THE SOILS OF ST. MARY'S COUNTY, MD.

SHOWING THE RELATIONSHIPS OF THE GEOLOGY TO THE SOILS

BY

JAY ALLAN BONSTEEL

A DISSERTATION

SUBMITTED TO THE BOARD OF UNIVERSITY STUDIES OF THE JOHNS HOPKINS UNIVERSITY, IN CONFORMITY WITH THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

JUNE, 1901

BALTIMORE

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U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF SOILS.
MILTON WHITNEY, Chief.

SOIL SURVEY OF ST. MARY COUNTY, MD.

BY

JAY A. BONSTEEL.

[Reprinted from the Report on Field Operations of the Division of Soils for 1900.]

SOIL SURVEY OF ST. MARY COUNTY, MD.

By JAY A. BONSTEEL.

GEOGRAPHY.

St. Mary County comprises about 360 square miles of territory, bounded on the northeast by the Patuxent River, on the east by Chesapeake Bay, on the south and southwest by the Potomac River, and on the west by Wicomico River and Budds Creek. All of these waters except Budds Creek are either salt or brackish, and in the Patuxent and Potomac rivers the tides rise to points far beyond the boundaries of the county. On the north, for a distance of about 25 miles, the boundary separating St. Mary from Charles County is an irregular land line, except along the northeastern portion, where Indian Creek forms the boundary.

St. Margaret, Bullock, St. Catherine, Blackistone, Heron, and St. George islands lie within the limits of the county, since the jurisdiction of Maryland extends to the water's edge along the Virginia shore of the Potomac instead of running only to the middle of the river. The longest streams of St. Mary County, especially in the southern portion, are tributary to the Potomac River and to indenting bays. The chief streams are Chaptico Creek, St. Clements Creek, McIntosh Run, and St. Mary River. None of these streams are navigable.

The southern coast of the county is indented by numerous embayments. Notable among these are Chaptico Bay, St. Clement Bay, Breton Bay, and the estuary and mouth of St. Mary River. The county lies between the parallels of 38° and of 38° 30′ north latitude and between the meridians of 76° 20′ and 76° 55′ west from Greenwich. It is irregular in outline, constituting a large peninsula stretching southeastward between the waters named. The county is the most southern of the Maryland counties occupying the western shore of Chesapeake Bay.

HISTORY.

St. Mary County was the scene of the earliest permanent colonization within the present limits of the State of Maryland, with the exception of a small settlement on Kent Island. In the year 1634 Lord Baltimore's first colonists were sent out, and after touching at Jamestown, Va., they sailed up the Chesapeake Bay to the mouth of

the Potomac River. Proceeding up this stream, they landed on St. Clements (now Blackistone) Island, where Governor Calvert took formal possession of Lord Baltimore's grant. This, the first authorized settlement in the State of Maryland, was made in what is now

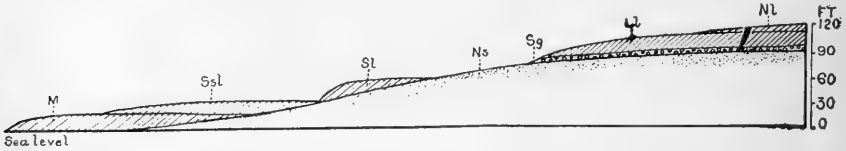

FIG. 13.—Diagrammatic section from upland to tide level, showing outcropping soil formations and terraces: *M*, Meadows; *Ssl*, Sassafras sandy loam; *Sl*, Sassafras loam; *Ns*, Norfolk sand; *Sg*, Susquehanna gravel; *Ll*, Leonardtown loam; *Nl*, Norfolk loam.

St. Mary County. St. Mary City, formerly an Indian village, was the first permanent settlement made, and it was the capital of this colony from the time of its settlement until October, 1694.

PHYSICAL GEOGRAPHY AND GEOLOGY.

St. Mary County lies wholly within the Coastal Plain area of Maryland. It consists of an interior upland division, rising from 90 to 200

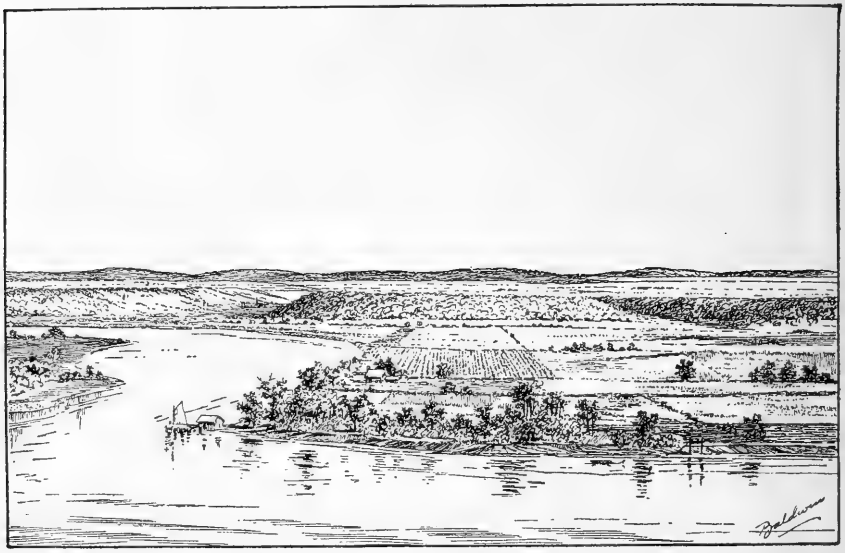

FIG. 14.—Meadow in foreground terrace of Leonardtown loam, with Norfolk loam and Windsor sand in background.

