongly rolling.

Along the Potomac and Patuxent Rivers and many of the larger streams the county is decidedly hilly (see Plate I). Sugar Loaf Mountain, an outlier of the Blue Ridge, situated in Frederick County to the north, touches the northern boundary of Montgomery County. Throughout the county on the broader ridges and also on the Potomac-Patuxent divide (the latter representing the southern extension of what is known as Parrs Ridge) small areas of almost level to gently rolling topography occur. Some of the more prominent bodies having this smoother surface are encountered near Laytonsville, Claysville, Olney, Sandy Spring, Spencerville, Norbeck, Gaithersburg, Poolesville, and Hunting Hill. Along the southeastern boundary of the county, in the Coastal Plain region, the topography is gently rolling to hilly. Throughout the county there are level and flat areas, usually narrow strips of first bottom and occasionally of second bottom, along the rivers and larger creeks.

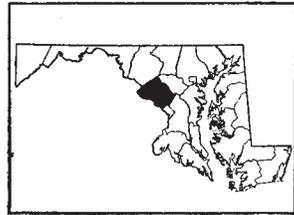


FIG. 1.—Sketch map showing location of the Montgomery County area, Maryland.

In elevation above sea level Montgomery County ranges from 60 feet at the extreme southern point along the Potomac River to about 850 feet in the extreme northern corner. However, the general elevation of most of the country is between 300 and 600 feet above sea level. The elevation at Kensington is about 300 feet, at Rockville 450 feet, at Poolesville 400 feet, and at Damascus 846 feet. The general slope of the county is southeasterly.

The greater part of the county is drained by the Potomac River. With a fall of 150 feet this stream flows in a southeasterly direction for a distance of 40 miles along the western border of the county. The main channel varies in width from a few hundred feet to nearly one-half mile. The river has a rather sluggish flow, except near Seneca, Great Falls, and Little Falls, the most pronounced rapids being at Great Falls. Water power of considerable magnitude could be developed at this point. The level of the present flood plain of this stream is about 100 to 250 feet below the general level of the adjoining uplands 1 mile to 3 miles inland from the stream. The principal tributaries of the Potomac are Little Monocacy River, Seneca, Cabin John, and Rock Creeks, and Northwest, Muddy, and Watts Branches. These streams have rather rapid currents. They occupy deep, narrow valleys and are still cutting their channels deeper. The Patuxent River, rising in the northern corner of the county, forms the northeastern boundary. Its principal tributary is Hawlings River, and this, with a few other small tributaries, drains a strip of the county 2 to 6 miles in width along the Patuxent. These streams are rather swift-flowing and cut valleys similar to those of the streams flowing into the Potomac. A small area along the northern boundary is drained by Bennett Creek, which flows westward out of the county.

In addition to the rivers, creeks, and branches enumerated, there are many small streams, spring branches, and intermittent streams throughout the uplands, giving an adequate and complete drainage system. On some of the steeper slopes the drainage is excessive. All the first-bottom lands along the streams are subject to occasional overflow. However, the water remains on the surface for only short periods of time.

Mills for grinding grain are operated by water power on many of the streams. The possibilities of extending such industries are good.

Montgomery County was formed from Frederick County in 1776, although some sections, particularly the site of the present town of Rockville, were settled long before that time. The early settlers were English or of English descent. The region around Sandy Spring was settled largely by Friends.

The population of Montgomery County is reported in the 1910 census as 32,089. It consists principally of descendants of the orig-

inal settlers. About 29 per cent of the population is colored. Since the largest town has a population of only 1,242, the entire population of the county is classed as rural, although about one-fourth of the people live in the towns and a considerable number of those living in the southern and central parts of the county are employed in Washington. The agricultural population is well distributed throughout the county. The least thickly populated region is the northwestern part, while the densest population is along the railroads and in the section adjoining the District of Columbia. The importance of agriculture in the county is attested by the large and well-distributed rural population.

Rockville, with a population of 1,181, is the county seat and principal town, and is located in the central part of the county. Gaithersburg, with a population of 625; Germantown, with 250; Kensington, 689; Dickerson, 125; Garrett Park, 185; Silver Spring, 200; Takoma Park, 1,242; and Chevy Chase, which is partly in the District of Columbia, are towns of local importance, while several smaller towns are distributed throughout the county along the railroads, trolley lines, and principal highways.

Transportation facilities are good through the central part of the county from south to northwest. The Metropolitan Branch of the Baltimore & Ohio Railroad traverses the central part of the county in a northwesterly direction. The transportation facilities of the eastern and western parts of the county are inadequate. A small area in the northeastern corner of the county is served by the main line of the Baltimore & Ohio Railroad, which is but a few miles outside the county. One trolley line extends from Washington to Rockville, with a branch to Great Falls, another from Washington to Kensington, another from Washington to Forest Glen, and one from Washington to Cabin John Bridge. These lines furnish transportation to a large number of people living in the suburbs of Washington. The first transportation line in operation in the county was the Chesapeake & Ohio Canal, which follows the Potomac River. This canal is used chiefly in freighting products from and supplies into the the county, and benefits only a small part of the population.

There are a number of excellent turnpikes extending through the county, including some of the State highways. The dirt roads are in good condition throughout the greater part of the year. All sections of the county are reached by rural mail delivery. Telephones are in general use, and good schools and churches are located at convenient places throughout the county.

Washington and Baltimore constitute the principal markets for the products of Montgomery County. Washington furnishes an excellent market not only for hay and other general-farming crops but also for dairy and poultry products, pork, beef, lambs, sheep, market-

garden products, orchard fruits, and berries. The small towns within the county consume a small part of the products.

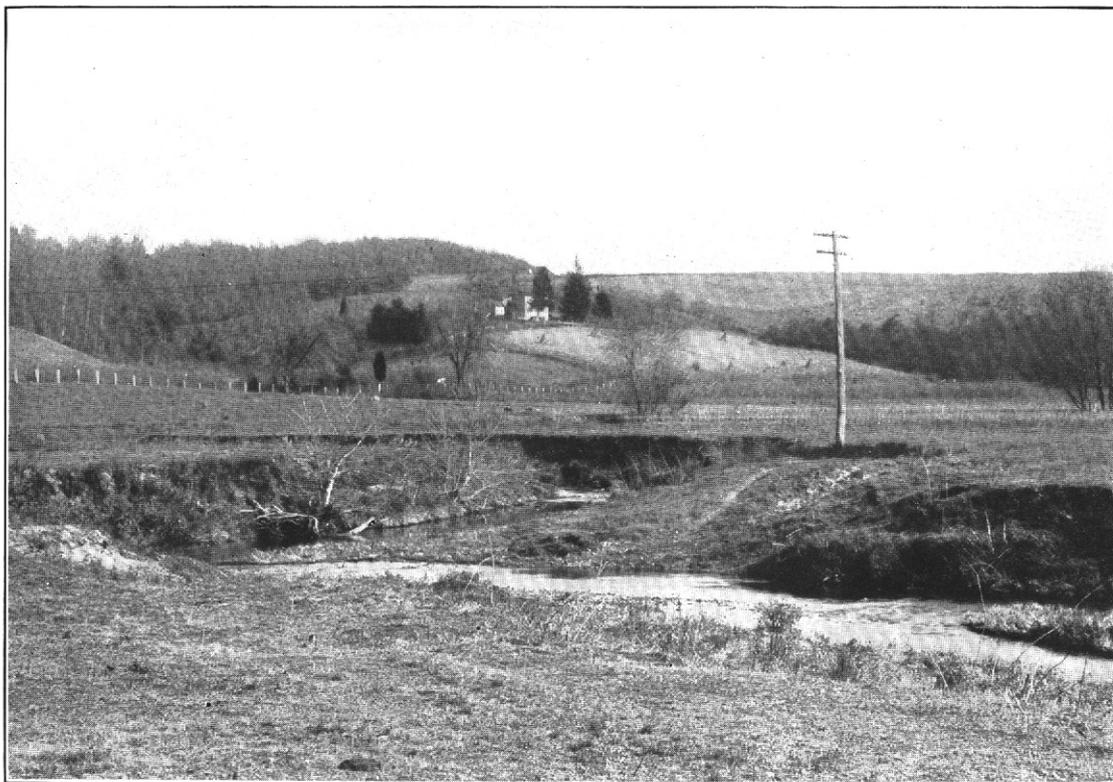
CLIMATE.

Montgomery County has a mild and healthful climate. The mean annual temperature is 53.8° F. The average growing season, which is the period between the latest killing frost in the spring and the earliest in the fall, is 170 days. The average date of the last killing frost in the spring is April 30, and of the first in the fall October 17. The latest recorded date of killing frost in the spring is May 12, and the earliest in the fall October 3. The mean annual precipitation of about 38 inches is well distributed throughout the year. The rainfall is usually adequate during the growing season, though occasionally crops are damaged by drought.

The table below, giving the normal monthly, seasonal, and annual temperature and precipitation for Montgomery County, is compiled from the records of the Weather Bureau station at Great Falls. This station is in the southwestern section, but the data are doubtless representative of the general climatic conditions of the entire county.

Normal monthly, seasonal, and annual temperature and precipitation at Great Falls.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	34.3	68	0	3.23	0.59	2.63
January.....	31.1	76	-4	2.93	2.23	3.11
February.....	30.6	68	-14	2.93	5.50	2.14
Winter.....	32.0			9.09	8.32	7.88
March.....	42.8	91	5	3.32	3.20	5.37
April.....	52.6	93	22	2.81	.49	3.91
May.....	64.3	96	28	3.28	4.12	2.37
Spring.....	53.2			9.41	7.81	11.65
June.....	72.1	99	41	3.33	3.44	4.33
July.....	76.1	104	48	4.33	2.95	4.10
August.....	74.3	99	47	3.45	1.38	8.89
Summer.....	74.2			11.11	7.77	17.32
September.....	68.2	97	35	3.20	3.32	.29
October.....	55.4	90	22	2.77	.43	8.47
November.....	43.7	78	11	2.39	2.53	1.84
Fall.....	55.8			8.36	6.28	10.60
Year.....	53.8	104	-14	37.97	30.18	47.45



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NARROW STREAM BOTTOMS AND TYPICAL ROLLING SLOPES LEADING TO THE UPLAND. MOST OF THE LATTER MAY BE CULTIVATED.



