

SOIL SURVEY OF FAIRFAX AND ALEXANDRIA COUNTIES, VIRGINIA.

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DESCRIPTION OF THE AREA.

Fairfax and Alexandria Counties are situated in the extreme northeastern part of Virginia, bordering the State of Maryland. The area is bounded on the northeast by Montgomery County, Md., and the District of Columbia; on the southeast by Prince Georges and Charles Counties, Md.; on the southwest by Prince William County, Va.; and on the northwest by Loudoun County, Va. It is separated from Maryland and the District of Columbia by the Potomac River, and from Prince William County by Bull Run, Occoquan Creek, Occoquan Bay, and Belmont Bay. Alexandria County lies directly opposite Washington, D. C., and the southern boundary of Fairfax County is 78 miles north of Richmond, Va. The area comprises 449 square miles, or 287,360 acres, Fairfax County having an area of 417 and Alexandria County an area of 32 square miles.

Physiographically, the area is mainly a plain, dissected by numerous streams which have cut narrow, shallow valleys. Over the greater part of the area the topography is gently rolling. Along the Potomac River, Bull Run, and Occoquan Creek, as well as along many of the larger interior streams, the valleys are more than 100 feet deep and the surface of the contiguous uplands is hilly and rough. On the broader divides and ridges throughout approximately the western two-thirds, or Piedmont section, of the area there are good-sized areas of undulating to gently rolling topography, the largest of which are around Herndon, Pleasant Valley, Chantilly, Bull Run, Fairfax, Vienna, Langley, Lewinsville, Merrifield, and Falls Church.

The Coastal Plain portion—approximately the eastern third—of the area has a surface not greatly unlike that of the Piedmont Plateau, the divides being nearly level to undulating, narrow plateaus, with a uniform elevation above sea level of 200 to 250 feet,



FIG. 10.—Sketch map showing location of the Fairfax and Alexandria Counties area, Virginia.

which in some places descend abruptly to the Potomac River and in others give way to steep slopes which extend down to broad, undulating flats or terraces lying from 20 to 60 feet above the river. The more prominent areas of smoother surface in the Coastal Plain lie around Alexandria, Clarendon, Baileys Crossroads, Springfield, Franconia, Gum Springs Church, Fort Hunt, Mount Vernon, Accotink, and Gunston. Narrow strips of level first-bottom land occur along all the streams of the area.

In elevation the area ranges from practically sea level along the tidal marshes of the Potomac River to 500 feet above near Pender, in the west-central part of Fairfax County. The elevation of the greater part of the area is between 200 and 400 feet above sea level. The elevation at Alexandria is about 50 feet, at Falls Church about 340 feet, at Fairfax 447 feet, at Great Falls postoffice (Forestville) 344 feet, at Herndon 380 feet, at Bull Run postoffice 299 feet, and at the District of Columbia Workhouse near Occoquan about 250 feet. The general slope of the area is southeasterly.

All the area is drained by the Potomac River. This stream follows a southeasterly course along the northern border of the area for about 20 miles, turning southward about 5 miles north of Alexandria and continuing in a southerly and southwesterly direction along the eastern side of the area for about 30 miles. The river has a fall of about 180 feet from the point where it first touches the area to where the current is affected by tidewater, a distance of about 20 miles. In this part of its course the river is rather gently flowing for the first few miles, but from Great Falls to a point a few miles below Little Falls the channel follows for the most of the distance a deep, narrow gorge and the current is swift, Great Falls and Little Falls being two cascades along this course.

The river for the first 20 miles of its course bordering the area ranges from a few hundred feet to nearly half a mile in width. From a point near Rosslyn it gradually widens, until in the lower part of its course bordering the area it is about $1\frac{1}{2}$ miles wide. Below Little Falls the river becomes a tidal estuary with branch estuaries extending up the lower parts of the valleys of the tributary streams. The largest of these (in some places a mile wide) are Occoquan, Belmont, Pohick, and Accotink Bays and Gunston Cove. The level of the flood plain along the Potomac is from 100 to 200 feet below the general level of the upland 1 to 3 miles inland from the stream. The principal tributaries of the Potomac draining the area are Occoquan Creek, Pohick Creek, Accotink Creek, Holmes Run, Cameron Run, Fourmile Run, and Difficult Run. Bull Run and Cub Run drain considerable territory in the western part of the area, flowing into Occoquan Creek. Most of these streams have rapid currents, occupy deep, narrow valleys, and are gradually cutting deeper channels.

In addition to these larger streams, there are numerous small branches and short, intermittent streams throughout the area, forming an adequate and complete drainage system, except for some of the rather flat tracts in the eastern part of the area along the Potomac River near Alexandria, Fort Hunt, and Gunston. The steeper slopes are subject to excessive drainage, while all the first-bottom lands are occasionally overflowed for short periods.

The water power along the creeks has long been used for operating grist mills, but many of these have fallen into disuse, notwithstanding the cheapness of operation and the possibilities of greatly extending the development of this power.

Fairfax County was formed from a part of Prince William County in 1742 and named in honor of Lord Fairfax. Later Loudoun County was formed from the western part of Fairfax. Alexandria County was originally a part of Fairfax County. It was ceded in 1789 to the Federal Government as a part of the District of Columbia, but in 1846 was re-ceded to Virginia, made a separate county, and named after its principal city.

Most of the early settlers of the region now comprising Fairfax and Alexandria counties were from the older English settlements on the lower Potomac, Rappahannock, and James Rivers, while some came direct from the British Isles. This area is one of the oldest settled regions of the United States.

According to the 1910 census, the population of Fairfax County is 20,536, and that of Alexandria County 25,560,¹ nearly all of whom are American born. About one-fourth the population of Fairfax County is colored. The entire population of the county is classed by the census as rural. About one-sixth of the residents live in small towns and villages, and many of these are employed in Washington. The farming population is well distributed, settlement being densest in the eastern part of the county. Agriculture is the principal industry of Fairfax County.

The largest town in Fairfax County is Falls Church, with a population of 862,² closely followed by Herndon, with 802 inhabitants. Vienna, with a population of 578; Fairfax, the county seat, with 413; and Clifton Station, 204, are important towns. There are a number of villages scattered throughout the county.

Alexandria County contains a large number of small towns, villages, and country homes, the residents of which are mostly employed in Washington or in local manufacturing industries, and the area devoted to agriculture is gradually decreasing. Only 40 per cent of the population is classed as rural.

¹ Alexandria County total includes population of Alexandria city (15,329), made independent between 1890 and 1900.

² The total population of Falls Church, including the part which lies in Alexandria County, is 1,048.

Alexandria, an old and historic city, lies on the Potomac River 6 miles south of Washington and mostly within Alexandria County, though a small part extends into Fairfax County. In and around Alexandria, in Alexandria County, there are a number of factories, the leading products being fertilizer, brick, glass, woodwork, and drugs. Alexandria is also an important railroad town, being the converging point of several railroad lines. Other towns and villages in Alexandria County are Clarendon, Ballston, Barcroft, Glencarlyn, Cherrydale, Rosslyn, Livingston Heights, and Del Ray.

Transportation facilities are excellent. Steam and electric railroads radiate from Washington and Alexandria in several directions, and there is hardly a place in the area more than 6 or 8 miles from a railroad or from the Potomac River. The Southern Railway runs south from Washington to Alexandria and thence in a general westerly direction across the central part of Fairfax County. Trains of the Chesapeake & Ohio Railway also use this line. The Washington Southern Railway (Richmond, Fredericksburg & Potomac) extends from Washington to Alexandria and from the latter place across the eastern part of Fairfax County. The Seaboard Air Line and the Atlantic Coast Line also use the tracks of this road. Electric lines from Washington have termini at Mount Vernon, Nauck, Fairfax, Bluemont, in Loudoun County, and Great Falls. These lines serve the more important towns in the two counties. The Potomac River is navigable to a point a short distance above Washington and is an important highway. Passenger boats run from Washington, D. C., to Norfolk, Va., throughout the year, stopping at Alexandria, and several steamboat lines make regular calls at various landings along the river.

There are some excellent turnpike roads in both counties. One of these connects Chain Bridge and Fairfax, and several others extend from Alexandria through the southeastern part of Fairfax County. There are some old, wornout turnpike roads in Fairfax County, and the dirt roads generally are in poor condition.

Practically all parts of the area are reached by rural mail delivery routes. Telephones are in general use, and good schools and churches are located in all sections.

Washington, Baltimore, Alexandria, and Richmond are the principal markets for the products of the area.

CLIMATE.

The area has a mild and healthful climate. The mean annual temperature at Washington, D. C.,¹ is 54.7° F. The mean temperature for the winter is 34.5°, for the spring 53.2°, for the summer 74.7°,

¹ The climatic conditions at Washington and in the area surveyed are essentially the same.

and for the fall 56.6°. The lowest recorded temperature is -15° and the highest 104°.

The mean annual precipitation of 40.8 inches is almost evenly distributed throughout the year, the greatest amount falling during the summer months—June, July, and August. The total amount of rainfall for the driest year of which there is any record (1826) was 18.79 inches, while that for the wettest year (1889) was 61.33 inches. The average annual depth of snowfall is 23.4 inches. Prolonged and severe droughts are rare. Periods of excessive precipitation are rather frequent. Loss of life or property from winds, hailstorms or electric storms is comparatively rare.

The average date of the last killing frost in the spring is April 7 and of the first in the fall October 21, giving an average growing season of 197 days. The date of the latest killing frost recorded in the spring is May 11 and that of the earliest in the fall October 2.

The following table gives the normal monthly, seasonal, and annual temperature and precipitation as recorded by the Weather Bureau station at Washington, D. C.:

Normal monthly, seasonal, and annual temperature and precipitation at Washington, D. C.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1826).	Total amount for the wettest year (1889).	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	36.1	73	-13	3.01	1.62	0.19	3.5
January.....	32.9	76	-14	3.13	0.60	4.05	6.0
February.....	34.5	78	-15	3.09	2.01	2.47	7.9
Winter.....	34.5	78	-15	9.23	4.23	6.71	17.4
March.....	42.2	93	4	3.47	1.68	4.20	4.6
April.....	53.1	93	22	3.27	0.45	9.13	0.4
May.....	64.2	96	33	3.71	0.80	10.69	T.
Spring.....	53.2	96	4	10.45	2.93	24.02	5.0
June.....	72.7	102	43	3.74	1.87	5.01	0
July.....	76.8	103	52	4.34	2.66	8.13	0
August.....	74.5	101	49	4.08	2.37	3.07	0
Summer.....	74.7	103	43	12.16	6.90	16.21	0
September.....	68.1	104	36	3.25	1.60	3.88	0
October.....	56.6	92	26	3.12	1.08	4.48	T.
November.....	45.0	80	12	2.59	2.05	6.03	1.0
Fall.....	56.6	104	12	8.96	4.73	14.39	1.0
Year.....	54.7	104	-15	40.80	18.79	61.33	23.4

AGRICULTURE.

The early settlers of this region produced tobacco, wheat, corn, and hay. Stock raising was carried on to some extent. Records indicate that tobacco was an important crop as early as 1730. Large quantities of tobacco and wheat were shipped to England and to the other colonies. Long before the Revolutionary War large plantations were in operation. During this early period many farmers produced cotton for making homespun cloth.

Market gardening has long been carried on in the vicinity of Washington and Alexandria. Owing to the methods of farming that have prevailed since the early days, the soils of the area are in general in a run-down condition.

Owing to the comparatively small size of Alexandria County and to the fact that it is becoming more and more a residential section, no detailed data relative to its agriculture are given in this report.¹ In 1909 the value of farm products in Alexandria County was \$158,885, as compared with \$2,313,483 in Fairfax County.