feet above sea level, and of a low-lying foreland border varying from 15 to 45 feet above sea level. The county is very much indented by large estuaries or bays, particularly on the Potomac side. The

streams of any length flow into the Potomac drainage system, while only steep-walled streams of short length are tributary to the Patuxent.

As in Calvert County, the basal skeleton of St. Mary County is built up of unconsolidated strata, only Neocene formations being found in St. Mary. The materials composing these strata are the same as in Calvert County, even in respect to the marl beds. In the same way the later Pleistocene deposits are far more directly concerned in the formation of soil types than are the older strata, and the correlation of soil types with geological formations given in considerable detail for Calvert County also applies to St. Mary. An ideal section showing the arrangement of soils is illustrated in fig. 13.

The chief geological difference between the two counties lies in the fact that in St. Mary the Eocene strata do not reach the surface, while in Calvert they do, and the Nomini formation is much more widely developed in southern St. Mary than in Calvert. The shell marls are the only ones present in large quantities in St. Mary County. Fig. 14 gives an idea of the arrangement and relative position of the principal types of soils.

SOILS.

The soils have approximately the following areas:

Areas of the different soils.

Soils.	Acres.	Per cent.	Soils.	Acres.	Per cent.
Leonardtown loam	95,500	41	Norfolk loam	8,500	4
Meadow	54,200	23	Susquehanna gravel	7,350	3
Norfolk sand	27,500	12	Windsor sand	3,450	2
Sassafras sandy loam	17,500	7	Swamp	2,200	1
Sassafras loam	16,200	7			

NORFOLK LOAM.

Norfolk loam extends as a long narrow strip along the highest portion of the divide between the Patuxent River drainage and that of the Potomac River. It also occupies small, irregular, scattered areas covering the flat plateau of the northern portion of the county.

Along the Three Notch Road, which follows the main divide of the county, the area occupied by the Norfolk loam presents a slightly rolling upland, varying from 120 to 165 feet in elevation. The highest elevations and the intervening hollows are included in the area covered by this soil.

The soil itself consists of a fine sandy to silty loam, reaching to an average depth of about 1 foot. When dry it is powdery and loose,

resembling corn meal in texture, distinctly lacking the smooth, clayey feeling of the finer-grained Leonardtown loam. When wet it packs to a firm surface, which cakes slightly through sun drying. In plowed fields this soil, though distinctly sandy, may clod into large-sized lumps. The subsoil is a reddish yellow sandy loam, finer in texture than the surface soil. It extends to a depth of about 30 inches and is almost universally underlaid by a coarse red sand mixed with fine gravel, having an indefinite depth.

The soil supports a natural growth of pitch pine, white oak and black oak, and chestnut, this latter tree occurring more frequently on this soil than on any other type represented in the county. The areas of Norfolk loam occurring in the northern portion of St. Mary County, particularly in the vicinity of St. Joseph's Church, constitute what is locally recognized as one of the most desirable tobacco soils in the county. The average yield per acre is about 1,300 pounds, and the average price about 6 cents per pound. Wheat, corn, and clover are also raised on this soil in regular rotation with the staple tobacco crop. The yield of these crops on the Norfolk loam compares favorably with the average yield of the same crops over the entire area of the county.

The following analyses show the texture of the soil and subsoil of the Norfolk loam:

Mechanical analyses of Norfolk loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5110	2½ miles W. of Sotterly.	Yellow sandy loam, 0 to 10 inches.	2.09	2.64	10.04	12.43	27.40	12.45	23.50	9.70
5112	1 mile E. of Newmarket.	Yellow sandy loam, 0 to 14 inches.	1.61	Tr.	.53	2.11	36.67	18.66	31.08	9.24
5111	Subsoil of 5110	Medium red sand, 10 to 40 inches.	2.10	2.61	12.46	14.35	31.94	7.78	13.89	14.91
5113	Subsoil of 5112	Red sandy loam, 14 to 30 inches.	2.03	0.00	Tr.	2.38	35.11	19.44	17.32	23.63

LEONARDTOWN LOAM.

The most extensive soil type in St. Mary County is the so-called white-oak or kettle-bottom soil of the upland. It extends from the vicinity of Ridge post office to the extreme northern limit of the county. The surface is slightly rolling or gently sloping, and the

broad, flat divides between the minor streams are covered by this soil. As the soil bears quite a variety of local names, it has seemed best to supplant them all by the name Leonardtown loam.