COMMON TYPE OF FARM BUILDINGS ON CHESTER LOAM, MONTGOMERY COUNTY, MD.

56704

AGRICULTURE.

Montgomery County was settled, for the most part, after 1700. Since its settlement agriculture has been practically the sole industry. The first crops grown were wheat, corn, and grass, with some tobacco. Very small yields are reported by some of the oldest inhabitants to have been the rule before and for many years after the Civil War. It is said that up to 25 or 30 years ago many of the now productive fields were in broom sedge and bushes and had an unproductive and somewhat desolate appearance. Some guano was used more than 50 years ago. The general use of lime had its beginning some 25 or 30 years ago, and this, together with the keeping of more cattle and other stock and the application of manure, had a noticeable effect in improving the soils and increasing crop yields. The prosperous condition of agriculture is due also to the growth of the dairy industry and the feeding of beef cattle.

According to the 1880 census there were 35,287 acres in corn in 1879, producing 1,020,573 bushels. The wheat acreage was 35,673, with an output of 615,702 bushels. There were 18,669 acres in hay, with a production of 20,327 tons. In addition to these crops some oats, rye, tobacco, and buckwheat were grown, together with about \$82,000 worth of orchard products and market-garden crops. The 1890 census figures indicate but little change in the acreage devoted to the various crops. By 1899 the corn acreage had increased to 40,030 acres and the production to 1,489,769 bushels. Wheat was grown on 48,436 acres, producing 766,280 bushels, and tame grasses on 26,838 acres, producing 28,028 tons of hay. The value of dairy products sold was \$348,129. The value of animals sold and slaughtered is reported as \$324,704 and of poultry raised \$90,191.

At the present time the agriculture in Montgomery County consists of the production of general farm crops for sale and home use, dairy farming, the feeding of beef cattle, hog raising, market gardening, and fruit growing. The principal crops are corn, wheat, and hay. Rye, oats, potatoes, and tobacco are grown to some extent.

Wheat occupies the largest acreage of any crop in the county and is the principal money crop. The census of 1910 reports 45,112 acres in wheat, with a production of 769,289 bushels. A part of the wheat is used locally, but most of the crop is shipped to Baltimore and Richmond, and a small amount to Washington.

Corn is grown on practically every farm, and is the second crop in importance. The 1910 census reports a total of 39,278 acres in corn, with a production of 1,380,249 bushels. There is a considerable acreage devoted to corn for ensilage. A large part of the corn produced in the county is utilized for feeding work stock, dairy stock,

and hogs, for fattening steers, and for other purposes. Considerable quantities are shipped to Washington and Baltimore.

The third crop in importance in Montgomery County is hay. A total of 25,063 acres is reported in tame or cultivated grasses in the 1910 census, with a production of 24,881 tons. The hay crop consists largely of timothy and clover, which are usually grown together, though over 10,000 acres are reported in timothy alone. The greater part of the hay is fed on the farms to work stock and beef and dairy cattle. A large part of the crop is sold locally and in Washington.

There are 10,322 dairy cows in the county. Dairying is followed by many farmers, particularly near the railroad, and the revenue derived from the sale of dairy products amounts to nearly \$500,000 annually. The dairy farms usually have from 10 to 30 cows, although there are a few larger herds. The Holstein and Jersey breeds and grades of these cattle are mainly used. Practically all the milk is sold in Washington; a small quantity is disposed of at the creameries at Cedar Grove and Etchison, where it is made into butter. Many of the farms are equipped with silos, the dairying being of the year-round type.

Many steers are shipped into the county from Tennessee, Virginia, and Chicago. On a number of the farms from 10 to 50 of these animals are fed for several months and then sold for beef in Washington, Baltimore, or other eastern markets. In other cases the animals may be kept for a year or more; on pasture during the summer and fed on hay and corn stover and corn during the winter. On some farms silage is coming into use as feed for beef animals. Most of them are fed at points some distance from the railroad. Over 6,000 calves and nearly 5,000 other cattle are reported in the 1910 census as sold or slaughtered.

The census of 1910 reports over 19,000 hogs sold or slaughtered in the county. The hogs are well distributed throughout the county, nearly every farm having from 3 to 15. After the demand of the home and of local markets is supplied, a considerable number are sold in Washington or Baltimore. On many farms from 20 to 50 sheep are kept, and the shipping of spring lambs to Washington and other markets produces considerable revenue.

The value of poultry and eggs produced is given as \$350,728 for 1909. The poultry industry is developed in a small way on the farms, and the products are sold in Washington and Baltimore. In the extreme northern part of the country tobacco is produced on about 50 or 60 farms. This is a pipe-smoking type of leaf, and finds its way to Baltimore for shipment abroad. In the southern part of the county, especially in that region influenced by the Washington markets, many farmers are engaged in market gardening, either as

a special industry or in conjunction with general farming. The growing of strawberries and other berries and fruits is also important in this part of the county. There are a few commercial orchards of apples and peaches in the country, the largest one being near Rockville.

The farmers of Montgomery County recognize that the Chester loam, Manor loam, and Louisa loam are well suited to the production of corn, wheat, and grass, and that the Penn loam and silt loam are good soils for these crops in ordinary seasons, but do not produce as good yields in dry seasons. The Penn sandy loam is recognized as a good corn soil, but as having too light a texture for the profitable production of wheat. The Leonardtown soils are considered best suited to berries, small fruits, and market-garden crops. The micaceous phase of the Manor loam is held a good soil for vegetables, berries, and small fruits. The Huntington loam and Congaree silt loam are universally recognized as the best corn soils in the county, and the Congaree is considered the best soil for natural pasture.

In growing corn the field is usually plowed in the spring to a depth of 6 to 8 inches, dragged down, and harrowed at least twice before planting. Occasionally the land is plowed in the fall or winter and either left bare or seeded to rye. Corn is cultivated three to five times. In the fall wheat is drilled in the corn land without plowing, and with it grass, mainly timothy, is sowed. The following spring red clover is seeded in the grass and wheat. The wheat is harvested and the timothy and clover remain on the land and are cut for hay the following year. Timothy and clover are pastured to some extent. After the first year the clover practically disappears and the timothy is subsequently cut for hay or pastured two or three years, except where the land is plowed again for corn.

The farm buildings, including the dwellings, are generally large and substantial (see Plate II). Many of them are built of stone. The barns are large, and many have stone foundations and are of the "bank-barn" type, with storage room for considerable grain and hay and space for the work stock and other animals. The fences are very good, many of them being woven wire. The work stock consists of draft horses of medium to heavy weight. The farm machinery in general use includes 2-horse or 3-horse turning plows, disk plows, smoothing harrows, cultivators, mowing machines, rakes, and binders. Machines for thrashing wheat travel about the country serving the farmers soon after harvest.

Definite systems of crop rotation are practiced in Montgomery County. One in general use consists of corn 1 year, followed by wheat for 2 years, which in turn is followed by grass for 1 year or 2 years, the grass land being again planted to corn.

For the farms reporting the use of commercial fertilizer the 1910 census gives an average expenditure of \$124 per farm. Most of this fertilizer is used for wheat. A smaller quantity is used in market gardening and for tobacco and corn. For wheat the fertilizers contain about 8 to 10 per cent of phosphoric acid, 1 to 2 per cent of nitrogen, and 2 to 3 per cent of potash. The fertilizer for tobacco is slightly higher in potash, while for market-garden crops a higher grade of complete fertilizer is used. Liming is generally practiced, and the farmers consider it highly beneficial. Lime is applied on sod land once during each rotation. The usual application consists of 25 to 30 bushels per acre of burnt lime. All the available barnyard manure is used on the land for corn.

Owing to the possibilities of employment offered by the various industries of Washington and Baltimore, farm labor is somewhat scarce in Montgomery County. Of the farms reporting in the 1910 census, an average of \$382 per farm was paid for labor in the census year. The farm labor is largely colored, although a large number of white men are employed. Where employed by the year the farm hands usually receive about \$25 per month, together with a house to live in, a garden, and firewood. Some laborers are paid \$15 to \$20 per month, with board, and where employed for short periods they receive \$1 to \$1.50 per day.

The farms vary widely in size, ranging from a few acres in the market-gardening section to more than 300 acres in the northwestern part of the county. Most of the farms range from 50 to 200 acres in size. The census for 1910 gives the average size of farms as about 112 acres. In the 1880 census the average size of the farms is reported as 156 acres. The census of 1910 reports 76.5 per cent of the farms as operated by the owners. This percentage has remained rather constant for the last 30 years. A small percentage of the farms are operated by managers for the owners, while the remainder are farmed by tenants. The farms are rented for periods of one year to three years, and usually on the share basis, approximately one-half of the crops produced being retained by the owner.

According to the 1910 census, 82 per cent of the land in Montgomery County is in farms, and 76.5 per cent of the land in farms is improved. Land values vary according to the condition of the farm land and buildings, the topography, and the location with respect to towns and transportation facilities. In the vicinity of the District of Columbia the value of the land has been influenced by the prospective growth of the city of Washington, and far exceeds the agricultural worth. Throughout the greater part of the county the farm land is held at \$50 to \$100 an acre. In the extreme northwestern section land sells at \$40 to \$75.

SOILS.

Montgomery County lies almost entirely within the Piedmont Plateau region, a physiographic province extending from the Hudson River to east-central Alabama. The county is situated in what is known as the northern division of the Piedmont Plateau, and is traversed by the line separating this region from the Coastal Plain province. The latter extends across the southern end of the county, and seldom attains a width of more than 3 miles. The boundary between the two provinces is well defined with respect to geology and soils.