At present the agriculture of Fairfax County consists mainly of general farming, the principal crops being corn, hay, wheat, oats, rye, and potatoes and other vegetables. Orchard and small fruits are grown throughout the county in a small way. The production of milk and cream for the Washington market is an important industry in certain sections of the area.

In 1879 the acreage and production of the principal crops in Fairfax County were as follows: Corn, 16,660 acres, producing 381,702 bushels; wheat, 9,238 acres, 106,533 bushels; hay, 9,041 acres, 9,761 tons; and oats, 3,414 acres, 50,771 bushels. The production of Irish potatoes amounted to 71,755 bushels. Only a small acreage was devoted to buckwheat and rye. The value of orchard fruits produced was \$64,589, and that of market-garden products, \$37,097.

In 1889 there was very little change in the acreage and production of corn and oats, but a decided increase in the case of hay and rye, and a reduction of about one-half in the case of wheat. The value of market-garden products, including small fruits, sold was \$55,451.

By 1899 the land in corn had increased to 20,987 acres, with a production of 542,870 bushels. The total area in wheat was 9,370 acres, producing 99,490 bushels. There were only 1,108 acres devoted to rye, from which 10,120 bushels were produced, and 1,985 acres in oats, producing 32,330 bushels. The area in hay amounted to about 10,000 acres. Irish potatoes were grown on 802 acres, with a production of 61,220 bushels, and sweet potatoes on 127 acres, with a production of 10,297 bushels. Orchard fruits produced were valued at \$39,516; grapes at \$1,674; small fruits, \$24,171; and dairy products,

¹ The agricultural statistics used are taken from the census reports.

\$230,755. The revenue from animals sold or slaughtered amounted to \$89,231, and the value of poultry raised was \$49,755.

At present more land is devoted to corn than to any other crop, and it is grown on practically every farm. In 1909 there were 22,654 acres in corn, with a production of 555,163 bushels. Most of the crop is used locally for feeding work stock, dairy stock, and hogs, and for fattening steers. Some corn is sold in Alexandria and Washington, and in some years the supply is insufficient to meet the demand. A considerable acreage is devoted to corn for ensilage in certain sections and the number of silos in the county is increasing.

Hay ranks second in importance and is grown on every farm. A total of 11,597 acres is reported in tame or cultivated grasses in 1909, with a production of 12,572 tons. This included 6,136 acres of timothy and clover mixed and 4,657 acres of timothy alone. Very small fields of alfalfa are grown by a few farmers, some of the stands having been quite successful. A large part of the hay crop is fed on the farms or sold locally, and some is sold in Washington.

Wheat, the third crop in importance, was grown on 6,528 acres in 1909, with a production of 79,604 bushels. A large proportion of the wheat is used locally, there being a number of gristmills in Alexandria and some of the smaller towns, as well as along the small streams. Some of the grain is shipped to mills at Richmond, Lynchburg, and other southern markets.

Oats are not grown extensively in Fairfax County, as in many seasons the climatic conditions are unfavorable. When the conditions are favorable fair yields are obtained. In 1909 there were 3,296 acres sowed to this grain, and 55,195 bushels were produced. Rye is grown in small fields by many farmers for pasturage. It is also grown for the grain, and 15,339 bushels were harvested in 1909 from 1,529 acres.

Irish potatoes have become an important crop in certain sections. The area planted in 1909 amounted to 1,460 acres and the production to 126,591 bushels. Some farmers plant as much as 30 acres, but usually 10 or 15 acres is considered a large individual planting. Two crops are made in one season, the early crop (mainly Irish Cobbler) maturing early in August and the late crop (Green Mountain and McCormick) being ready for digging early in November.

Considerable market gardening is carried on within a few miles of Washington and Alexandria. In 1909 the value of vegetables produced in the county was \$287,236, and of fruits and nuts, \$94,949. Large quantities of strawberries, grapes, blackberries, and raspberries are grown, and sold in Washington. Apples and other tree fruits are produced in small farm orchards for home use and for sale in the local markets.

Dairying is carried on by many farmers in the sections of the two counties near the steam and electric railway lines and within a few miles of Washington and Alexandria. The value of the dairy products of Fairfax County in 1909, excluding those used in the home, was \$417,537. The dairy herds generally contain from 5 to 30 cows, although some herds are larger. Practically all the milk is sold in Washington.

In certain parts of Fairfax County, mainly in the extreme western part, steers are fed and fattened for the market. These are nearly all shipped in from southwest Virginia, North Carolina, and Tennessee, a few coming from Chicago. Usually the herds range in size from 10 to 50 head. A few stock farmers raise beef cattle. After being fed for periods ranging from a few months to more than a year the beef cattle are sold in Philadelphia, Baltimore, and, to a less extent, in Washington. Occasionally choice steers are marketed in Jersey City. There is an increasing tendency among dairy farmers to raise calves instead of selling them for veal. Hogs are raised in small numbers on practically every farm, the surplus above home requirements being sold in Washington, Baltimore, and local towns. A few farmers keep small flocks of sheep. In 1909 there were 4,138 calves, 2,498 other cattle, 8,382 hogs, and 1,009 sheep and goats sold or slaughtered.

Poultry is raised on all farms, the surplus products being sold in Washington, Baltimore, and local towns. The value of poultry and eggs produced in 1909 was \$311,416.

Many farmers in Fairfax County recognize in a general way the importance of the adaptation of crops to soils. The Huntington and Ochlockonee loams and the Congaree and Bermudian silt loams are considered the best corn and grass soils in the area, while the Manor, Chester, Louisa, and Penn loams and the Penn silt loam are regarded as well suited to the production of corn, wheat, and grass. The Iredell and Conowingo silt loams and the Montalto clay loam are considered to be better suited to small grains and grass than to corn, vegetables or fruit, and the Granville and Leonardtown silt loams as better suited to wheat and grass than to corn. Farmers rate the Granville and Leonardtown loams as fair corn soils where properly improved. The lighter textured soils of the area, including the Susquehanna, Sassafras, and Leonardtown loams, and, where most micaceous, the Manor loam, are considered well suited to vegetables and small fruits.

Corn land usually is plowed in the spring, though some farmers prefer fall plowing. The depth of plowing ranges from about 4 to 8 inches. The fields are dragged and harrowed until a good seed bed is prepared, usually not less than two harrowings being necessary. If

plowed in the fall the land frequently is seeded to rye, which is used for pasturage during the winter and early spring and then plowed under. As a rule corn is cultivated 3 or 4 times, and sometimes oftener. In the fall wheat is drilled in on the corn land, the land usually being disked and harrowed until vegetation is destroyed and a shallow seed bed prepared. Grass seed is sowed with the wheat and the following spring clover is sowed with the young wheat and grass. After the wheat has been harvested the clover and timothy are allowed to remain two or three years for pasturage and hay before being plowed under again for corn.

The farms and improvements in many sections of the area are very good. This is especially true in the northern part of Fairfax County. The quality of the work stock varies with the character of the farms and improvements. Improved farm machinery is used in most sections.

Commercial fertilizers are extensively used throughout Fairfax County. The number of farms reporting the use of commercial fertilizer in 1909 was 1,565, and the total expenditure for this purpose was \$92,218, or an average of \$58.93 for each farm reporting outlay. Fertilizer is most generally used for wheat, but many farmers also fertilize land for corn. Various formulas are used. One that is extensively employed contains 2 per cent of nitrogen, 8 per cent phosphoric acid, and 2 per cent potash. Ground phosphate rock, 16 per cent phosphoric acid, is used rather extensively at present. Fertilizers of special brands are used to some extent for vegetables.

Many farmers also apply lime to the land, in quantities ranging from 500 to 2,000 pounds per acre, and the value of this material as a soil improver is becoming more generally recognized.

Farm laborers are very scarce in Fairfax County, owing to the opportunities for employment in Washington and Alexandria. In 1909 the total expenditure for labor in the county amounted to \$344,323, or an average of \$244.72 per farm reporting. A large proportion of the laborers are colored. Where employed by the month farm hands are paid \$20 to \$25 and board. Day laborers receive \$1 or \$1.50, the higher price being paid in harvest time.

Of the total land area of Fairfax County, 71.6 per cent is in farms. There are 2,320 farms in the county, of an average size of 82.3 acres, and 60.9 per cent of the land in farms is classed as improved. The farms range in size from a few acres in the market-gardening districts to 300 or 400 acres in the western and southern parts of the county. The average size of the farms in 1879 was 123 acres. At present 83.6 per cent of the farms are operated by owners, 15 per cent by tenants, and 1.4 per cent by managers, and these proportions have remained fairly constant for the last 30 or 40 years.

Farms usually are rented on a share basis, the owner receiving one-third the crops produced. Some farms are rented for cash, the amount of rental ranging from \$2 to \$3 an acre, depending on improvements.

The price of land in Fairfax County is influenced by location, transportation facilities, and public roads, as well as by topography, character and condition of soil, and farm improvements. Within a few miles of Washington and Alexandria the prices are greatly influenced by the prospective growth of suburban towns. Land that is used strictly for farming, however, ranges in price from \$30 to \$125 an acre.

In Alexandria County, in 1909, only 20.6 per cent of the land area was in farms. There were 96 farms, of an average size of 42.7 acres, and 73.1 per cent of the farm land was classed as improved. The average price of land is \$276.46 an acre, the value being influenced by its probable use for suburban residence sites.

SOILS.

Approximately the western two-thirds of the area lies within the Piedmont Plateau, a physiographic province extending from New York to Alabama. The eastern third is situated in the Coastal Plain province, which borders the Atlantic Ocean and Gulf of Mexico from New York to Texas. The area is located in what is known as the northern division of both the Piedmont Plateau and Coastal Plain provinces. The boundary between the two provinces in the area is irregular and is determined by the extent of stream erosion. Roughly, it follows a northeast-southwest line extending near Falls Church, Baileys Crossroads, Springfield, and Occoquan. Several small, isolated outliers of the Coastal Plain lie west of the main body, the largest of these, 3 or 4 square miles in extent, lying just north of Dunn Loring. With respect to geology and soils, however, the two physiographic provinces are well defined.

The soils of the area belong to three general groups, (1) those derived by the processes of disintegration and decomposition in place from the underlying rocks of the Piedmont Plateau, (2) those derived from the unconsolidated sediments of the Coastal Plain, and (3) the recently deposited material along the streams.

There are two groups of rocks in the Piedmont Plateau in this area—those of igneous origin and those of sedimentary origin. The igneous rocks are crystalline in character and occur over a considerably larger area than do the sedimentary rocks. They consist of gneiss, schist, granite, diorite, diabase, serpentine, and similar rocks. In most places they have weathered into a soil covering several feet deep. The sedimentary rocks in the Piedmont Plateau

consist of red and gray sandstones and shales and a small development of fine-grained conglomerate, all of Triassic age. These sedimentary rocks, with the small areas of eruptive rocks which accompany them, occupy approximately 65 square miles in the extreme western part of the area. They have a much shallower soil covering than the crystalline rocks. In many places the rocks are but 2 to 4 feet below the surface and they outcrop on the steeper slopes. The surface of the area occupied by the consolidated sedimentary rocks is undulating to gently rolling, in contrast with the rolling to hilly topography of the region underlain by the crystalline rocks. No abrupt topographic changes indicate the boundary between the areas of the crystalline and sedimentary rocks, though the Triassic region lies from 50 to 100 feet lower.

The broad body of Coastal Plain material in the lower, eastern part of the area consists of unconsolidated gravel, sand, and clay interbedded in places, lying in beds practically undisturbed. The material was derived originally from the Appalachian, Piedmont, and Limestone Valley regions west of where it now lies, having been deposited in the sea at a time when the land lay lower than at present.

There are narrow strips of recent alluvium along the numerous streams of the area. The alluvial soil along the Potomac River is made up in part of material brought from the Appalachian Mountain regions and in part of locally derived material, while that along the other streams consists entirely of sediment of local derivation.

The upland soils are the result of long-continued weathering of the various rock formations. These soils, nevertheless, generally show relationship to the parent materials, differing with differences in the lithological and chemical characteristics of the original materials. These soils differ in color, origin, and structural characteristics, and on this basis they are grouped into series. On the basis of difference in texture the soil series are further divided into soil types.

The series of soils derived from the Piedmont crystalline rocks are the Manor, Chester, Louisa, Iredell, Conowingo, and Montalto. From the consolidated sedimentary rocks (Triassic) the Penn, Granville, and Lehigh series are formed. From the unconsolidated Coastal Plain sediments the soils of the Leonardtown, Sassafra, Susquehanna, Keyport, Elkton, and Norfolk series are developed. The recent-alluvial soils along the streams are classed with the Huntington, Congaree, Bermudian, and Ochlockonee series.

The surface soils of the Manor series are brown to yellowish in color and are underlain by reddish-yellow or reddish-brown to light-red subsoils. The subsoils are characteristically micaceous. These

soils are derived from micaceous schists and mica schists. One type, the Manor loam, is mapped in large bodies in this area.

The Chester soils are brown to yellowish in the surface layer and yellow to brown in the subsoil. One type, the Chester loam, is mapped, with an extensive development classed as the Chester loam, gray phase, from the unusually light color of the surface soil. The Chester soils occur in large areas throughout the northern Piedmont region of the United States. They are formed from the weathering of gneiss, schist, and granite.

The surface soil of the types included in the Louisa series are brown to reddish, and the red subsoil is somewhat micaceous, but less micaceous than the subsoil of the Manor series. These soils are formed from schist, gneiss, and granite. One type, the Louisa loam, occurs in the area.

The Iredell series includes types with gray surface soils and a brown or yellowish-brown, waxy, heavy clay subsoil. These soils are derived through weathering from diorite, diabase, and related rocks. One type, the Iredell silt loam, is mapped.

The types of the Conowingo series have gray soils and a yellow to yellowish-brown, compact, waxy subsoil. These soils are formed from serpentine and from dark-colored, quartz-free, igneous rocks. Only one type, the Conowingo silt loam, occurs in this area. It closely resembles the Iredell silt loam.

The Montalto series includes types with brown to red surface soils and a red subsoil. The series is derived from dikes of diabase and diorite. One type, the Montalto clay loam, is inextensively developed in this area.

The Penn series is characterized by soils and subsoils of Indian-red color. The series is derived from red shales and sandstones of Triassic age (see Pl. X, fig. 1). Two types, the Penn loam and silt loam, are mapped.

The soils of the Granville series are gray in color, with a yellow or mottled subsoil. They are derived from gray sandstone, fine conglomerate, and shale of Triassic age. Three types, the Granville very coarse sandy loam, loam, and silt loam, are mapped in this area.

The Lehigh surface soils are gray to bluish gray and are underlain by bluish-gray mottled subsoils. These soils are weathered from bluish rocks of Triassic age which occur in close association with dikes of igneous rocks and seem to have been slightly metamorphosed by heat from them. One type, the Lehigh silt loam, occurs in this area.

The Leonardtown series is characterized by the light-brown or gray to pale-yellow color of the surface soils, the pale-yellow color of the subsurface soil, and the mottled gray and yellow color and

compact structure of the lower subsoil. A gravel substratum is developed at a depth of several feet. These soils represent the weathered surface of unconsolidated marine sediments (see Pl. X, fig. 2). Two types of this series, the Leonardtown loam and silt loam, are mapped in this area.

The surface soils of the Sassafras series are brown to yellowish brown. The subsoil is brown to reddish brown or brownish yellow. These soils represent marine sediments more thoroughly weathered and oxidized than those giving rise to the Leonardtown soils. Two types are mapped—the Sassafras gravelly loam and loam.

The Susquehanna soils are gray to light brown in the surface layer, and are underlain by a yellow to brown, somewhat waxy but gritty subsoil. The soils of this series are derived from the heavier beds of the Coastal Plain deposits, with varying proportions of material consisting of coarser wash from higher lying beds. One type, the loam, is mapped.

The Keyport soils occur in this area as smooth bodies lying less than 100 feet above sea level and considerably lower than the other Coastal Plain deposits. They seem to represent recent estuarine sediments. The surface soils are gray to pale yellow. The upper subsoil is somewhat lighter in color, while the lower subsoil consists of mottled gray and brown material, imperfectly oxidized because of the smooth topography, rather heavy texture, and comparatively recent deposition. The silt loam is the only type mapped in the area.

Closely associated with the Keyport series is the Elkton. The Elkton soils are gray in the surface layer and have a mottled, bluish-gray and yellow, heavy subsoil. Poor drainage is a characteristic of these soils. Only one type, the silt loam, occurs in this area.

A small area of Norfolk fine sand, the only type of this series developed in the area, is mapped. The surface soil is pale yellow to grayish and the subsoil is yellow. It is derived from more sandy beds of the Coastal Plain deposits.

Both the surface soils and subsoils of the Huntington series are brown. These soils are developed in the first-bottom lands of the Potomac and are subject to overflow. One type, the loam, is mapped.

The Congaree soils are brown-colored types occurring along the first bottoms of streams. The soil material has been washed from areas of the crystalline rocks of the Piedmont Plateau. The silt loam is the only type of this series in the area.

The Bermudian series comprises those first-bottom soils along streams of the Piedmont which have a characteristic Indian-red color. These soils represent sediments washed from areas of the Indian-red upland soils derived from the Triassic rocks. The silt loam is the only representative of the series in this area.

The Ochlockonee soils are brown to grayish soils of the Coastal Plain occurring in the first bottoms of streams. The soil material comprises deposits washed from the Coastal Plain areas. The loam is the only representative of the series in this area.

Tidal marsh owes its origin to the gradual deposition of very fine sediments from backwater of the Potomac River and its tributaries, the result of tidal movements.

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

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Chester loam.....	27,776	23.9	Granville silt loam.....	4,032	1.4
Gray phase.....	40,960		Bermudian silt loam.....	3,456	1.2
Manor loam.....	65,408	22.8	Lehigh silt loam.....	3,072	1.1
Leonardtown silt loam.....	21,504	7.5	Ochlockonee loam.....	2,496	.9
Penn silt loam.....	17,344	6.0	Tidal marsh.....	1,856	.6
Congaree silt loam.....	15,744	5.5	Huntington loam.....	1,472	.5
Keyport silt loam.....	15,488	5.4	Granville loam.....	1,216	.4
Susquehanna loam.....	13,760	4.8	Elkton silt loam.....	1,216	.4
Sassafras gravelly loam.....	11,840	4.1	Granville very coarse sandy loam.....	1,152	.4
Iredell silt loam.....	8,128	2.8	Montalto clay loam.....	960	.3
Leonardtown loam.....	6,784	2.4	Norfolk fine sand.....	448	.2
Conowingo silt loam.....	6,016	2.1	Clay pits.....	192	.1
Penn loam.....	5,824	2.0			
Louisa loam.....	5,056	1.8			
Sassafras loam.....	4,160	1.4			
			Total.....	287,360

MANOR LOAM.

The surface soil of the Manor loam consists of about 8 inches of a reddish-brown to yellowish-brown, friable loam of mellow structure. Usually the soil contains sufficient fine mica flakes to give it a smooth feel when rubbed between the fingers. The subsoil is a friable, micaceous clay loam or light, friable clay, ranging in color from light red to reddish yellow, reddish brown or yellowish red. Over the greater part of the type the mica content and red color of the subsoil increase with depth. Frequently, at a depth of 18 to 36 inches, the subsoil is a light-red loam containing a very large percentage of finely divided mica. Small fragments of vein quartz and mica schist are present in both surface soil and subsoil, but never in large quantities. The soil mass has weathered deeply, and only on the steepest slopes does the underlying parent rock of soft, weathered schist lie within a few feet of, or outcrop at, the surface.

Many areas of Louisa loam and Chester loam, too small to indicate on the map, are included with the Manor loam. The Chester loam

occurs in the smoother locations, and the Louisa loam on the steeper slopes.

The Manor loam is an extensive and important soil type in Fairfax County, occurring in large areas throughout the northern part of the county. The largest area extends from the vicinity of Fairfax north to the Potomac River, in a belt 6 to 10 miles wide. Smaller areas lie near Clifton Station, Sisson, and Burke in the southwestern part of Fairfax County. The type is inextensively developed in Alexandria County.

The topography is rolling to hilly (see Pl. XI, fig. 1). Numerous small streams dissect the type, and many of the valleys are deep. The surface, however, is seldom so rough as to prevent cultivation. The slopes, even where steep, are smooth and regular.

Drainage is good to excessive, and in places where the surface is not protected erosion is severe. The percolation of water through the surface soil is rapid, but the subsoil usually contains sufficient clay to hold considerable moisture and prevent serious leaching.

About 75 per cent of this type is under cultivation, the remainder being in the native forest growth of pine, chestnut, white, red, and black oak, hickory, and poplar. Much of the best timber has been cut, but some merchantable timber still remains.

The principal crops grown on this type, named in the order of their importance, are corn, hay, and wheat. Rye is grown in small fields, mainly for grazing, and oats are grown to a very small extent. Vegetables and berries are grown by many farmers for the Washington market, and small quantities of orchard fruits and grapes are produced, mainly for home use. Dairying, when carried on in conjunction with the growing of corn, wheat, or rye, and grass, is the most profitable type of agriculture on this soil, as shown by the results obtained by some farmers in the northern part of Fairfax County. Cattle feeding is an important industry. Hogs and poultry are raised on practically all the farms, and small flocks of sheep are kept by some farmers. A few small patches of alfalfa seen in the course of the soil survey seemed to be doing well.

Corn ordinarily yields 25 to 40 bushels, hay 1 to 1½ tons, and wheat 12 to 20 bushels per acre.¹

The Manor loam is easily tilled and does not bake or clod badly on drying. Most of the farmers practice a systematic rotation consisting of corn 1 year, wheat 1 or 2 years, followed by timothy and clover for 1 to 3 years.

A majority of the farmers on this type apply some lime to the soil, the usual applications ranging from 500 to 1,000 pounds per acre. Lime is applied at intervals of 3 to 6 years or more. Most

¹ Statements in this report as to crop yields are based on information obtained from farmers.

farmers use commercial fertilizers at the rate of 200 to 400 pounds per acre for wheat, and some use about 100 pounds per acre for corn. Phosphoric acid is the most essential constituent of fertilizers applied to this soil. Barnyard manure is used, mainly on corn land, but the quantity available is inadequate, except on some of the dairy farms. As a rule, the most productive farms on this type are those on which dairy farming is practiced. Cowpeas and crimson clover are grown to some extent for green manuring.

The Manor loam responds quickly to applications of fertilizer, organic matter, and lime. Where the soil has been neglected the farms present a run-down appearance, and crop yields are very low, but where proper methods of farming have been employed the soil is very productive.

The price of farm land on this type ranges generally from \$30 to \$60 an acre, depending largely on location and improvements. In the rougher and more remote sections the land is sold for less than \$30 an acre, while well-improved farms on the smoother areas can not be bought for less than \$100 an acre.

Judging from the effect of lime on this soil, it would seem that the use of larger quantities, say 20 to 30 bushels per acre, would be desirable. With liberal applications of lime, in conjunction with manuring and the growing and plowing under of leguminous crops, such as crimson clover and cowpeas, it seems that the only fertilizing element required for corn, wheat, and rye, and timothy and other hay crops would be phosphoric acid.

LOUISA LOAM.