The soils of the county are included in two general groups, (1) residual soils, or those derived in place through processes of disintegration and decomposition from the underlying rocks of the Piedmont Plateau, and (2) soils derived from the unconsolidated material of the Coastal Plain and the recently deposited material along the streams. There are two distinct groups of rocks in the Piedmont Plateau, (1) those of igneous and metamorphic origin, and (2) consolidated sedimentary rocks. The igneous or crystalline rocks are by far the most extensive, and consist of gneiss, granite, schist, gabbro, diabase, diorite, serpentine, and slates, derived from altered volcanic tuffs. Generally these have weathered to a depth of several feet. The consolidated sedimentary rocks consist of red and gray sandstones and shales of Triassic age, and are confined to the northwestern corner of the county, occupying an area of approximately 70 square miles within the county. These rocks have not weathered as deeply and the soil material is not as deep as in the case of the crystalline rocks. The soil is usually not more than 2 to 4 feet deep, and frequently the rocks outcrop, particularly on the slopes. The surface of the area underlain by the sedimentary rocks is gently rolling, as contrasted to the rolling to hilly topography of the area underlain by the igneous rocks. This Triassic region is from 20 to 50 feet lower, and the boundary between the two classes of rocks is marked in many places by a very irregular but smoothly sloping escarpment.

The narrow strips of Coastal Plain material along the southeastern boundary of the county consist of unconsolidated interbedded sand, gravel, and clay. This material has been brought down from the Appalachian, Piedmont, and limestone valley regions through the channels of the Potomac River and its tributaries. The few very small areas of shallow sedimentary deposits superimposed on the Triassic rocks in the extreme northwestern part of the county undoubtedly came through the Potomac channel.

There are widely distributed small areas of alluvial soils of recent origin in the county which are constantly receiving additional sediments from the overflow waters of the streams. The material along

the Potomac River represents wash from the limestone valleys, Appalachian Mountains, and in part from the Piedmont. The soil along the other streams represents Piedmont material, reworked and deposited.

The various rock formations and unconsolidated materials throughout the county differ in their lithologic characteristics, and their subsequent disintegration and decay give rise to different soils. These soils, on the basis of difference in color, origin, and structural characteristics, are grouped into series. The series are divided into types on the basis of texture.

The series comprising soils derived from the igneous rocks are the Chester, Louisa, Manor, Cecil, and Conowingo. From the consolidated sedimentary rocks the Lehigh, Penn, and Lansdale series are developed. The unconsolidated marine sediments give rise to soils of the Sassafras and Leonardtown series. The alluvial and recent deposits along the streams are classed with the Elk, Huntington, and Congaree series.

The Chester soils are brown to yellowish brown in color and underlain by yellow to brown subsoils. They are developed extensively throughout the northern Piedmont. They are derived in this county from the weathering of crystalline rocks, including the Wissahickon formation of gneiss and schist and some granite. One type, the Chester loam, occurs in the county.

The soils of the Louisa series differ essentially from those of the Chester. They have red subsoils and are decidedly more micaceous. They are derived from mica schists, and the weathering and oxidation of the material are more complete. Only one type, the Louisa loam, is mapped.

The Manor series includes light-brown to yellowish surface soils, with yellow or brownish-yellow to reddish-yellow subsoils. These soils are characteristically micaceous. The series is represented in this county by the Manor loam; Manor loam, micaceous phase; and Manor stony loam. The loam is derived from yellow schist or impure slates metamorphosed from the so-called complex of acid and basic volcanic and argillaceous sediments. The micaceous phase and also the stony loam are derived from mica and schist of the Wissahickon formation.

The Cecil series has brown to red surface soils and red clay subsoils. One type, the Cecil clay loam, occurs in the county, and it is derived from the weathering of granite, gneiss, and dikes of diabase.

The Conowingo series comprises white to light-gray surface soils underlain by yellow, compact, impervious clay subsoils. In this county only one type, the Conowingo silt loam, is developed. It is derived from dikes of serpentine and steatite and strips of epidote,

and chloritic rocks, while the Iredell clay loam, areas of which are shown by inclusion symbol in Conowingo color, is derived from diorite and diabase.

The Lehigh soils are gray to bluish in the surface section with drab to yellowish and brown subsoils. One type, the Lehigh loam, is mapped. It owes its origin to the weathering of a blue or bluish-gray fine-grained slate. This formation is closely associated with the rocks giving rise to the Manor loam.

The soils of the Penn series are characterized by the Indian-red color of both soil and subsoil. Three types, the Penn sandy loam, loam, and silt loam, are mapped. These soils are derived from red sandstones and shales of Triassic age.

The Lansdale series is closely associated with the Penn, differing from it in having gray to brown surface soils and yellow subsoils. The Lansdale silt loam is the only member of the series in this county.

The Sassafras series has brown to yellowish-brown surface soils and brown to reddish-brown or reddish-yellow friable subsoils. One type, the Sassafras loam, is mapped.

The Leonardtown series comprises gray to pale-yellow surface soils and yellow, friable subsoils, characterized by a gravel substratum encountered at depths of 2 to 4 feet. These soils are derived from unconsolidated marine sediments. Two types occur in the county, the loam and silt loam. In close association with this series is developed the Norfolk series. The main differentiation between these is the absence of the gravel substratum in the Norfolk in this county. The Norfolk fine sandy loam and the Norfolk gravelly loam, including spots of sand and coarse sand, are shown by symbol in Leonardtown loam color. The gravelly loam is described in connection with the Leonardtown loam.

The Elk series includes light-brown to brown surface soils and yellowish to brownish-yellow, friable subsoils. The material forming these soils is derived principally from mixed limestone and Appalachian materials. The series is developed on the alluvial terraces. The Elk loam and Elk loam, high-terrace phase, are mapped.

The Huntington series differs from the Elk primarily in that it is developed on the first bottoms of the Potomac, and is subject to the addition of material by overflows. The loam is the only representative of this series in the county.

The Congaree series includes brown soils and subsoils. These soils are composed of sediments brought down from the Piedmont Plateau region and deposited along the first bottoms of the streams. One type, the Congaree silt loam, is developed in Montgomery County. This type occurs only along the shorter streams having their courses through the Piedmont Plateau region.

The following table gives the names and the relative and actual extent of the various soils mapped in Montgomery County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Chester loam.....	124,992	40.4	Penn sandy loam.....	4,352	1.4
Manor loam.....	27,392	16.9	Leonardtown loam.....	4,224	1.4
Micaceous phase.....	25,216		Leonardtown silt loam.....	3,712	1.2
Manor stony loam.....	21,888	7.1	Sassafras loam.....	3,712	1.2
Congaree silt loam.....	21,696	7.0	Huntington loam.....	2,304	.9
Penn loam.....	18,624	6.0	Poorly drained phase.....	640	
Lehigh loam.....	14,404	4.7	Cecil clay loam.....	2,944	.9
Louisa loam.....	11,200	3.6	Lansdale silt loam.....	2,432	.8
Penn silt loam.....	8,896	2.9			
Conowingo silt loam.....	6,528	2.1	Total.....	309,760
Elk loam.....	3,456	1.5			
High-terrace phase.....	1,088				

CHESTER LOAM.

The surface soil of the Chester loam is a brown to yellowish-brown, mellow, friable loam, which has a depth of 8 to 12 inches and frequently is quite silty. In forested areas where the type has never been cultivated the surface soil is pale yellow. The subsoil to depths of 36 inches or more is a yellow, yellowish-brown, or brown friable clay loam to clay. When very dry the surface soil has a grayish to light-brown color. In places the subsoil is reddish yellow. Throughout the areas of this type there are many small bodies of Louisa loam and Manor loam that are too inextensive to map. Finely divided mica scales are present in the soil and subsoil, but these are not so abundant as in the Manor soils. On the steeper slopes the mica content is more abundant. Here the soil and subsoil have a distinctly greasy feel, and below 24 inches the subsoil is often very micaceous. As a rule the Chester loam has weathered deeply, but on the surface and throughout the soil and subsoil there are large quantities of small, highly weathered gneiss and schist fragments and small, irregular fragments of vein quartz. These fragments do not interfere with cultivation. Locally this soil is called "red clay land."

The Chester loam is the most extensive soil type in the county and occurs as large, continuous areas extending over the greater part of the central and southern sections. The main towns of the county, Rockville and Gaithersburg, are located near the center of this type. In general, the topography is gently rolling to very rolling and hilly (see Pl. III).

Around Laytonsville and along some of the drainage divides there are large bodies of the type that have an undulating to gently rolling



CHESTER LOAM WITH SLOPES OF MANOR STONY LOAM.



ORCHARD AND FARM BUILDINGS ON CHESTER LOAM.

surface, and in these locations the surface soil is more silty and the subsoil less micaceous than in the more rolling areas. The greater part of the type lies from 300 to 600 feet above sea level. Surface drainage is adequate in all places. On some of the steeper slopes erosion is active, but with the careful methods employed the land does not wash badly. The subsoil is retentive of moisture and crops do not suffer, except during unusually severe droughts.

The Chester loam is the most important soil type in Montgomery County. A very large part of it, perhaps 85 per cent, is in cultivation or pasture. Only small areas are forested, the original timber growth consisting mainly of chestnut, red oak, white oak, pine, poplar, and hickory.

The most important crops produced on this soil are corn, wheat, and hay. The acreage in corn is about equal to that devoted to wheat, and the acreage in grass is slightly less. Wheat is the principal money crop. A large part of the corn and hay is used to feed the work stock on the farm, a small amount is sold, and the remainder is utilized for the production of meat and dairy products for market. The main live-stock industries on the farms are the raising of hogs, feeding of steers, and dairying. Dairying is conducted on an extensive plan, the cows being pastured for a considerable part of the year. Considering the type as a whole, there are no important specialized crops. However, in certain localities market gardening is practiced for the purpose of supplying the Washington market. There are a few commercial orchards of apples and peaches (see Pl. IV). The most important orchard is near Rockville.

On the Chester loam corn yields from 30 to 70 bushels per acre, wheat 15 to 25 bushels, and hay 1 to 2 tons. Irish potatoes yield 100 to 200 bushels, rye 12 to 15 bushels, and oats 10 to 30 bushels.¹

The soil of the Chester loam is easily tilled and does not clod or bake badly on drying. The land responds readily to improvement and fertilization, and with good methods of cultivation, such as are employed by the best farmers, the fertility is easily maintained. A systematic crop rotation is generally practiced. Corn is grown 1 year, and wheat 1 year, or possibly 2 years, followed by timothy and clover, after which corn is again planted. All the farmers use commercial fertilizers for wheat, and sometimes for corn. The fertilizer used commonly contains 2 per cent nitrogen, 8 per cent phosphoric acid, and 2 per cent potash. It is usually applied to wheat at the rate of 300 to 500 pounds per acre. Lime is used on practically all the type, the applications ranging from 1,000 to 3,000 pounds to the acre. Large quantities of stable manure are used with good results. The manure is applied mainly to the corn land. In general, the best

¹ The crop yields given in this report are based on information obtained from farmers.

farms on the Chester loam are those on which dairy farming or cattle feeding is carried on.

The Chester loam sells for \$75 to \$150 an acre near railroads or trolley lines. At some distance from the main lines of transportation land of the same type may be bought for \$50 to \$75 an acre. Near the District of Columbia the type is valued at \$150 an acre or more for residential purposes.

The Chester loam varies widely in productiveness. It is very responsive to improvement and fertilization, while if neglected it rapidly deteriorates. The use of lime about once in each rotation is recommended. It is absolutely necessary that the soil should be well supplied with humus for best results. The growth of leguminous crops, such as clover, cowpeas, and alfalfa, greatly improves the soil. By green manuring the humus supply can be maintained, and this, together with the growing of legumes and the use of barnyard manure, will furnish sufficient nitrogen, so that this element may largely be eliminated in the fertilizer mixtures used for the main farm crops.

The few fields of alfalfa seen on this type indicate that this crop can be successfully and profitably grown where the soil is properly prepared, inoculated, and manured or fertilized. Crimson clover is a crop that in all probability would prove successful as a soil improver. While the soil is well suited to oats, the wide variation in the rainfall during the spring makes the production of this crop uncertain.

The Chester loam is well suited to the production of apples, peaches, pears, plums, and cherries. The thrifty condition of the well-kept, small orchards of these fruits indicates that their production on a commercial scale could be profitably extended. The best varieties of apples are the Arkansas (Mammoth Black Twig), Stayman Wine-sap, and York Imperial, and of peaches the Carman, Belle of Georgia, and Elberta. The type is also well suited to grapes, damsons, quinces, blackberries, raspberries, and strawberries. The principal variety of wheat is the Fultzo-Mediterranean, although Leips Prolific and Everetts High Grade give good results. Wheat has an important place in the rotation, and in getting a stand of clover and timothy the growing of wheat is highly beneficial.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Chester loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201011.....	Soil.....	0.9	4.9	3.0	13.1	15.1	50.4	12.3
201012.....	Subsoil.....	.4	3.2	1.9	10.3	16.2	45.8	21.6

LOUISA LOAM.

The surface soil of the Louisa loam is a brown to reddish-brown loam to heavy loam 4 to 8 inches deep. The subsoil is a red clay, which is very micaceous. The mica content increases with depth, and the lower subsoil is frequently a micaceous clay loam. While the surface soil is not always noticeably micaceous, the subsoil is invariably so. Small fragments of quartz and gneiss or schist occur in varying quantities in both soil and subsoil.

This type is developed in large areas in the extreme southern part of the county bordering the Potomac River and the District of Columbia. A number of small areas are scattered throughout the central and eastern parts of the county.

The topography is rolling to hilly, the type being developed mainly on the slopes. Many of the slopes are steep, but they are generally smooth. The type has good natural surface drainage. In places the drainage is excessive, resulting in destructive erosion.

Owing to its comparatively small extent and its irregular surface, this type is not important agriculturally. Probably 70 per cent of the type is in cultivation, and the remainder is forested with white oak, chestnut, hickory, and pine. Corn, wheat, and hay are grown to about equal extent. Some dairy cows are kept. Corn yields from 20 to 50 bushels, wheat 15 to 20 bushels, and hay about 1 ton per acre. The Louisa loam is handled in practically the same way as the associated type, the Chester loam, except that the steeper slopes are manured or fertilized more heavily and require more careful cultivation to prevent erosion.

The better farm lands of this type are held at \$40 to \$100 an acre, the higher values obtaining near the District of Columbia.

For the improvement of the Louisa loam it is necessary to handle the steeper slopes with considerable care in order to prevent surface erosion and gullyng. These slopes should be kept in some cover crop as much of the time as possible. The cultivated areas are generally in need of deeper plowing and the addition of humus. Barnyard manure is very beneficial. Lime is used on this soil, but the most profitable returns are obtained only where the soil is well supplied with humus.

MANOR STONY LOAM.

The surface soil of the Manor stony loam is a brown to yellowish-brown silty loam 6 to 8 inches deep. The subsoil is a yellow, brown, or reddish-brown silty clay loam or heavy loam. The soil and subsoil contain sufficient very finely divided mica to give a greasy feel, and below 24 inches the subsoil is a fine, micaceous loam, very greasy to the feel when moist and fluffy when dry. Flattish schist fragments,

which are soft and highly weathered, are scattered over the surface and throughout the soil and subsoil. Most of these fragments are small, though on the steeper slopes some are several inches across, while below 24 inches in these locations the soil is a mass of partially weathered rock. (See Pl. V.) Rarely are the stone fragments sufficiently large or numerous to interfere with cultivation.

The Manor stony loam is encountered mainly in the northern part of the county. It occurs in the vicinity of the Patuxent River just north of Etchison, and near Cedar Grove and Germantown, as well as in smaller areas just north of Darnestown.

The type occupies steep slopes along some of the larger streams. It has a rolling to hilly topography and is well drained. The slopes are often so steep that unprotected fields are injured by erosion.

Probably 60 per cent of this land is in cultivation, the remainder being forested to chestnut, red oak, white oak, and hickory. The principal crops grown on the Manor stony loam are corn, wheat, and hay, in about equal proportion. Some tobacco is grown, and dairying is practiced to a small extent. Corn yields 30 to 50 bushels, wheat 15 to 20 bushels, and hay about 1 ton per acre. The varieties of tobacco grown are those locally called the "Burley" and the "Lower County." The former yields about 800 pounds and the latter 1,000 to 1,200 pounds per acre.

The Manor stony loam is handled and fertilized in practically the same way as the Chester loam and the Manor loam. The type is valued at \$40 to \$75 an acre.

The methods of improvement suggested for the Chester loam are applicable to this type. Especial care should be given to the prevention of erosion.

MANOR LOAM.

The surface soil of the Manor loam consists of a brown or yellowish-brown silty loam 6 to 8 inches deep. The subsoil is a silty clay loam ranging in color from yellow or yellowish brown in the upper part to reddish brown or reddish yellow in the lower subsoil. In many places the lower subsoil has a pinkish to salmon color. Both soil and subsoil have a slick, greasy feel. This is due to the presence of very finely divided mica flakes. Scattered over the surface and throughout the soil and subsoil occur many small, soft, flat schist fragments. These are most abundant in the lower subsoil, where the soil mass is often composed almost entirely of the partially weathered fragments. The schist is yellow to buff in color, soft and greasy to the feel, and highly weathered. Occasionally some of the schist is bluish. Associated with the schist are many fragments of impure vein quartz. In the northern part of the county, near Dickerson, in

the vicinity of Sugar Loaf Mountain, and along the county line, the subsoil of this type is predominantly red. Near Clagettsville the typical soil contains many altered pyrite crystals.

The Manor loam occurs in the northwestern part of Montgomery County as a large body with a few small outlying areas. The main body of the type includes a large number of small areas of Lehigh loam. The occurrence of the Manor loam has a northeast-southwest trend, and a line drawn roughly from Poolesville through Boyds and Kings Valley to the Patuxent River marks its southern limit.

The topography of the Manor loam is rolling to hilly. The type occupies long, gently sloping ridges extending from northeast to southwest. Even in the most hilly areas the slopes are smooth. Surface drainage is good and though water flows quickly from the surface the soil and subsoil are porous and rapidly absorb large quantities of water. Erosion is active where the slopes are not protected by growing crops.

The Manor loam is an important soil in Montgomery County. Probably 75 per cent of the type is in cultivation. Some small areas are forested with chestnut, oak, hickory, and some pine.

The principal crops grown are corn, wheat, and hay. About the same acreage is devoted to each crop. In addition there are quite a number of farms growing tobacco in fields of a few acres each. Considerable dairying is practiced on this type near the railroads.

Corn yields 30 to 60 bushels per acre, wheat 15 to 20 bushels, and hay 1 ton to 1½ tons. Tobacco yields 800 to 1,000 pounds per acre.

The Manor loam is handled and fertilized practically in the same way as the Chester loam. Heavier applications of commercial fertilizers are used for tobacco than for other crops. Much of the type has been brought up to its present high state of cultivation in the last 25 years by liming and manuring, and by the use of commercial fertilizers.

The Manor loam can be bought for \$35 to \$60 an acre, though some of it near the railroads is valued at as high as \$100 an acre. Suggestions for the improvement of the Chester loam apply to the Manor loam.

Manor loam, micaceous phase.—Cross-lined areas of the Manor loam on the soil map indicate bodies of the Manor loam, micaceous phase.