The surface soil of the Louisa loam is a brown, reddish-brown or red, friable loam, 6 to 8 inches deep. The subsoil, to a depth of several feet, is a red, friable clay, containing sufficient finely divided mica flakes to give it a distinctly greasy feel. A few small schist and quartz fragments are scattered on the surface and throughout the surface soil and subsoil in many places. A few areas of Cecil loam, too small to be shown on the map, are included in this type.

The Louisa loam occurs in very small, scattered areas over a large part of Fairfax County in association with the Manor and Chester loams. Owing to its small extent, it is of little importance. The largest areas are near Great Falls and Langley, in the northern part of the county; around Oakton, in the central part; and near Clifton Station, in the southern part. The surface is rolling to steep, and drainage is thorough, the steeper, unprotected slopes being subject to severe erosion.

Probably 75 per cent of the type is cleared and cultivated, the remainder supporting a forest growth similar to that on the Manor

loam. This type is used for the same crops as the Manor loam and with about the same results. It responds to the same methods of cultivation and fertilization.

Land of this type forms a part of farms composed mainly of the Manor loam.

CHESTER LOAM.

The surface soil of the Chester loam is a brown to brownish-gray, friable loam or silty loam, 8 to 12 inches deep. The subsoil is a yellow to yellowish-brown clay loam or friable clay. In uncleared areas the surface soil is yellow. In some areas there is a small quantity of fine mica flakes in the surface soil and subsoil, while in places the subsoil below 18 to 24 inches contains a very large percentage of this material, which gives it a loamy texture and a greasy feel. Both soil and subsoil contain some small fragments of vein quartz and schist. The soil has weathered deeply, the parent rock rarely being exposed, and then only on the steepest slopes. Often cuts several feet deep do not expose the unweathered rock. Areas of the Louisa and Manor loams, too small to map, occur throughout this type.

The Chester loam is a rather extensive and important soil type in Fairfax County, but very little of the type is developed in Alexandria County. It occurs in some good-sized areas and many small ones in the central and northern parts of Fairfax County. One of the largest areas lies just south of Falls Church and Vienna, and smaller areas are located near Fairfax, McLean, Herndon, and Oakton.

The topography is gently rolling to very rolling (see Pl. XI, fig. 2). A number of small streams dissect the type, and along the largest of these the valleys are deeply cut and the slopes are steep. As a rule, however, the topography is not so rolling nor the slopes so steep as in the case of the Manor loam.

The type is well drained and some of the steeper slopes are subject to erosion where unprotected. The subsoil is sufficiently heavy to hold a considerable reserve of moisture for growing crops.

About 80 per cent of the Chester loam is in cultivation. Where uncleared, it supports a forest growth consisting mainly of white, red, and black oak, pine, poplar, chestnut, and hickory. In places there is a second growth consisting largely of field pine.

The main crops grown on the Chester loam are corn, hay, wheat, rye, oats, sorghum, and peas. Vegetables and orchard fruits are grown on every farm for home use, and some market gardening is carried on, but most of the type is too remote from Washington for trucking. Large quantities of small fruits and berries are produced on some farms and find a ready market in Washington. Irish potatoes are successfully grown on a small commercial scale by some farmers. Two crops of potatoes may be grown in a season, the early

crop maturing in the latter part of July and the late crop early in November.

Crop yields vary considerably, but as a rule are higher than on the Manor loam. Ordinarily yields of 30 to 50 bushels of corn, 1 to 2 tons of hay, 15 to 25 bushels of wheat, and 15 to 18 bushels of rye per acre are obtained. Under the most favorable conditions corn and wheat make much higher yields. In the occasional good seasons 30 to 50 bushels per acre of oats are obtained.

Within several miles of the railroads the type is largely utilized for dairy farming, usually in conjunction with the production of the crops named. Few farmers on the type feed beef steers, but hogs and poultry are raised on every farm, and on some farms small flocks of sheep are kept.

The Chester loam works up easily into a mellow, friable seed bed. Practically the same methods of cultivation, rotation, and fertilization are practiced as on the Manor loam. The soil responds quickly to good methods of cultivation and fertilization, but deteriorates rapidly when neglected. However, it probably retains its productivity longer under poor methods than does the Manor loam.

Farms on the Chester loam sell for \$40 to \$100 an acre, depending largely on improvements and location with respect to railroads. Most of the type lies within a few miles of steam or trolley lines.

Alfalfa is grown on a few small patches, and, judging from the results obtained, this is a crop that might be profitably extended. In Montgomery County, Md., just across the Potomac River to the north of Fairfax County, this type has been brought to a high state of productivity by more extensive dairy farming and the addition of large quantities of lime and barnyard manure in conjunction with the growing and plowing under of green manuring crops.

Chester loam, gray phase.—The surface soil of the gray phase of the Chester loam is a yellowish or yellowish-gray to nearly white loam or silt loam, 8 to 10 inches deep. The upper 2 to 4 inches of the surface soil is somewhat lighter in color than the remainder of the material. On the more nearly level divides the lighter colored surface soil is deeper than on the slopes. The subsoil is a yellow or reddish-yellow, friable clay that, on the smoother areas, is frequently faintly mottled with gray. Generally the subsoil is only slightly micaceous, but on some of the slopes there are sufficient finely divided mica flakes below 18 to 24 inches to give the material a greasy feel. Small fragments of vein quartz are present in both surface soil and subsoil. Near Lee Chapel the soil and subsoil contain a rather high percentage of fine quartz gravel. The bedrock has weathered to great depths and exposures at the surface are infrequent.

Very extensive areas of the Chester loam, gray phase, occur in the southern part of Fairfax County. The territory extending

from Fairfax south to Occoquan Creek is composed almost entirely of this soil.

The topography is rolling to very rolling and hilly. The phase is dissected by many streams, the largest of which have cut deep valleys with steep sides. Drainage is good over nearly all this phase, and is excessive on many of the slopes where no vegetation exists. On a few level spots on the divide, however, water sometimes stands after rains.

Probably not over 15 per cent of the phase is in cultivation. This is due in part to the rather rough topography of some areas and in part to the fact that it comprises parts of large estates that have not been subdivided into farms. Most of the land is covered with a forest growth of white, black, and red oak, pine, chestnut, poplar, and hickory. The timber is utilized to some extent for lumber, posts, railroad ties, firewood, paper pulp, and other purposes.

The principal crops grown on this phase are corn, hay, wheat, rye, oats, and cowpeas. Vegetables and orchard fruits, including apples, peaches, and pears, are grown for home use. Very little, if any, dairying or feeding of beef cattle is carried on.

Crop yields vary considerably, but as a rule are lower than on the typical Chester loam. Ordinary yields are about as follows: Wheat, 12 to 15 bushels; corn, 20 to 35 bushels; hay, 1 ton; and rye, about 15 bushels per acre. Higher yields are obtained on some of the better improved farms.

The same methods of cultivation are followed and the same grades of fertilizer are used on this phase as on the typical Chester loam, though usually smaller applications of lime and fertilizer are made. Little or no barnyard manure is used.

The price of land ranges from about \$20 an acre in the rougher, timbered sections to \$60 or \$75 an acre for the best improved farms near the Southern Railway.

This phase responds to the same methods of improvement as the main type. It is more deficient in organic matter, however, and for that reason requires heavier applications of barnyard and green manures.

IREDELL SILT LOAM.

The surface soil of the Iredell silt loam is a gray silt loam, grading at a depth of 6 to 8 inches into a compact, yellowish-gray silt loam or silty clay loam, frequently slightly mottled with gray, which extends to a depth of about 15 inches. The subsoil is a heavy, waxy, and tenacious, brown or yellowish-brown clay, usually several feet deep. On some of the steeper slopes the surface soil in spots has been almost removed by erosion and the underlying waxy subsoil may be reached by the plow. A few small areas have a number of

large diabase boulders scattered over the surface or outcropping. Such areas usually are unfit for cultivation and are indicated by the Rock outcrop symbol.

The Iredell silt loam is not extensively developed. Several small areas and one fairly large area occur just east and south of Herndon, in the northwestern part of Fairfax County, while an area several square miles in extent is located around Bull Run and Centerville, in the southwestern part.

The topography is prevailingly gently undulating, some small areas being nearly level. Usually surface drainage is good, but, owing to the impervious character of the subsoil, water stands on some of the more nearly level areas.

Probably not more than 10 per cent of this type is cultivated. There are few, if any, farms composed entirely of it. Uncleared areas support a tree growth consisting of white and water oak, pine, soft maple, and cedar, from which railroad ties, posts, and firewood are obtained.

The principal crops grown on this type are corn, grass, and wheat. Rye and oats are grown only in small patches. Corn yields 15 to 20 bushels, wheat 12 to 18 bushels, and hay 1 to 2 tons per acre. Oats in good seasons yield 40 bushels per acre and rye 15 bushels.

The Iredell silt loam usually occurs in association with the soils of the Penn and Granville series, and the same methods of cultivation and fertilization are followed as on those soils. The soil is unretentive of moisture and crops suffer greatly and are sometimes a complete failure in seasons of light rainfall. On the other hand, the soil becomes very wet and soggy after heavy rains, and crops frequently are injured by freezing.

The price of farms composed partly of the Iredell silt loam ranges from about \$25 to \$40 an acre, the presence of this type having a depressing effect on the value of the better land. In the vicinity of Herndon the price is somewhat higher than that stated.

The Iredell silt loam is very deficient in organic matter and for its improvement requires heavy applications of lime and stable manure, as well as the frequent growing and plowing under of green manuring crops. Its best use at present is as pasture land and for the production of hay.

CONOWINGO SILT LOAM.

The surface soil of the Conowingo silt loam consists of a gray to pale-yellow silt loam, grading at about 6 inches into a very compact, yellow or mottled yellow and gray silt loam or silty clay loam. Usually at a depth of 15 to 36 inches the subsoil becomes a brownish-yellow clay, which is generally very heavy and waxy. In poorly drained depressions it is a mottled drab and yellow or drab and

rusty-brown, waxy clay. The surface soil when dry is nearly white. The soil has weathered to a depth of several feet, and only on some of the steeper slopes does the underlying rock outcrop. In places the lower subsoil has a greasy feel, probably from very finely divided mica.

The Conowingo silt loam has its largest development in the southwestern part of Fairfax County, where it occurs in a strip about a mile wide and several miles long, following the crest of a winding divide from the vicinity of Oakton nearly to Bull Run, 3 miles west of Clifton Station. Near Pender, in the west-central part of the county, there are two small areas.

The surface is gently undulating in most places, but there are a few steep slopes along the small streams. Surface drainage is fairly well established over the greater part of the type, but in spots where the surface is nearly level water stands after rains and artificial drainage is necessary.

Only about 15 per cent of the Conowingo silt loam is in cultivation, the remainder supporting a forest growth consisting mainly of pine, white, black, and red oak, and hickory. There are a few farms on this type, and the principal crops are corn, hay, wheat, and rye. Corn yields 15 to 25 bushels, wheat 15 to 20 bushels, rye 15 to 18 bushels, and hay 1 ton to 2 tons per acre. The soil is better suited to wheat, rye, and grass than to corn, although these crops are liable to injury by freezing.

The methods of cultivation and fertilization followed on this type are similar to those used on the associated type, the Manor loam. Some farmers use lime at the rate of 500 to 1,000 pounds per acre. Commercial fertilizer in applications of 200 to 300 pounds per acre is used for wheat.

The price of uncleared land of this type ranges from \$20 to \$30 an acre, but improved farm land in the vicinity of Fairfax probably could not be bought for less than \$50 or \$60 an acre.

The Conowingo silt loam is very similar to the Iredell silt loam and responds to the same methods of improvement. Its most profitable use is for pasturage and the production of hay.