The soil of this phase is a brown to grayish-brown loam 8 to 12 inches deep. It is very friable and contains sufficient mica to give a very greasy feel. The subsoil is a light loam to clay loam, ranging in color from yellowish brown to reddish brown or light red. The subsoil is very micaceous and in the Patuxent River region the substratum below 3 feet is composed of gray, finely divided mica. All the soil in the vicinity of the Patuxent River is very micaceous, and

the entire phase is much more micaceous than the typical Manor loam or the Chester loam. There are small quantities of fragments of quartz and schist scattered through the soil and subsoil.

The Manor loam, micaceous phase, is located in the southern and eastern sections of the county. The surface is rolling to hilly. Smooth, steep slopes are characteristic of the phase. Drainage is good, and in places erosion is excessive where the ground is left bare. Water passes rapidly downward through the soil, and in the more micaceous areas along the Patuxent the soil is very porous and leachy. The Manor loam, micaceous phase, occurs in large areas, and probably 65 per cent of it is cultivated. Chestnut, oak, pine, and poplar are the principal growth in the uncleared areas.

The same crops, with the same relative importance, are grown on this soil as on the Manor loam and Chester loam. Dairying and truck farming are important industries on a part of the phase, and beef cattle are fed in a small way. In some locations peaches, pears, quinces, grapes, berries, and vegetables are grown by market gardeners for sale in Washington. Crop yields are somewhat lower than on the Chester loam, though on some desirable and well-improved farms they closely approach those on the latter type. However, on the most micaceous areas wheat does not make very good yields. The Manor loam, micaceous phase, is limed, manured, fertilized, and otherwise treated in practically the same way as the Chester loam.

Suggestions for the improvement of the Chester loam apply to the Manor loam, micaceous phase. The land should be kept covered as much as possible to prevent erosion. The soil requires large quantities of humus and manure for best results. It is best suited to corn, peaches, small fruits, berries, and vegetables. Grass and wheat do well on the least micaceous areas, such as those in the vicinity of Kensington, but near the southeastern boundary of the county and along the Patuxent River the mica content makes the land better suited to peaches, small fruits, berries, and vegetables. The land of this phase sells for \$50 to \$100 an acre.

DEKALB LOAM.

On the soil map certain areas in the Manor loam are marked by symbols. These indicate a relatively small acreage of Dekalb loam. The soil here is a pale-yellow to grayish-yellow loam 6 or 8 inches deep, underlain by a yellow sandy or gritty clay loam. On the surface and throughout the soil and subsoil are many small fragments of quartz and gray sandstone. On narrow ridges through the Dekalb areas large sandstone fragments up to several feet in thickness occur on the surface. These stony areas are too small to be

mapped separately. In a small part of the area shown as the Dekalb loam the soil is really a sandy loam.

The Dekalb loam occurs along the northwestern boundary of the county in the vicinity of Mount Ephraim, at the foot of Sugar Loaf Mountain. The soil is formed by the weathering of the sandstone formation which forms Sugar Loaf Mountain. The surface of the Dekalb loam areas is rolling and the drainage is good.

The Dekalb loam is very inextensive, and probably 75 per cent of it is forested, mainly with chestnut. Where cultivated this soil is devoted to the same crops as the Manor loam with which it is associated. It is a thin soil of low productive capacity, and crop yields are much lower than on the Manor loam. The soil is very deficient in humus and requires heavy applications of manure and commercial fertilizer to produce even moderate yields. The land is probably best suited to grass.

CECIL CLAY LOAM.

The surface soil of the Cecil clay loam is a brown or reddish-brown clay loam to a depth of 8 to 12 inches. The subsoil to a depth of 36 inches is a red, brittle clay.

Included with this type are patches of stony loam, represented on the soil map by stone symbols. Scattered over the stony areas are large subangular fragments of diabase and gabbro which interfere with cultivation, and in some cases make tillage impossible.

The Cecil clay loam occurs principally in the southern and western parts of the county. A few small areas are found in the eastern part. It has a gently rolling to rolling topography. The surface drainage is good. The subsoil is pervious, but is retentive of moisture.

This is a relatively small and unimportant type. Its chief use is for corn, wheat, and grass, and these crops produce fair yields.

Owing to the texture and structure of the Cecil clay loam in its natural condition, cultivation is more difficult than upon the prevailing loamy textured soils with which it is associated. It is sticky when wet and clods upon drying. Cultivation and plowing on this type must be carried on when the soil is in a fairly moist condition. It should be harrowed immediately after it is plowed in order to break the clods before baking takes effect. The incorporation of organic matter and the use of lime improve the physical condition. The type may be highly improved. It is best suited to wheat, grass, and pasture, and can be used advantageously for dairying. Apples do well on this soil.

CONOWINGO SILT LOAM.

The surface soil of the Conowingo silt loam consists of a whitish, light-gray or pale-yellow silt loam having a depth of about 8 or 10

inches. The subsoil is a compact, impervious silty clay which is dominantly yellow, with mottlings of gray and brown. In places the subsoil has a waxy, tenacious structure and the green serpentine rock is encountered at 24 to 36 inches below the surface. The surface soil when dry is quite compact. A few small iron concretions are frequently present in the subsoil, while on the surface and throughout the soil and subsoil are fragments of serpentine and quartz, and in places these fragments are so numerous as to make the soil a stony loam. Locally this type is known as "white land" or "fullers' earth."

The Conowingo silt loam is developed principally in the southern part of the county. The largest areas extend in a northeast and southwest direction and are located near Hunting Hill and Potomac. The topography is gently rolling, the type occurring on the broad divides. While the natural surface drainage is good, internal drainage is retarded by the impervious subsoil.

This is a relatively unimportant type, and considerably less than half of it is farmed. The remainder is forested with white oak and red oak, with some blackjack oak, pine, hickory, and chestnut. Its chief use is for the production of wheat, corn, and grass. Wheat yields 12 to 15 bushels and corn 25 to 30 bushels per acre. Clover and timothy give light yields. This soil is handled in about the same way as the surrounding soils and receives the same fertilization as the Chester loam. The land is held at \$20 to \$40 an acre.

The Conowingo silt loam bakes on drying, and is cultivated with difficulty. This is largely due to the fact that the soil is deficient in humus. This condition can be corrected by plowing under green manuring crops and by the addition of barnyard manure. The soil in its natural condition does not respond readily to the use of lime and commercial fertilizers, but would do so if it contained a good supply of humus. The type could be used more profitably for the production of small grains and grasses than for growing other crops. It is said that rye and bluegrass do particularly well. It is probable that the soil could best be utilized for pasture.

Results of mechanical analyses of samples of the soil and subsoil follow:

Mechanical analyses of Conowingo silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201001.....	Soil.....	4.6	6.3	1.2	2.6	4.6	66.6	13.7
201002.....	Subsoil.....	4.5	5.3	1.1	3.1	6.8	57.7	21.4



SUBSOIL OF THE MANOR STONY LOAM.

56705

IREDELL CLAY LOAM.

A group of areas near Boyds, shown on the map by the Conowingo silt loam color, is distinguished from that type by inclusion symbol. This represents the Iredeell clay loam. The surface soil of these areas is a brown clay loam, ranging in depth from 4 to 12 inches. The subsoil is a brownish-yellow, heavy, tough, waxy clay, which grades into the disintegrated rock at 18 to 30 inches. A few small, black to brown iron concretions are present in both soil and subsoil. Small stony areas and even Rock outcrop are of local occurrence. The surface is undulating to gently rolling, and the soil occupies a somewhat basin like position. Surface drainage is fair except in slight depressions, but the movement of water through the subsoil is slow on account of the impervious and waxy character of the material. The type is unimportant in this county. Only a few small patches are under cultivation, the greater part being forested with white oak, blackjack oak, cedar, and hickory. Efforts at farming on this soil have met with indifferent success. The staple farm crops have been grown in a small way with poor results, small grain, such as wheat, barley, and rye, doing best. The soil is especially suited to grass. It supports a good growth of native grasses and is utilized for pasture. Cultivation is difficult. The soil bakes hard in dry weather, and crops suffer, except where the rainfall is unusually well distributed. The incorporation of vegetable matter improves the texture and makes the soil easier to cultivate. Kainit has proved beneficial on this type in other areas.

LEHIGH LOAM.

The surface soil of the Lehigh loam is a dark-gray loam or silty loam 6 to 8 inches deep. The subsoil to a depth of 36 inches or more is a yellowish-brown or bluish silty clay loam. Small, bluish slate fragments and small quantities of the buff or yellow slaty schist fragments which give rise to the Manor loam are scattered over the surface and throughout the soil and subsoil. Associated with the slate fragments are fragments of impure vein quartz. On steep slopes the massive bluish slate rock approaches the surface and sometimes outcrops. Locally this type is referred to as "blue-slate land."

The Lehigh loam is located entirely in the northwestern part of the county in close association with the Manor loam, and the boundaries between these types form rather straight lines regardless of topography. The Lehigh loam is a rather extensive type; many of the areas are narrow strips several miles long. The bodies of this type extend from northeast to southwest. The towns of Clarksburg and Damascus are located on the larger areas of the type.

The topography of the Lehigh loam is rolling to hilly. Much of it occupies the smooth crests and slopes of ridges. The surface drainage is good, and on some steep slopes it is excessive. Where the rock is near the surface the land dries out badly in the summer. In the spring, when the ground is saturated, the water flows out along the slopes where the rock lies near the surface and these places remain wet after the surrounding areas are dry. This gives rise to the local term of "spouty land."

About 60 per cent of the Lehigh loam is in cultivation, though small areas are forested with an original forest growth of pine, chestnut, and white oak.

The principal crops grown are corn, wheat, and hay. The acreages of these crops are about equal. On some farms tobacco is grown on a few acres and constitutes an important money crop. Corn yields 25 to 50 bushels, wheat 12 to 15 bushels, hay about 1 ton, and tobacco 800 to 1,000 pounds per acre.

The Lehigh loam soil is handled and fertilized in much the same manner as the Chester loam, and the farm practices are practically identical with those on the Manor loam. Farm land on this type sells for \$25 to \$50 an acre.

This soil is not naturally as productive as the Manor loam, with which it is associated. The slopes are so steep in many places that special care is necessary to prevent erosion or the leaching out of fertilizers. The general methods of improvement suggested for the Chester loam and the Manor loam apply to this type. Rye, buckwheat, and millet would give fair yields on this soil.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Lehigh loam:

Mechanical analyses of Lehigh loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201013.....	Soil.....	3.6	5.0	2.6	8.8	9.5	48.4	21.9
201014.....	Subsoil.....	5.4	7.9	2.9	9.8	8.8	45.3	19.7

PENN SANDY LOAM.

The surface soil of the Penn sandy loam is a brown to Indian-red sandy loam 10 to 12 inches deep. This is underlain by a brown to Indian-red coarse sandy loam. The surface soil varies in places from a fine sandy loam to a coarse sandy loam. Both soil and subsoil contain some fragments of grayish or purplish sandstone of the Triassic formation, and frequently there is some rounded quartzite gravel from the conglomerate rock of the same formation. The soil

mass has not weathered deeply, and at a depth of 2 to 3 feet usually the soft, partially weathered sandstone is encountered. When dry the subsoil is very compact.

The Penn sandy loam occurs in a number of small, widely scattered areas in the western part of the county. The largest of these bodies are near Poolesville and Dickerson. The topography is undulating to rolling. Surface drainage is good, but the soil mass is rather porous and leachy and this results in inadequate moisture for growing crops in some dry seasons.

Probably 80 per cent of the Penn sandy loam is cultivated. The same crops are grown as on the Penn silt loam, namely, corn, wheat, and hay, but corn is grown most extensively, as the texture is too light for profitable wheat production.

The Penn sandy loam has about the same or possibly a slightly lower value than the Penn loam.

This type should be used for corn rather than for wheat. The soil is quite deficient in humus, and the plowing under of green manuring crops and the use of barnyard manure are necessary for best results. The type could be used more extensively for growing vegetables and berries, as it is well suited to these crops, but at present markets are not convenient.

PENN LOAM.

The surface soil of the Penn loam is a light, friable loam to silty loam, Indian-red in color and extending to a depth of 6 to 10 inches. The subsoil is an Indian-red silty clay loam or clay. Both soil and subsoil contain a considerable quantity of small, Indian-red, soft shale and sandstone fragments of the Triassic formation. These increase with depth and on many slopes the partially weathered bedrock lies within 2 or 3 feet of the surface. At no place have the rocks weathered to a depth of more than a few feet. On the crests of some of the slopes there are small areas where a considerable quantity of rounded quartzite and sandstone gravel occur on the surface and throughout the surface soil. These scattered areas, too small to be mapped separately, are indicated on the soil map by gravel symbols.

The Penn loam is not extensively developed in Montgomery County. It occurs in the western part of the county.

The surface is undulating to rolling, with occasional steep slopes near the streams. The natural drainage is good, and on some slopes erosion is excessive and gullies have been formed.

About 80 per cent of the Penn loam is cultivated or in pasture. The timber growth on the few forested areas consists of white oak, hickory, red oak, and some black oak.

The crops grown on this type are corn, wheat, and hay, on about equal acreages. Dairy cattle and beef cattle are kept on some of

the farms. Crop yields are about the same as on the Penn silt loam, though wheat yields are somewhat lower in the gravelly areas. The methods of handling and fertilizing are practically the same as on the Penn silt loam.

This type is fairly retentive of moisture, but is sufficiently porous to allow water to pass downward readily, and crops suffer from lack of moisture in seasons of extended drought. The soil warms up early in the spring and the planting and maturity of crops are slightly earlier than on the Chester loam.

The well-improved farms on the Penn loam are valued at \$40 to \$60 an acre.

For its improvement this type requires the same treatment as Penn silt loam.

PENN SILT LOAM.

The surface soil of the Penn silt loam is an Indian-red to brown silt loam, having a depth of 8 to 15 inches. The subsoil consists of an Indian-red silty clay loam, which usually continues to a depth of 3 feet or more. Frequently there is a faint mottling of gray in the upper part of the subsoil. The soil locally contains a few small soft shale fragments of an Indian-red color and occasionally on the slopes Indian-red rock fragments of the Triassic formation are present.

This type occurs in the western part of the county. The largest development is found in the vicinity of Sugarland, Poolesville, and Dawsonville. The topography is dominantly undulating to gently rolling, the surface of this type being smoother than that of any other upland soil of the region. The surface drainage is fair, though the run-off from some of the more nearly level areas is comparatively slow. Owing to the fact that the subsoil becomes quite compact and that the underlying bedrock is near the surface this type does not withstand drought well.

The Penn silt loam is one of the important types of the county, and practically all of it is under cultivation. The small forested areas support a growth of white oak, red oak, and hickory. Corn, wheat, and hay are the principal crops. Some cattle feeding is followed on this type. Corn yields from 25 to 40 bushels, wheat 15 to 18 bushels, and hay about 1 ton per acre. The handling of this soil, including methods of rotation and cultivation, is not materially different from the practices on the Chester loam. Commercial fertilizers are used for wheat at the rate of 300 to 500 pounds per acre of a mixture containing approximately 2 per cent nitrogen, 8 per cent phosphoric acid, and 2 per cent potash. Most of this land is limed, and barnyard manure is used extensively. Farms on the Penn silt loam are held at \$40 to \$60 an acre.

The installation of tile drainage on some of the flatter areas of this type has proved beneficial. This soil is capable of being built up to a fairly high state of productiveness. This can best be accomplished through the growing and turning under of cowpeas and crimson clover, and by the addition of barnyard manure. Where this is done less nitrogen is required in the commercial fertilizers and more lime and phosphoric acid can be used profitably. The incorporation of vegetable matter in connection with deeper plowing will make this soil more drought resistant. The crops now grown are well suited to this land. While the soil is susceptible to permanent improvement, under inefficient methods it deteriorates rapidly.

BERMUDIAN SILT LOAM.

Certain small areas within the Penn silt loam represent the Bermudian silt loam, distinguished on the soil map by inclusion symbol. This type has a total area of only 110 acres. The soil is an Indian-red silt loam which grades at 12 to 15 inches into an Indian-red silty clay loam. It occurs in the narrow first bottoms of a few small streams and is composed of alluvial material washed from adjoining areas of the Penn soils. In topography, drainage, and agricultural use and value it is practically identical with the Congaree silt loam.

LANSDALE SILT LOAM.

The surface soil of the Lansdale silt loam is a light-brown to pale-yellow silt loam, 10 to 15 inches deep. The subsoil to a depth of 36 inches or more is a yellow to yellowish-brown, very compact silty loam or silty clay loam. Occasionally the lower subsoil is faintly mottled with gray. Very few stones are found in either the soil or subsoil. The underlying rock is encountered at depths of several feet, or at greater depths than in the case of the Penn soils. This type includes a few areas of loam too small to be mapped separately. In occasional small areas some rounded quartzite gravel is present on the surface and throughout the soil and subsoil. Areas in which this gravel is present in sufficient quantity to form a gravelly loam are indicated on the soil map by gravel symbols. The largest of these areas is between Poolesville and Dickerson.

The Lansdale silt loam is of small extent in Montgomery County, being confined to a few small areas scattered through the larger areas of the Penn soils in the western part of the county. The surface is undulating to gently rolling, the type usually occupying the higher portions of the broad, undulating ridges. Surface drainage is good.

The Lansdale silt loam is of little importance in this county. Perhaps 80 per cent of it is cultivated in conjunction with the surrounding soils of the Penn series. The same crops are grown on this type

as on the Penn loam and silt loam, but crops do not suffer from drought as much as on the Penn soils. In general, the yields are about the same or perhaps slightly higher on the Lansdale silt loam. The gravelly loam areas are largely forested, but where cultivated these areas produce somewhat lower yields than the silt loam, especially of wheat. The Lansdale silt loam has practically the same value as the surrounding Penn soils.

The methods of improvement suggested for the Penn soils are applicable to this type.

SASSAFRAS LOAM.

The surface soil of the Sassafras loam consists of a brown or brownish-yellow friable loam 8 to 12 inches deep. The subsoil is a friable clay loam to clay, which is brown, reddish yellow, or yellowish brown in color. In occasional low, small areas the subsoil is slightly mottled with gray. When dry the subsoil is quite compact.

There are a very few small spots where the surface soil is sufficiently sandy to form a fine sandy loam, but these are unimportant and are not shown on the map. In many places smooth, well-rounded quartzite and sandstone gravel is encountered. Where this gravel is present in large quantities the soil is a gravelly loam, and these areas are designated on the map by gravel symbols. The gravel is gray to brown in color and ranges in size from fine particles to fragments several inches in diameter.

The Sassafras loam occurs in a number of small areas in the western part of the county, 1 mile to 3 miles back from the Potomac River. The largest area is near the village of Martinsburg. The type occupies ridges lying about 40 to 200 feet above the Potomac River and the topography is undulating to gently rolling. It has good drainage except in a few slight depressions.

On account of its small total area this type is not very important. Approximately 70 per cent of it is in cultivation, including the areas of gravelly loam. Small areas are forested with white oak, red oak, poplar, chestnut, and hickory.

The principal crops on the Sassafras loam are corn, wheat, and grass, and these occupy about equal acreages. Some cattle are fed, but the type is too far from railroads for dairying. Corn yields from 30 to 50 bushels per acre, wheat 15 to 25 bushels, and hay 1 ton to 1½ tons. The gravelly loam areas generally produce somewhat lower yields of these crops.