MONTALTO CLAY LOAM.

The surface soil of the Montalto clay loam is a brown, red or reddish-brown clay loam about 8 inches deep. The subsoil to a depth of 36 inches or more is a dull-red, heavy but friable clay. On the surface of small areas fragments of roundish, igneous rocks occur. Such areas are indicated on the map by Rock outcrop and stone symbols.

Only a few small areas of the Montalto clay loam were encountered in the area surveyed. Several of these occur around Herndon, and several others, widely separated, are located south and southwest of Pleasant Valley. This type occupies gentle swells or ridges surrounded usually by the Iredell and Penn soils. The topography is smoothly rolling and drainage is good.

This type constitutes only a small part of the farms on which it occurs. Probably 50 per cent of the type is cultivated, the remainder being in white and red oak, pine, and other trees. In many places on the slopes the type apparently comes from material similar to that giving rise to the Iredell silt loam, but which is in a more advanced stage of weathering and oxidation.

The same crops are grown on the Montalto clay loam as on the surrounding soils, and where the soil has been improved fair yields are obtained. It is better suited to wheat, rye, and hay than to corn or vegetables. Wheat yields 15 to 20 bushels, corn 30 to 40 bushels, and hay 1 ton to 2 tons per acre. The soil is cultivated and fertilized in about the same way as the adjacent Penn and Granville soils.

Judging from the results obtained in two small orchards which were observed in the course of the soil survey, apples can be very successfully grown on this type.

PENN LOAM.

The Penn loam consists of an Indian-red silty loam, 10 to 12 inches deep, underlain by an Indian-red, friable clay or clay loam. Both surface soil and subsoil generally contain small, soft fragments of Indian-red shale or sandstone. On the steeper slopes the unweathered or partially weathered shale or sandstone lies within 3 feet of the surface and in places outcrops. A few areas of Penn fine sandy loam are included with this type as mapped, on account of their small extent.

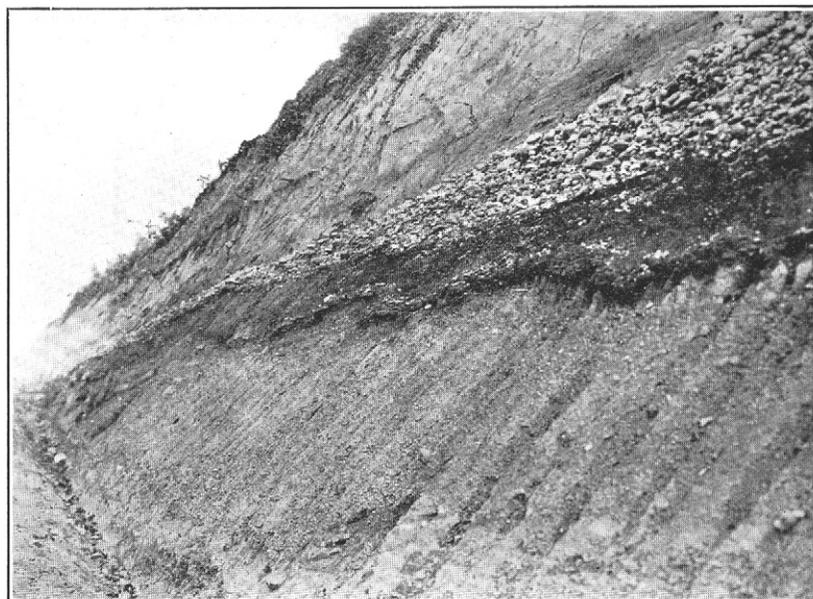
The Penn loam is developed in a few small areas in the northwestern part of Fairfax County, near Herndon. It lies in close proximity to areas of the Penn silt loam. The topography for the most part is gently rolling to rolling, but some of the larger stream slopes are quite steep. Drainage is very good throughout the type, and in places erosion is severe where the surface is unprotected. In seasons of light rainfall crops are likely to be injured by drought, especially where the underlying rock lies within a few feet of the surface.

About 75 per cent of this type is under cultivation. It is used for practically the same purposes as the Penn silt loam, gives similar yields, and responds to the same methods of improvement.



87640

FIG. 1.—VIEW SHOWING UNDERLYING TRIASSIC RED SHALE FROM WHICH THE PENN SOILS ARE DERIVED.



87601

FIG. 2.—UNCONSOLIDATED BEDS OF SAND, GRAVEL, AND CLAY, FROM WHICH THE LEONARDTOWN SOILS ARE FORMED.



FIG. 1.—VERY ROLLING TOPOGRAPHY OF THE MANOR LOAM.

87599

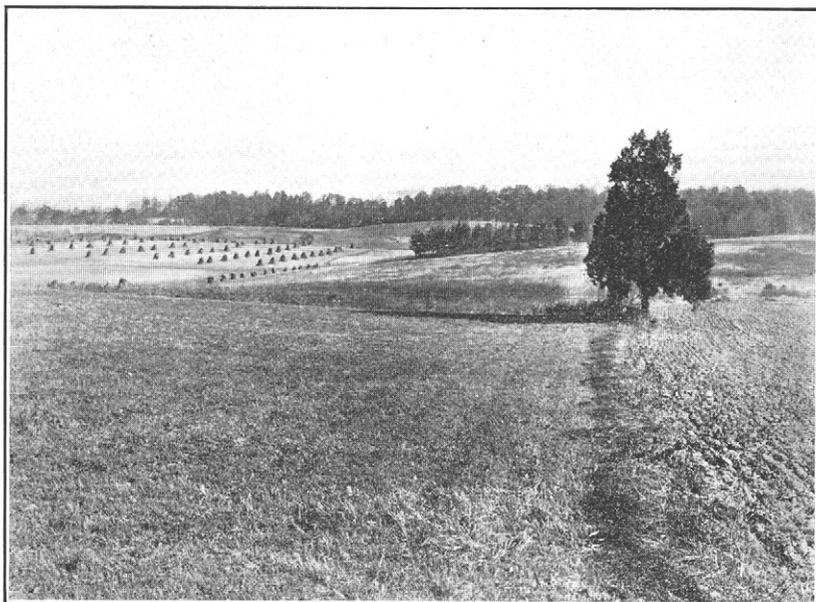


FIG. 2.—TOPOGRAPHY OF THE CHESTER LOAM IN NORTHERN FAIRFAX COUNTY.

87590

PENN SILT LOAM.

The Penn silt loam consists of an Indian-red silt loam, 8 to 12 inches deep, underlain by an Indian-red silty clay loam or friable clay. In uncultivated areas the soil is very compact when dry. On the steeper slopes the partially weathered Indian-red shale frequently lies within 3 feet of the surface and in places outcrops, and both the surface soil and subsoil contain numerous small fragments of shale and fine-grained sandstone. In some small interstream areas where the surface is nearly level the soil in the upper few inches is light brown to gray, and in other places the color is very light Indian-red. The subsoil, however, has the typical Indian-red color.

The Penn silt loam is developed in areas of considerable extent along the western border of Fairfax County, and represents the eastern limit of what are probably larger areas in Loudoun County.

Over the greater part of the type the topography is undulating to gently rolling, but some of the slopes along the larger streams are rather steeply rolling. Surface drainage generally is good and only in spots does water stand on the surface after rains.

About 85 per cent of the Penn silt loam is cleared and utilized for agriculture. The tree growth on the uncleared areas consists mainly of white and red oak, pine, and hickory. The principal crops are corn, wheat, and hay. Small quantities of rye, oats, potatoes, sorghum, and vegetables also are grown. On most farms orchard fruits and berries are grown in a small way. Alfalfa is successfully produced in small fields on a few farms. On one farm with liberal applications of lime, fertilizer, and organic matter, as much as 5 tons per acre of alfalfa hay has been obtained.

Dairying is an important industry on this type, the milk being shipped to Washington. Some beef cattle are raised and a large number are fed. Silos are in use on many farms, and their number is increasing.

Corn on this type yields 25 to 50 bushels, wheat 15 to 20 bushels, and hay 1 to 1½ tons, per acre. In good seasons oats yield 30 to 40 bushels per acre.

Farmers on this type practice the rotation in general use throughout the area, consisting of corn, wheat, and hay. Applications of lime usually are made at the rate of 1,000 to 2,000 pounds per acre once in every 3 to 5 years. An application of 300 to 500 pounds per acre of commercial fertilizer is generally made for wheat. On corn land liberal additions of organic matter are made in the form of stable manure and green manuring crops, in addition to applications of 100 to 125 pounds per acre of commercial fertilizer.

The price of farm land of the Penn silt loam ranges from \$30 to \$70 or more an acre, depending upon location and improvements. Plate XII, fig. 1, shows typical farm buildings on this type.

LEHIGH SILT LOAM.

The surface soil of the Lehigh silt loam is a gray or bluish-gray silt loam, about 12 inches deep. The subsoil is a compact silty clay, mottled bluish gray and brown or gray and yellow. In places the subsoil extends to a depth of more than 3 feet, but frequently the bluish or reddish shale lies near the surface. A few small fragments of bluish shale are scattered over the surface and throughout the surface soil and subsoil.

The Lehigh silt loam is an inextensive soil type, occurring in small, narrow strips between areas of the Iredell and Penn silt loams in the western part of Fairfax County, near Pleasant Valley, Bull Run P. O., Centerville, and Chantilly.

The surface is undulating and drainage is good. Probably 70 per cent of the type is cultivated. Uncultivated areas support a forest growth consisting mainly of white and red oak, pine, hickory, and cedar.

No farms are composed entirely of this type of soil, and it is usually farmed in connection with the Penn silt loam, being used for the same crops. The soil is cultivated and fertilized in practically the same way as the Penn silt loam and responds to the same methods of improvement, but is not quite so productive.

GRANVILLE VERY COARSE SANDY LOAM.

The surface soil of the Granville very coarse sandy loam is a light-brown sandy loam, about 10 inches deep, carrying a large quantity of fine, angular quartz gravel and coarse sand. The subsoil is a brown, yellow, yellowish-brown or brownish-yellow, friable clay, containing a large quantity of fine, angular quartz gravel. When dry the subsoil is quite compact.

The only areas of this type encountered occur in a narrow strip about 3 miles long in the western part of Fairfax County. The village of Centerville is located on this type.

The topography is gently rolling, the main area of the type occupying the crest of a long, smooth ridge lying adjacent to the Iredell silt loam on one side and the Penn loam on the other. Drainage is good, although the soil contains sufficient clay to make it fairly retentive of moisture.

About 90 per cent of this type is cultivated, the uncleared areas supporting a tree growth consisting mainly of pine, red oak, and white oak.

The same crops are grown on this type as on the adjoining Penn loam. Ordinary acreage yields of corn are 25 to 35 bushels, wheat 10 to 15 bushels, and hay three-fourths to 1 ton. On some farms

where the soil has been neglected yields are less. There are small orchards of apples, peaches, pears, plums, and cherries on the type, which do well.

This soil is cultivated and fertilized in the same manner as the Penn silt loam, and responds to the same methods of improvement. Farm land of this type sells for \$30 to \$40 an acre.

The Granville very coarse sandy loam is well suited to vegetables and fruit, especially peaches, small fruits, and berries, but is rather light for the best production of small grains and hay.

In the following table the results of mechanical analyses of samples of the soil and subsoil of this type are given:

Mechanical analyses of Granville very coarse sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
211544.....	Soil.....	16.0	14.8	5.3	18.5	11.2	26.4	7.8
211545.....	Subsoil.....	6.7	9.0	4.3	17.1	15.1	28.4	19.3

GRANVILLE LOAM.