The Sassafras loam is handled and fertilized in much the same way as the Penn soil, which occurs in the same general region. The land is held at about \$40 to \$60 an acre, the more gravelly areas having a somewhat lower value.

The productiveness of the Sassafras loam depends on the care devoted to it and the methods of improvement employed. The soil is friable and easily cultivated and works up into a good seed bed. It requires a good supply of humus, and barnyard manure should be applied heavily. This land, especially in the more sandy areas, is well suited to the production of vegetables. Irish and sweet potatoes could be grown successfully, and the soil is said to be especially suited to artichokes. With convenient markets, the production of vegetables should prove a profitable industry on this type. Experiments by one farmer on this soil indicate that alfalfa can be grown with success. Fruits and berries do well.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Sassafras loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201029.....	Soil.....	0.7	3.1	3.2	17.6	14.6	48.9	11.6
201030.....	Subsoil.....	.2	1.8	3.0	32.6	14.2	32.0	16.0

LEONARDTOWN SILT LOAM.

The surface soil of the Leonardtown silt loam is a pale-yellow silt loam, having a depth of 10 to 12 inches. The immediate surface dries out in places to a whitish color. The subsoil is a yellow silty clay loam, which is smooth and friable but rather compact when dry. At 24 to 30 inches a substratum of small, rounded quartz gravel is encountered.

This type is confined to the southeastern part of the county, being developed along the Prince Georges County line between the Patuxent River and the District of Columbia. It occupies high ridges, and the surface is dominantly undulating, with steeper slopes along the streams. The surface drainage is fair, except in some of the more nearly level areas, where water stands on the surface after rains.

The timber growth on the few forested areas consists of white oak, red oak, and chestnut. The principal crops grown are corn, wheat, hay, and market-garden crops. Corn yields 15 to 25 bushels per acre, wheat 12 to 20 bushels, hay about 1 ton, and Irish potatoes and sweet potatoes from 100 to 200 bushels. Apples, peaches, pears, cherries, grapes, plums, and strawberries, blackberries, and raspberries are grown for home use and for the Washington market. Farm land on this type sells for \$50 to \$100 an acre.

The Leonardtown silt loam is deficient in organic matter, and every effort should be made to increase the supply. As a rule this soil is not so productive as the Chester loam. However, through the use of barnyard manure, the growing of green manuring crops, and liberal applications of lime and commercial fertilizers, good yields can be obtained. Dairying and market gardening can be extended profitably, and the products find a ready market in Washington. This soil is easy to till, and the baking occasionally experienced can be remedied by the addition of organic matter.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Leonardtown silt loam:

Mechanical analyses of Leonardtown silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201083.....	Soil.....	2.4	9.1	4.9	12.6	8.6	51.9	10.3
201084.....	Subsoil.....	1.6	6.2	3.9	9.9	8.8	52.1	17.1

LEONARDTOWN LOAM.

The surface soil of the Leonardtown loam is a yellow to brownish-yellow loam of a mellow structure, having a depth of 6 to 10 inches. In cultivated fields the immediate surface dries out to a gray color. The subsoil is a yellow to slightly brownish yellow clay loam which passes into a gravel substratum at 24 to 36 inches. The gravelly material extends to a depth of several feet. Some small, rounded quartz gravel is frequently scattered over the surface. Small spots of sandy loam are included with this type, especially bordering gravelly areas.

The Leonardtown loam is situated in the southeastern part of the county, being developed in the vicinity of Takoma Park and around Burtonsville. It occupies the plateau ridges, and has an undulating to gently rolling topography, being somewhat more rolling than the silt loam. The surface drainage is good.

The Leonardtown loam has a small total area. Most of it is under cultivation, and the remainder supports a growth of white oak, red oak, and chestnut. Corn, wheat, hay, and market-garden crops are grown to about equal extent. Corn yields 20 to 30 bushels per acre, wheat 10 to 18 bushels, and hay about 1 ton. Vegetables, small fruits, and berries are grown for the Washington market.

Land of this type sells for \$50 to \$100 an acre, depending on improvements and the distance from Washington.

The Leonardtown loam is deficient in organic matter. It can be greatly improved by growing and turning under cowpeas, crim-

son clover, or rye, and by applying large quantities of barnyard manure. Late truck crops, Irish and sweet potatoes, and sweet corn can be grown profitably where the soil is fertilized and manured. The type responds readily to the addition of humus and the effects of such treatment are quite lasting. The growing of apples, pears, peaches, and cherries, and also dairying and poultry raising could be extended with profit.

The areas of Leonardtown loam shown on the soil map with gravel symbols consist of gravelly loam. This soil differs from the typical in that both the soil and subsoil contain from 20 to 60 per cent of small, rounded quartz gravel. A few narrow strips of the gravelly loam occur along the Prince Georges County line between the District of Columbia and the Patuxent River. It is developed on the steep slopes, and the natural surface drainage and underdrainage are good to excessive. Some of this soil is droughty. Most of these areas are forested, the principle tree growth being white oak, red oak, chestnut, and pine. On the less gravelly areas market-garden crops, corn, Irish potatoes, sweet potatoes, and some apples, peaches, and pears are grown. All of these crops are fertilized heavily. This soil is much less desirable for general farming than the loam.

NORFOLK FINE SANDY LOAM.

The areas shown in Leonardtown loam color with inclusion symbol represent patches of Norfolk fine sandy loam which are too small to be shown as a separate type. The surface soil of the Norfolk fine sandy loam is a light-gray to yellowish-gray loamy fine sand, grading at 3 to 6 inches into a pale-yellow loamy fine sand which extends to a depth of 15 to 30 inches. The subsoil is a yellow, friable fine sandy clay. To the east of Burtonsville and along the Prince Georges County line there are a few patches of gray sand underlain by a yellow sand.

The fine sandy loam is confined to a few small bodies in the southeastern part of the county, lying along the Prince Georges County line. The surface is undulating to gently rolling, and owing to the topography, together with the loose, open structure of both soil and subsoil, the natural drainage is good. These areas are of minor importance. They are used for the production of market-garden crops and corn. The corn yields are light, except where the soil is heavily manured. Commercial fertilizers are used for all crops. This is one of the best early truck soils of the Coastal Plain region, as it warms up quickly in the spring, responds freely to fertilization, and is very easy to till. Frequently two crops of potatoes are grown in a year on the same land. The Norfolk fine sandy loam areas are particularly adapted to market-garden and truck crops, cantaloupes, watermelons, and sweet potatoes.

ELK LOAM.

The surface soil of the Elk loam is a brown, friable loam having a depth of 8 to 12 inches. The subsoil is a yellow to yellowish-brown clay loam to fairly compact clay. Included with this type are spots of silt loam and heavy fine sandy loam, too small to be separated satisfactorily on the map.

The typical Elk loam is confined to long, narrow bodies along the Potomac River in the western part of the county, being well developed at Whites Ferry and to the south thereof. The surface is level to undulating and lies about 15 to 20 feet above the normal water level of the Potomac River. The type is very seldom overflowed; the last flood is said to have occurred in 1889. In general it has good drainage, but small spots are wet, owing to the accumulation of seepage water from the adjoining uplands.

About 90 per cent of the Elk loam is cultivated; the remainder is forested with elm, ash, maple, water oak, and other oaks. Corn is the principal crop. Considerable wheat is grown, and hay has about one-half the acreage of corn. Some of the land has been seeded to white clover and bluegrass, which make excellent pasturage for stock. Corn yields from 40 to 60 bushels per acre, wheat 18 to 25 bushels, and hay $1\frac{1}{2}$ to 2 tons. The land is limed at intervals of about 5 or 6 years. The fertilizers used contain no nitrogen, or a smaller quantity than those used on the upland soils. The Elk loam is cultivated in about the same way as the soils of the uplands. Some apples are grown. This type sells at \$40 to \$80 an acre, depending on improvements.

The Elk loam is easily tilled and a mellow seed bed can be made. Alfalfa probably can be grown successfully where the soil is limed, inoculated, and finely pulverized before sowing. Apples can be grown profitably on this soil, the moisture conditions being more favorable than in the case of the Penn soils.

Elk loam, high-terrace phase.—The Elk loam, high-terrace phase, is shown on the map by Elk loam color, with cross lines. It differs from the typical Elk loam mainly in topography. The phase is developed along the Potomac River from near Whites Ferry to near Edwards Ferry, and occupies high-terrace areas, lying about 10 to 30 feet above the Elk loam. It has undulating to gently rolling surface features throughout, with a general slope from the uplands to the lower lands. The surface drainage is good. Included with this phase are spots or narrow belts of soil, extending, with a few breaks, from the District of Columbia line for a distance of several miles up the river to near Great Falls. The surface soil of these areas is brown loam, and the subsoil is a reddish to red clay. The phase also includes spots of gray silt loam having a yellow mottled with gray silty clay loam subsoil. This variation occurs at Cabin John.

Practically the same crops are grown and similar yields obtained on the high-terrace phase as on the typical Elk loam.

Mechanical analyses of samples of soil and subsoil of the typical Elk loam gave the following results:

Mechanical analyses of Elk loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
201045.....	Soil.....	0.0	1.2	2.5	19.8	17.4	38.2	20.9
201046.....	Subsoil.....	.2	1.2	2.0	14.9	16.3	49.3	15.8

HUNTINGTON LOAM.

The surface soil of the Huntington loam is a brown, friable, silty loam, 12 to 15 inches deep. The subsoil is a heavy loam to friable clay, which is generally dark brown in color, though in some slight depressions the lower subsoil is a dark-gray clay, sometimes faintly mottled with brown or yellow. Occasional small spots of Huntington silt loam occur in areas of this type, and a few small bodies of Huntington fine sandy loam are encountered, but these are too small to be mapped separately.