The surface soil of the Granville loam is a brown or yellowish-brown, friable loam, 8 to 10 inches deep. When dry the surface soil is gray in color, resembling the silt loam of the same series. The subsoil is a yellow, friable clay loam, having a brownish-yellow tinge in places, and frequently underlain at 24 to 30 inches by a yellow or brown, compact fine sandy loam. In some spots the surface soil is a fine sandy loam.

There are only two areas of this type. These occur just south of Herndon, in close association with the Granville silt loam. The topography is gently rolling and the drainage is good.

More than 50 per cent of the type is in cultivation, the remainder being in pine, white oak, and various other varieties of oak.

The same crops are grown on this type as on the Granville silt loam. Yields of corn are somewhat higher where good methods of farming are used, but as a rule other crops yield approximately the same as on the silt loam (see Pl. XII, fig. 2). The type is locally referred to as "sandy land."

GRANVILLE SILT LOAM.

The surface soil of the Granville silt loam is a grayish-yellow, pale-yellow or yellowish-brown silt loam, 8 to 10 inches deep. When dry the surface inch or two is light gray to nearly white. The subsoil is a pale-yellow, compact, though friable, silty clay loam, in places slightly mottled with gray, and grading at a depth of 15 to 20 inches into a rather heavy, compact but friable clay, yellow

or yellowish brown in color, and mottled with gray. This material usually continues to a depth of 36 inches, but in places a very compact fine sandy clay or fine sandy loam is encountered at 30 to 36 inches. Frequently the lower subsoil contains Indian-red mottlings.

The Granville silt loam occurs in several areas in the western part of Fairfax County, near Herndon. It has an extent of only a few square miles.

The topography is generally undulating to very gently rolling. In places the type occupies nearly level areas, surrounded by the more rolling Penn silt loam. Surface drainage as a rule is fairly well established, although in places water remains on the surface for some time after rains. Owing to the compact nature of the subsoil, underdrainage is poor, and the land is somewhat "soggy" in the spring in many places.

Approximately 75 per cent of this type is in cultivation, much of the land being farmed in conjunction with other soils. The native timber growth consists mainly of pine, white and red oak, and hickory.

The principal crops grown, named in the order of their importance, are corn, wheat, and hay. Rye, oats, cowpeas, and crimson clover and other legumes are grown to some extent. There are small orchards and gardens on the best areas of the type, producing fair yields. Dairying is an important industry.

Corn yields 20 to 40 bushels, wheat 12 to 20 bushels, and hay 1 ton to 1½ tons per acre. Oats yield 30 to 50 bushels per acre in good seasons. Rye is grown, principally for grazing.

The Granville silt loam is handled in about the same way as the Penn silt loam.

This land is usually held at \$50 to \$75 an acre, though farms composed partly of this type in the vicinity of railroads are valued more highly. The comparatively high price of this soil is due to its favorable location.

Judging from results obtained in the vicinity of Herndon, the Granville silt loam is better suited to dairy farming than to any other type of agriculture. Small grains and grasses do better than corn, although grains are sometimes injured or destroyed by freezing. The soil is very deficient in organic matter, and the incorporation of large quantities of stable manure, green manuring crops, and lime is necessary for its improvement. Some of the nearly level areas require artificial drainage.

LEONARDTOWN LOAM.

The surface soil of the Leonardtown loam is a light-brown or brownish-gray loam, 8 to 10 inches deep, underlain by a yellow or yellowish-brown clay loam or friable clay. Usually there is a sub-

stratum of smooth, rounded quartz and sandstone gravel or very gravelly clay, several feet thick, underlying the subsoil, and in many places on the slopes the surface soil and subsoil contain small quantities of this gravel. Some areas of Leonardtown gravelly loam and fine sandy loam, too small to map separately, are included with this type.

The Leonardtown loam occurs in small areas in the southeastern and eastern parts of the area in close association with the Leonardtown silt loam, usually occupying slopes between the latter type and the lower lying Sassafras gravelly loam.

The topography is undulating to gently sloping and the surface drainage and underdrainage are good. In the gravelly areas the material is rather porous and leachy.

It will be noticed that the Leonardtown series is described as having a compacted layer in the lower part of the subsoil. Typically, although its density varies from place to place, this stratum is dense enough to interfere with, but not to prevent, the movement of subsoil water and the penetration of roots. The loam as here mapped is free from this development and is therefore not a true member of the Leonardtown series. It is included with that series because of its occurrence in close association with the silt loam, which is typical, and because of its variation in color from the Sassafras soils. It is more nearly related to the latter series, however, than to the true Leonardtown.

Owing to its small extent, this type is not important. About 75 per cent of it is under cultivation. The native forest growth is similar to that on the Leonardtown silt loam. The type is used for the same purposes as the silt loam, in connection with which it is farmed. Yields on the two types are approximately the same, although the loam is somewhat better suited to vegetables than the silt loam.

LEONARDTOWN SILT LOAM.

The surface soil of the Leonardtown silt loam is a light-brown or yellowish silt loam, 8 to 10 inches deep. The immediate surface material dries out to a light-gray or whitish color. The subsoil is a yellow or brownish-yellow silty clay loam of friable structure.

On the smooth areas the subsoil, beginning at a depth of 18 to 24 inches, consists of a mottled, friable but compact silty clay to clay. A small quantity of gravel may or may not be present. This stratum is fairly impervious to water and is frequently called hardpan.

An underlying bed of rounded quartz and sandstone gravel occurs, usually more than 3 feet below the surface. In some places near slopes the gravel substratum comes near the surface, and the surface

soil may contain a small quantity of gravel. A few scattered areas of Leonardtown gravelly loam, sandy loam, and loam, too small to show on the map, are included with this type.

The Leonardtown silt loam is an important type in both Fairfax and Alexandria Counties. It is encountered throughout the eastern part of the area. The largest developments lie a few miles northwest, west, and southwest of Alexandria, and good-sized bodies occur near Pohick, Accotink, Franconia, Lincolnia, Bailey Crossroads, and Clarendon.

The surface is gently undulating to nearly level, with occasional slight depressions. Surface drainage is generally poorly established and in the depressions water stands on the surface for some time after rains. Where the compact lower subsoil layer is present the downward passage of water is slow, consequently much of the type remains in a wet condition for a long time, even where the surface water has passed off.

The native forest growth on this type consists mainly of pine, white oak, red oak, and hickory. About 75 per cent of the type is cleared and under cultivation. The principal crops grown are corn, rye, wheat, and timothy and clover. Small quantities of oats are grown. Irish potatoes are grown, to some extent, commercially. Market gardening is carried on by many farmers, who take their produce to Washington and Alexandria. Apples, peaches, cherries, grapes, and berries are grown by many farmers, and do well. There are many small apple orchards on this type, summer apples and certain varieties of winter apples, principally Winesap and York Imperial, being commonly grown. There are many small dairy herds on this type, the milk being hauled or shipped to Washington and Alexandria. A few hogs and dairy cattle are raised.

Corn yields ordinarily 25 to 40 bushels, rye 15 to 20 bushels, and wheat 12 to 20 bushels per acre, though much higher yields have been obtained. Wheat and clover are frequently injured by freezing of the soil. Hay (timothy alone or timothy and clover mixed) yields ordinarily 1 to 1½ tons and in the most favorable seasons 2 tons per acre. Some fields of timothy have produced good yields for as much as 8 years. Good yields of alfalfa have been obtained on this type, but the crop frequently is killed by freezing of the soil. Under favorable conditions 3 cuttings are made in a season, with a total yield of about 3 tons. Alfalfa is not grown commercially, the fields being small and in most cases experimental. Early Irish potatoes yield on an average 75 bushels per acre, and the late crop 150 bushels per acre.

Corn land on this type is plowed as early in the spring as it is dry enough. If plowed too wet the soil bakes and forms hard clods.

Usually the spring plowing is done in March or April. Corn usually is planted in May, although when grown for ensilage it is sometimes planted as late as July. While wheat or rye may be grown 2 years in succession, usually they are grown only 1 year. Clover and timothy are allowed to stand as long as good yields are obtained, generally 2 or 3 years.

The most commonly used rotation on this type consists of corn 1 year, rye or wheat 1 or 2 years, and grass 2 or 3 years. On some farms, especially where dairying is carried on, corn is grown several years in succession.

Commercial fertilizer is extensively used on this type, especially for wheat and rye, the usual application being about 300 pounds per acre. Some farmers apply 100 to 200 pounds per acre to corn land. The results obtained by some farmers on this type would seem to indicate that acid phosphate gives as good results as a complete fertilizer mixture. Where lime has been used it has greatly benefited the soil. The type is deficient in organic matter, and although the available stable manure is returned to the land the supply is inadequate. Little green manuring is done.

Near the larger towns and along the trolley lines and turnpikes improved land of this type is sold for \$50 to \$100 an acre, and sometimes more. The price of uncleared land and of cleared land more remote from markets ranges from about \$25 to \$50 an acre, depending on the improvements.

Many of the flatter or slightly depressed areas of this type could doubtless be improved by tile drainage and to a less extent by ditching.

SUSQUEHANNA LOAM.

The surface soil of the Susquehanna loam, where typically developed, is a light-brown to grayish coarse loam, usually quite gritty, owing to a large content of fine quartz gravel or coarse sand. This is underlain at a depth of 6 to 12 inches by a yellow, brownish-yellow or mottled light-red and yellow, slightly waxy but very gritty clay.

There are many variations in the type. The surface soil in many spots is a sandy loam to coarse sandy loam, and in other places it contains considerable rounded quartz gravel. On some of the slopes the surface soil is only 3 or 4 inches deep, while in depressions it may be 18 inches deep. The subsoil, while prevailing somewhat waxy in structure, may or may not be gritty. In places a bed of coarse sand and sharp, fine gravel is encountered at a depth of 2 or 3 feet. Sometimes the lower subsoil between 18 and 24 inches is mottled red and gray or yellow and gray. On the steeper slopes there occur many patches of Susquehanna clay which, owing to their small

extent, were mapped with the loam. In places this type resembles the Sassafras loam, in that the surface soil is brown and the subsoil is a light-brown, friable clay, particularly in the more level areas.

The Susquehanna loam occurs in a number of small to fairly large areas on the slopes along the larger creeks in the eastern part of the area. The topography is prevailingly gently rolling to undulating, though a few slopes are quite steep. Drainage is fair over most of the type.

Though not of great extent, this type is rather important agriculturally, as probably more than 80 per cent of it is cleared and utilized for farming. The native timber growth consists mainly of pine, chestnut, and white, red, and black oak.

The principal crops grown are corn, wheat, and hay, with some rye and oats. More than half the type is devoted solely to these crops. On the remainder of the type dairying and market gardening are frequently carried on in conjunction with the production of the field crops.

Irish potatoes are one of the most important of the market-garden products, two crops being grown in a season by many farmers. Other vegetables grown for market are tomatoes, cabbage, sweet corn, peas, beans, turnips, and sweet potatoes. Apples, peaches, pears, plums, and cherries are grown in small orchards and do well. The dairy herds on this type are composed of Holsteins and Jerseys, or grades of these breeds, and range in size from 5 to 20 head. Few sheep are raised, but every farmer raises a few hogs to supply pork products for home use. Some poultry, eggs, and butter are sold by many farmers.

Corn yields 20 to 40 bushels, wheat 12 to 18 bushels, and hay about 1 ton per acre. Early Irish potatoes yield 75 to 100 bushels and the late crop 150 to 200 bushels per acre. Vegetables produce good yields where the surface soil is deep, especially on the more sandy areas.

The methods of cultivation and fertilization followed on this type are similar to those employed on the adjacent soils.

Farms on the Susquehanna loam are sold at \$40 to \$60 an acre, depending largely on the extent to which the land has been improved.

The Susquehanna loam varies considerably in productiveness, but the less productive areas can be readily built up by the use of fertilizer and the incorporation of organic matter and lime.

KEYPORT SILT LOAM.

The surface soil of the Keyport silt loam is a grayish-yellow to yellow or light-brown silt loam, 8 to 10 inches deep. On drying, the surface inch or two is quite gray. The subsoil is a compact, yellow silt loam or silty clay loam, grading at about 20 inches into a com-

pact, heavy, yellow silty clay mottled with gray, which extends to a depth of several feet. In the more level areas gray and drab mottling is more pronounced, but in the sloping areas it is faint and in places lacking. On some of the steeper slopes there are a few spots where the surface soil is a fine sandy loam to loam, but these were deemed too small and unimportant to show separately on the map.

The Keyport silt loam is not extensively developed in this area. It occurs in both Alexandria and Fairfax Counties, occupying the greater part of the low, smooth terraces along the Potomac River from the vicinity of Rosslyn to the southern extremity of the area. The type is cut into a number of small areas by the bays and tributary creeks of the river. The largest areas lie near Fort Hunt and Woodlawn School, and between Hallowing Point and Sandy Point. The city of Alexandria is located on this soil.

The topography is gently undulating to level, and in places slight depressions occur (see Pl. XIII, fig. 1). A few of the slopes are rather steep, and the margin of the type next the river is in many places marked by low bluffs. Near Rosslyn the type lies from 40 to 60 feet above the river, but its elevation above the stream gradually becomes less toward the south, until at Hallowing Point, near the southern extremity of Fairfax County, it lies only 20 to 30 feet above.

Drainage is fairly well established over most of the type, though water remains on the surface of the small depressions, which are in places quite numerous.

Probably 70 per cent of the type is cleared. All the areas lying between Alexandria and Washington are cleared and are utilized mainly as building sites for residences and factories. In this section of the area, as well as at Riverside, the clay material of the subsoil and substratum is used extensively for the manufacture of brick and tile. On the large neck of land terminating in Sandy and Hallowing Points, in the southern part of Fairfax County, is found the largest forested area of the type. The timber consists of white, red, water, and pin oak, pine, hickory, poplar, and sweet gum.

The principal crops grown on the Keyport silt loam are corn, hay, and wheat, with some rye and oats, Irish potatoes, and other vegetables. Orchard fruits are grown on some of the farms. Dairy farming is carried on to some extent and hogs and poultry are raised in a small way on every farm.

On the best farms corn yields 30 to 50 bushels, hay 1 to 2 tons, wheat 15 to 20 bushels, and rye about 15 bushels per acre. Early potatoes yield about 100 bushels and late potatoes about 150 to 200 bushels per acre.

The cultural methods followed are the same on this type as on the Susquehanna loam.

Farms on this type are sold for \$40 to \$100 an acre. Around Alexandria and north of that city, where the land is largely used for factory and residence sites, much higher prices are obtained.

The Keyport silt loam is deficient in organic matter and lime. The soil is probably best suited to grasses and small grains, though good yields of corn can be obtained by providing a good supply of organic matter, especially on the more rolling areas. The more level areas would be greatly benefited by tile drainage and ditching.

NORFOLK FINE SAND.

A small area of Norfolk fine sand is indicated on the map, in Keyport silt loam color, by inclusion symbol. The surface soil of the Norfolk fine sand is a grayish to light-brown loamy fine sand, 3 or 4 inches deep, grading into a pale-yellow fine sand. The subsoil, beginning at a depth of about 12 inches, is a yellow fine sand several feet thick.

The only area of Norfolk fine sand encountered is less than 1 square mile in extent and lies in the extreme southern part of Fairfax County, bordering the Potomac River, about one-half mile northwest of Gunston P. O. The surface is gently undulating and drainage is good.

More than half this type is in cultivation, being farmed in conjunction with the Keyport silt loam. Corn, wheat, and hay make rather low yields on this soil. Vegetables and fruits do well, and there are some very good apple orchards on the type. For best results this soil requires the incorporation of large quantities of organic matter and of fertilizer high in nitrogen and phosphoric acid.

ELKTON SILT LOAM.

There are mapped in the Keyport silt loam color and distinguished by symbols small areas of Elkton silt loam. The surface soil of the Elkton silt loam is a compact, gray silt loam, ranging in depth from 6 to 12 inches. The subsoil is a compact, tough silty clay, mottled bluish gray and yellow or orange, which extends to a depth of several feet.

The total area of this type amounts to only a few hundred acres. It occurs in the southeastern part of Fairfax County, around Gum Springs Church and near Fort Hunt and Sandy Point. A number of areas of this type, too small to indicate on the map, are included with the Keyport silt loam without differentiation on the map.

The topography of the Elkton silt loam is flat to slightly depressed and drainage is poor. In places water stands on the surface until removed by evaporation.

Probably less than 10 per cent of the type is under cultivation. It is farmed in connection with the surrounding soil. The native timber growth consists of white, water, and pin oak, sweet gum, and soft maple.

This soil is not very productive in its present condition, but with artificial drainage it would be especially well suited to wheat, rye, and grass.

SASSAFRAS GRAVELLY LOAM.

The Sassafras gravelly loam consists of a light-brown or yellowish gravelly loam, 6 to 10 inches deep, underlain by a yellow or yellowish-brown gravelly clay which extends to a depth of several feet. The immediate surface material dries out to a gray or white color. The gravel in the soil and subsoil consists of smooth, rounded fragments of quartz and sandstone, the largest of which are 3 or 4 inches in diameter. It constitutes 25 to 80 per cent of the soil material. In cuts the subsoil frequently appears very hard and compact. In places it is a heavy, waxy clay, sometimes mottled with red and gray.

This type occurs in widely scattered, narrow strips along the slopes of the plateaulike areas of Leonardtown loam and silt loam throughout the eastern part of the area. The largest developments occur a few miles west and southwest of Alexandria.

The topography is steep to gently sloping and drainage is good. The soil is generally leachy and the type is unimportant agriculturally, less than 5 per cent of it being under cultivation. Most of it is covered with the original forest growth, consisting mainly of pine, chestnut, white and red oak, and hickory. A few small patches are cultivated in connection with the Leonardtown loam and silt loam. Yields are lower than on those types. On some of the least gravelly areas fair yields of vegetables and corn are obtained and orchard fruits, grapes, and berries do well.

Land of this type is sold in connection with the more extensive adjoining soils, from the value of which it detracts.

The abundant gravel deposits in this type are extensively used as a source of material for road building. The best use for the more gravelly areas of this type is forestry.

SASSAFRAS LOAM.

The surface soil of the Sassafras loam is a brown to yellowish-brown loam about 12 inches deep. The subsoil to a depth of 36 inches is a brown or reddish-brown, friable clay. In some places the subsoil is nearly red in color, while in other places it may be yellowish brown. Occasionally a small quantity of waterworn quartz and sandstone gravel is encountered in the subsoil. There are a few

included areas of fine sandy loam and silt loam, too small to separate on the map.

Covering a portion of the Arlington Experiment Farm and in one small area lying immediately south of Great Falls and several others along the river between Arlington Junction and Alexandria is a light-brown loam or silt loam underlain at 8 or 10 inches by a yellowish-brown friable clay. These bodies occupy river-terrace positions and the soils in color, texture, and structure closely resemble the Elk loam as mapped on the higher bottoms along the Potomac River in Montgomery County, Md. Owing to their small extent it was not considered necessary to show these areas as a distinct soil in the present survey.

The Sassafras loam is not an extensive soil type. It occurs in a number of small, widely separated areas on the terraces along the Potomac River, in the vicinity of Rosslyn, Alexandria, Fort Hunt, Mount Vernon, Accotink, and Colchester. An area of considerable extent lies at Tysons Crossroads, and there are a few other areas at some distance from the river.

The topography is gently rolling and drainage is good. Two small areas located 2 or 3 miles southwest of Alexandria occupy a terrace about a hundred feet higher than the terraces on which most of the type occurs.

The native forest growth on this type consists mainly of pine and several varieties of oak. About 80 or 90 per cent of the type is under cultivation. On the large area north of Mount Vernon there are some farms that are composed almost entirely of soil of this type, and data obtained here are considered typical of the agricultural conditions on the type.

The principal crops grown on the Sassafras loam near Mount Vernon are corn, hay, wheat, rye, and Irish potatoes. Other vegetables are produced, but mainly for home use. In this vicinity Irish potatoes are becoming an important crop, as much as 18 acres being devoted to this crop on one farm. Two crops of Irish potatoes are produced, the first maturing about August 1 and the second in the early part of November. The soil is well suited to orchard fruits, small fruits, and berries. Dairy farming is carried on in a small way.

The same methods of cultivation and fertilization are followed on this type as are practiced in general throughout the area.

Corn yields 30 to 40 bushels, wheat 15 to 20 bushels, hay 1 to 1½ tons, and rye 15 to 20 bushels per acre. Irish potatoes average about 100 bushels per acre for the early crop and 150 bushels for the late crop. Oats sometimes yield 40 bushels per acre.

The best farming land on this type is held for \$75 or \$80 an acre.

Near Washington and Alexandria the land is more valuable, owing to its use for residential sites.

This type can be readily improved and its productiveness maintained by the use of lime and stable and green manures.

HUNTINGTON LOAM.

The surface soil of the Huntington loam is a brown, friable loam, 12 to 18 inches deep. The subsoil to a depth of 3 feet or more is a brown, friable clay, sometimes slightly mottled with gray below 30 inches. This description applies to that part of the type which lies above Rosslyn. Below that point the soil is of about the same texture but has more of a reddish color. Some areas of Huntington silt loam and fine sandy loam, too small to map separately, are included with this type.

The Huntington loam is not an extensive soil type. It occupies narrow strips and small areas along the Potomac River. Of the three largest of these one occurs just opposite Washington, another a mile north of Alexandria, and the third a mile south of Alexandria. The area opposite Washington is called Alexander Island.

This type lies 4 to 10 feet above the river and has a level surface. Drainage is good. Occasional overflows cover the surface for a day or two, but these may not occur for periods of several years.

Practically all the type is cleared and is in partial cultivation. It is utilized mostly for corn, though sometimes wheat and hay are grown. Ordinarily corn yields 40 to 60 bushels and hay 1 to 2 tons per acre. The soil is best suited to corn and grasses.

The Huntington loam is naturally a very productive soil, but its productiveness is decreased by the prevailing one-crop system of corn growing. However, it may be easily improved and maintained in a productive condition by the liberal use of manures and lime. Where sufficient organic matter is incorporated with the soil phosphoric acid is apparently the only fertilizer required.

About 40 acres mapped as this type at the northwestern end of Alexander Island consists of Tidal marsh over which silt and sand have been deposited by dredges which have lifted this material from the bottom of the Potomac. The surface soil consists mostly of silt loam a few inches deep, while the subsoil is the bluish and grayish mottled silty clay of marsh formation. This made land is flat and poorly drained. In the season of 1915 some corn was planted on it, but only a small quantity matured. With proper drainage the soil would be very productive. A small area of filled-in land also occurs at the lower edge of Alexandria.

CONGAREE SILT LOAM.

The surface soil of the Congaree silt loam consists of a brown silty loam or silt loam, 12 to 15 inches deep. The subsoil to a depth of 36 inches is a grayish-brown loam or silt loam to friable clay. A large quantity of fine mica flakes occurs in both soil and subsoil in many places. Frequently, especially in the depressions, the subsoil is a dark, bluish or bluish-gray silty loam or silty clay, mottled with brown. Along some of the small streams in the very narrow valleys, areas of Congaree loam, too small to map separately, are included with this type.