The Huntington loam is located on the first bottoms of the Potomac River and on small islands in that stream. It constitutes narrow fringes along the first bottoms. The surface is almost level, and is about 10 to 20 feet above the normal level of the river. Surface drainage is adequate for agriculture except in a few slight depressions. Occasionally the type is overflowed by the Potomac, but overflows do not occur every year.

Although comparatively inextensive, the Huntington loam is an important soil. Probably 90 per cent of the type is in cultivation. The natural forest growth consists of elm, maple, ash, and sycamore. The timber occurs mainly on the small areas of the fine sandy loam. The type makes excellent pasture, and supports a good growth of white clover and bluegrass where not cultivated. Corn is the principal crop grown. Wheat and hay are grown to some extent on the mainland areas, but the islands are devoted entirely to corn. Alfalfa would doubtless prove a profitable crop on this type.

Corn yields 50 to 75 bushels per acre and hay about 2 tons per acre. Where commercial fertilizer is used it is usually applied at the rate of about 150 to 200 pounds per acre. It is considered that the soil requires no additional nitrogen, and best results have been obtained by the use of a mixture containing 8 to 10 per cent of phosphoric acid and 2 to 4 per cent of potash.

This type is farmed in conjunction with the adjoining upland soils and with the Elk loam. Ordinarily it is handled in about the

same way as the Elk loam. In the depressions where drainage is poor, plowing the land into beds has proved beneficial. The Huntington loam sells for \$40 to \$60 an acre.

Huntington loam, poorly drained phase.—On the soil map the small areas of Huntington loam shown with cross lining represent the Huntington loam, poorly drained phase. The soil of this phase consists of a brown silt loam to silty clay loam 8 to 12 inches deep, frequently mottled with ocherous yellow, rusty brown, or gray. The subsoil is a silty clay, which is steel gray in color, mottled with yellow and rusty brown.

This phase is of small extent. It occurs in narrow strips on the terrace occupied by the Elk loam, lying along the base of the steep slopes of the uplands. These areas are a few miles southeast of Edwards Ferry.

The surface of the Huntington loam, poorly drained phase, is basinlike. It lies 2 to 5 feet below the general level of the Huntington loam. It has very poor drainage and is covered with drainage water from the upland slopes for a considerable part of the time. It supports a heavy growth of maple, water oak, and cottonwood, and presents a swamplike appearance. It is not cultivated, though by ditching it could be utilized with profit for growing corn and grass.

CONGAREE SILT LOAM.

The surface soil of the typical areas of the Congaree silt loam consists of a brown silt loam, and has a depth of 12 to 15 inches. The subsoil is a brown silt loam to silty clay loam which extends to a depth of 3 feet or more. Slight variations in color and in texture occur, but these are usually too small in extent to be shown separately.

In places in the southern part of the county a considerable quantity of finely divided mica scales is present, giving both the soil and subsoil a smooth, greasy feel. In the northern part of the county the type contains very little mica, and not infrequently the subsoil below 20 or 24 inches is a dark-gray, mottled with yellow or rusty brown, silty clay. Along the banks of the streams in many places there are very narrow strips of fine sandy loam or loam, while adjoining the upland areas narrow bands of wet land having a mottled gray, yellow, and brown subsoil are encountered.

This type is distributed throughout all parts of the county. It is confined to the first-bottom lands bordering the interior streams, these first bottoms ranging from a few hundred feet to half a mile in width. The surface is uniformly flat, with a slight gradient from the stream courses toward the uplands and also in the direction of flow of the streams. The type lies only 4 to 6 feet above the normal

water level of the streams. The natural surface drainage is rather poor, and practically all the type is subject to occasional inundation.

While there are no large bodies of this type, it has a considerable total acreage. Probably half of it is forested with oak, poplar, sycamore, and other trees. The remainder is either cleared or partially cleared and supports a heavy growth of native grasses. Its chief use is for grazing for work and dairy stock. A small part of it is under cultivation. Corn is the principal crop, and a very small acreage is in wheat. The yields of corn range from 50 to 70 bushels per acre.

The Congaree silt loam is sold only in conjunction with the adjoining uplands. It is a good corn and grass soil and its best use is for growing these crops. It is naturally one of the most productive soils of the county. The straightening and deepening of the natural drainage ways and the construction of lateral ditches would benefit all areas of this soil.

WEHADKEE SILT LOAM.

The inclusion symbol is used on areas in Congaree silt loam color to represent Wehadkee silt loam. This soil occurs in narrow strips and patches in widely separated regions, the largest body lying in the vicinity of Mount Zion. The Wehadkee silt loam, locally called "fullers' earth," is a whitish silt loam to a depth of about 8 inches. The subsoil is a bluish-gray silty clay showing mottlings of yellow, orange, or rusty brown, and frequently containing small black or rusty-brown iron concretions. It occupies flat or slightly depressed and basinlike positions usually associated with the Congaree silt loam. It has poor surface and subsurface drainage. This soil is not cultivated. A part of it supports a growth of water maple, water oak, and black oak, and marsh grass. Most of the cleared land is in pasture. The soil requires artificial drainage, liming, manuring, and the incorporation of organic matter. When restored to a condition suitable for general farming it is best suited to wheat and grass. About 500 acres of this type occur within the county.

SUMMARY.

Montgomery County adjoins the central part of the western border of Maryland. It has an area of 484 square miles, or 309,700 acres.

The topography varies from almost level or gently rolling to strongly rolling and hilly, being prevailingly rolling. The general slope is southeasterly. Narrow, level, and flat surface areas are developed along the streams. The elevation of the county above sea level ranges from 60 to 850 feet, though the greater part has an elevation of 300 to 600 feet. The county is drained mainly by the Potomac River and its tributaries, and throughout the county the surface drainage is good.

The county has a population of some 32,089, by far the greater part of which is engaged in agriculture. The principal towns are Rockville, Gaithersburg, Germantown, Kensington, Dickerson, Garrett Park, Silver Spring, Takoma Park, and Chevy Chase. Trolley lines connect most of these places with the city of Washington. The transportation facilities in the central part of the county from south to north are good. Excellent highways have been built. The county is well supplied with telephone lines and good schools and churches. Washington and Baltimore are the principal markets, the former receiving most of the market-garden, dairy, and poultry products, as well as a large part of the staple crops.

The climate of Montgomery County is mild and healthful. The mean annual temperature is reported at Great Falls as 53.8° F., and the mean annual precipitation as 37.97 inches. There is a normal growing season of 170 days.

The agriculture of Montgomery County consists of the production of general farm crops, including corn, wheat, hay, and some tobacco, both for sale and home use; dairy farming, the feeding of beef cattle, hog raising, market gardening, and fruit growing. The farm dwellings are neat and substantial, and the barns are large. The work stock consists of rather heavy draft horses, and improved farm machinery is in general use.

As a rule the systematic rotation of crops is practiced. Lime is used beneficially throughout the county, and large quantities of commercial fertilizer are applied, especially to wheat, tobacco, and market-garden crops. A fair supply of farm labor is available at reasonable wages. The size of the farms ranges from a few acres to about 300 acres. Most of them, however, comprise between 50 and 200 acres. Farm land sells for \$40 to \$100 an acre. In the vicinity of the District of Columbia land values are influenced by the prospective growth of the city of Washington.

Montgomery County lies almost entirely within the Piedmont Plateau region. A narrow strip along the southeastern boundary includes Coastal Plain material. The soils of the Piedmont Plateau region are derived from the weathering of the underlying rock formations. The greater part of these are igneous or metamorphic rocks, such as gneiss, schist, granite, diorite, diabase, gabbro, slate, and serpentine. These rocks give rise to the Chester, Louisa, Manor, Cecil, and Conowingo soils. In the extreme western and northwestern parts of the county, covering an area of 76.2 square miles, the red and gray sandstones and shales of Triassic age give rise to the Lehigh, Penn, and Lansdale soils. The Sassafras and Leonardtown soils are derived from unconsolidated Coastal Plain deposits of sand, clay, and gravel. The alluvial deposits along the streams are classed with the Elk, Huntington, and Congaree series.

The Chester loam is by far the most extensive and important soil type mapped. This type dominates the agriculture of the county. It is well suited to the production of corn, wheat, and hay and to dairy farming. Most of the tobacco is grown on the Manor loam. The Elk, Huntington, and particularly the Congaree soils are well suited to corn, hay, and pasturage.

The soils of Montgomery County compare favorably with the soils of adjoining States. They are capable of being built up to a high state of productiveness and offer good opportunities in dairying, market gardening, and poultry raising, in connection with general farming.



[PUBLIC RESOLUTION—No. 9.]

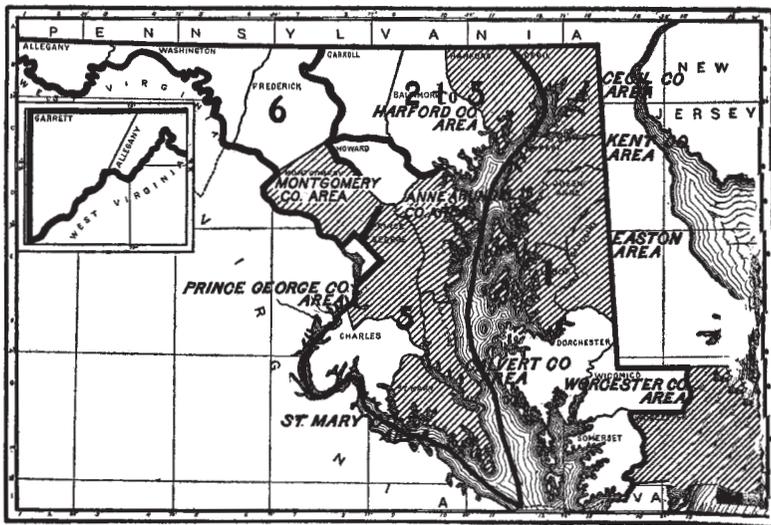
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Maryland.

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