The Congaree silt loam occurs throughout the area, with the exception of the extreme southeastern and western parts. While it is not developed in any large areas, its aggregate acreage is extensive. It occupies the first-bottom lands bordering the interior streams. These bottoms range in width from a few hundred feet to nearly one-half mile and lie from 4 to 6 feet above the streams at normal stage. The surface is flat. The wider bottoms are slightly lower adjacent to the uplands than at the banks of the streams and are semimarshy in places. The type, while not wet for long periods of time, is on the whole rather poorly drained, and all of it is subject to occasional inundations.

About 75 per cent of the Congaree silt loam is forested, the timber growth consisting of poplar, elm, sycamore, beech, red and water oak, and ironwood. The remainder of the type is used mainly as pasture for work animals and dairy stock. Some corn is produced, the yields ranging from 40 to 60 bushels per acre. Occasionally a small acreage of wheat is grown, but the growth of stalk is rather rank and the crop is likely to lodge. The soil is best suited to grasses, clover, and corn.

The Congaree silt loam is sold in connection with other types, and therefore no definite price for it can be stated. It is naturally a very productive soil, but yields are uncertain owing to the occasional overflows. The type can be greatly improved in many places by deepening and straightening the natural drainage ways and leading lateral ditches into them.

BERMUDIAN SILT LOAM.

The Bermudian silt loam consists of an Indian-red or brownish silt loam, 12 inches deep, underlain by an Indian-red silt loam or silty clay loam, which extends to a depth of 3 feet or more.

This is an inextensive type, occurring along the small streams in the extreme western part of Fairfax County. It occupies the shallow first bottoms of the valleys, which are usually only a few hundred feet in width. The surface is flat and the type is subject to overflow.

In some slight depressions, usually adjacent to the uplands, the soil is in a semimarshy condition.

The native tree growth consists of several varieties of oak, black gum, sycamore, soft maple, elm, willow, and ironwood. About 70 per cent of the type is cleared or partly cleared. It is utilized principally for grazing dairy and beef cattle, the growth of wild grasses being abundant (see Pl. XIII, fig. 2). Some corn is grown and yields 40 to 50 bushels per acre.

The Bermudian silt loam comprises parts of farms consisting principally of the Penn silt loam.

The type has about the same agricultural value as the Congaree silt loam, and, like that type, can be improved by artificial drainage and by straightening and deepening the natural drainage ways.

OCHLOCKONEE LOAM.

The surface soil of the Ochlockonee loam is a dark-gray to brownish loam, 6 to 10 inches deep. The subsoil to a depth of 36 inches is a brown, mottled bluish-gray and brown or yellow friable clay or heavy clay.

The type occupies a few strips along small streams in the eastern and southern parts of the area surveyed. It is flat and rather poorly drained, and is subject to occasional overflows. About half the type is cleared and utilized, mainly for native-grass pasturage. Some corn is grown.

The Ochlockonee loam has about the same agricultural value as the Congaree silt loam, which it closely resembles in position, topography, drainage, and productiveness.

TIDAL MARSH.

Tidal marsh consists of a bluish or bluish-gray to black silt loam to silty clay, faintly mottled with brown or yellow, and several feet deep. The greater part of the soil mass is composed of fine grass roots in various stages of decomposition.

Tidal marsh is not extensively developed. It occurs in small areas at the mouths of tributaries of the Potomac River and in the estuaries of the river. The largest area lies about 2 miles south of Alexandria.

The surface of Tidal marsh is perfectly flat and lies below the water level at high tide. It is nearly always covered with water, which varies from a few inches to 2 feet in depth. Small lagoons and channels of open water wind through the marsh areas.

The native vegetation consists of a heavy growth of wild rice, marsh grass, flags, and other water-loving grasses and plants.

In its present condition Tidal marsh has no agricultural value. If reclaimed it would probably be well suited to celery and onions, but it is doubtful if such small areas could be profitably reclaimed.

SUMMARY.

Fairfax and Alexandria Counties are situated in the extreme northeastern part of Virginia, bordering the State of Maryland. Their total area is 449 square miles, or 287,360 acres.

The topography ranges from gently undulating to very rolling and hilly, being predominantly gently rolling. The general slope is toward the southeast. Along streams there are narrow and level first-bottom areas. The greater part of the area lies between 200 and 400 feet above sea level, and the range in elevation is from sea level to 500 feet above. All the area is drained by the Potomac River and its tributaries, and drainage is good throughout.

In 1910 the population of Fairfax County was 20,536, and that of Alexandria County 25,560, including the city of Alexandria, which was made independent between 1890 and 1900. Most of the inhabitants of Fairfax County are engaged in agricultural pursuits, while Alexandria County is given over largely to suburban residence sites. Alexandria, located about 5 miles south of Washington, is the only city in the area. Clarendon, Ballston, Cherrydale, Del Ray, and Rosslyn are the largest towns in Alexandria County, and Falls Church,¹ Herndon, Vienna, Fairfax, and Clifton Station are the largest in Fairfax County. Railroads and trolley lines connect these towns with Washington.

The area is provided with excellent rail transportation facilities, being traversed by a number of stream and electric railroads. A few excellent highways have been built, but over the greater part of the area the roads are poor.

Practically all parts of the area are reached by rural mail delivery routes. Telephones are in general use, and good schools and churches are numerous.

Washington, Baltimore, Alexandria, and Richmond are the principal markets, practically all the market-garden, dairy, and poultry products, as well as much of the staple crops, being sold in Washington.

The climate of the area is mild and healthful. The mean annual temperature as reported at Washington is 54.7° F., and the mean annual precipitation is 40.8 inches. There is a normal growing season of 197 days.

The agriculture of Fairfax County consists mainly of general farming, the principal crops grown being corn, hay, wheat, rye, oats, and potatoes and other vegetables. Dairy farming, the feeding of beef cattle, hog raising, market gardening, and fruit growing are engaged in to a greater or less extent. Many of the farms are well improved, but in some sections the improvements are not of a high standard.

¹ A part of Falls Church lies in Alexandria County.

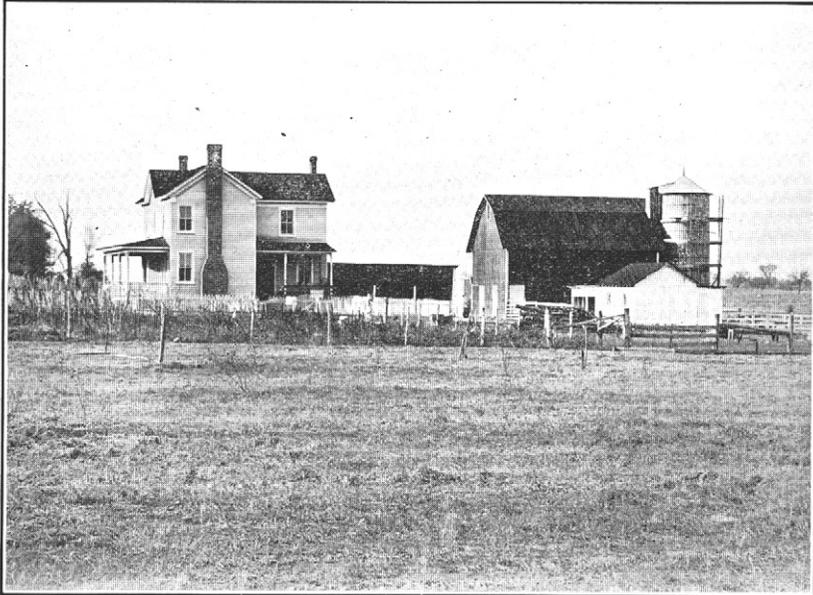


FIG. 1.—TYPICAL FARM BUILDINGS ON PENN SILT LOAM.

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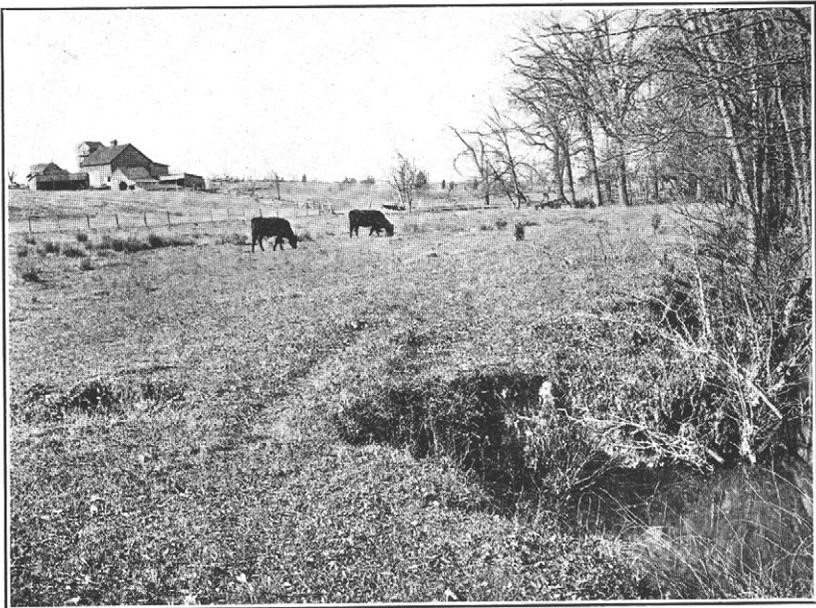
FIG. 2.—CORN ON GRANVILLE LOAM.

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FIG. 1.—LEVEL TO GENTLY UNDULATING TOPOGRAPHY OF THE KEYPORT SILT LOAM.



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FIG. 2.—PASTURE ON BERMUDEAN SILT LOAM, THE BOTTOM-LAND TYPE ALONG STREAMS FLOWING THROUGH THE PENN SILT LOAM.

The systematic rotation of crops is generally practiced. Lime is largely used by many farmers, but its use is not so general as in some of the adjacent counties. Commercial fertilizers are in general use for wheat, corn, and market-garden crops. Farm labor is scarce and expensive.

There are 2,320 farms in Fairfax County, with an average size of 82.3 acres. Farm land sells for \$25 to \$100 an acre. In the northern part of the area, near the District of Columbia, where the land is largely occupied by suburban towns, the price is much higher.

The western two-thirds of the area lies within the Piedmont Plateau province and the eastern third within the Coastal Plain province. The soils of the Piedmont Plateau are derived from the weathering of the underlying rock formations, consisting largely of crystalline rocks, such as schist, gneiss, granite, diorite, diabase, serpentine, and similar formations. In the extreme western part of the area a territory of about 65 square miles is underlain by sedimentary rocks of Triassic age. These include red and gray sandstones and shales and some fine conglomerate.

The crystalline rocks give rise to the soils of the Chester, Manor, Louisa, Iredell, Conowingo, and Montalto series. The consolidated sedimentary rocks of the Piedmont have formed the Penn, Granville, and Lehigh soils.

The Leonardtown, Sassafras, Keyport, Norfolk, Elkton, and Susquehanna soils are derived from the Coastal Plain material, which comprises unconsolidated deposits of gravel, sand, and clay.

The alluvial deposits along the streams constitute soils that are classed with the Huntington, Congaree, Bermudian, and Ochlockonee series, and Tidal marsh.

The Chester loam, with its gray phase, and the Manor loam are by far the most extensive and important soil types of the area. These soils, together with those of the Louisa, Iredell, Conowingo, and Montalto series, are well suited to corn, wheat, hay, and dairy farming. The Huntington, Congaree, Bermudian, and Ochlockonee soils are bottom-land types, well suited to corn and grass and other forage crops.

The Leonardtown, Sassafras, Susquehanna, Keyport, Elkton, and Norfolk soils are fairly well suited to corn, hay, and vegetables.

The soils of the area are quite variable in productiveness, but respond readily to methods of improvement, including the incorporation of organic matter and lime. Dairying, market gardening, poultry raising, and fruit growing, in connection with general farming, could be profitably extended.

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