The extensive forests of white oak and pitch pine occurring over the upland region are found largely on this type of soil. Where small irregular depressions without any outlet are found the sweet gum also flourishes. Where the Leonardtown loam is exposed on slopes to the washing action of rains, scalds or washes frequently form and they rapidly encroach upon the arable land. A permanent sod is the only sure cure for these scars, though brush dams cause a temporary delay in the progress of erosion.

The cultivated areas of Leonardtown loam vary considerably in the

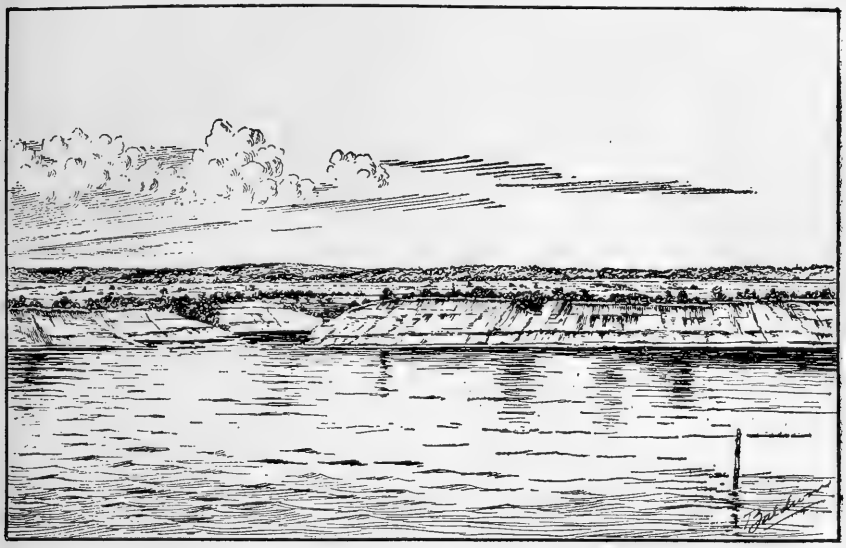

FIG. 15.—Leonardtown loam, with Norfolk loam and Windsor sand in background.

amounts of the various crops produced. Wheat, corn, and grass are best suited to this soil, while tobacco is better adapted to lighter, sandier soils. This soil type forms the nearest approach to the heavy clays of limestone regions that is found in the Coastal Plain of Maryland. A treatment similar to that employed on the limestone soils should increase the productivity of the Leonardtown loam.

The soil consists of a silty yellow loam, fine and powdery when dry, but puddling to a plastic clay-like mass when thoroughly wet. On redrying, this mass usually bakes to a hard, firm surface, or if stirred before being sufficiently dried, it clods up into hard lumps. The subsoil consists of a brittle mass of clay lenses, lumps, and fragments separated from each other by seams and pockets of medium to fine

sand. The subsoil, if evenly mixed, would form a somewhat sandy loam, but its peculiar structure causes it to act like a dense clay in its behavior toward the water circulation. The lenses of clay are slightly flattened and their edges overlap somewhat like the shingles on a roof. Consequently, water in its passage through the subsoil, follows a roundabout course along the sand-coated seams. Its progress downward is thus much delayed, and the subsoil is as impervious and as retentive of moisture as a heavy clay soil. The peculiar structure also gives rise to the brittleness noticed on plowing.

The bright-yellow color of the soil indicates a lack of organic matter. This can be corrected by plowing under green crops and by the application of stable manures. The tendency toward puddling and baking

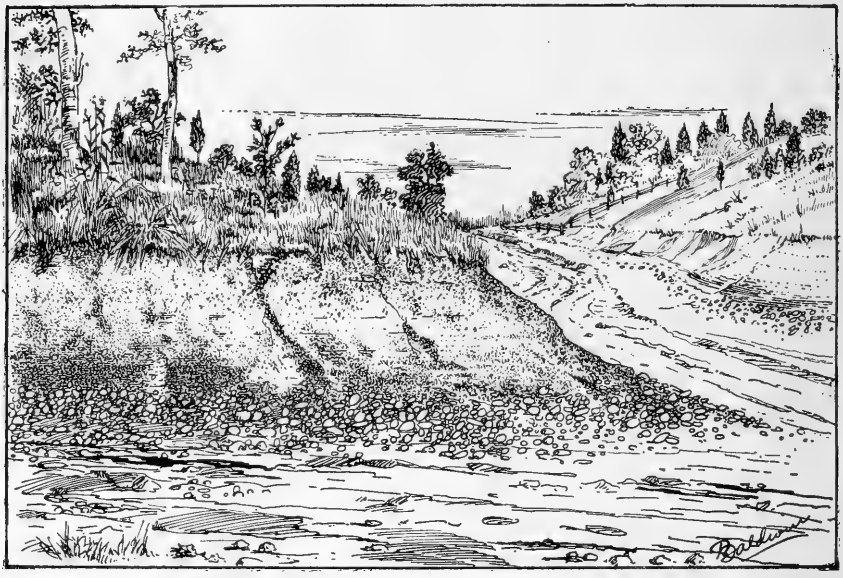

FIG. 16.—Leonardtown loam, with narrow band of Susquehanna gravel overlying Norfolk sand.

may be corrected by the application of lime. Figs. 15 and 16 show something of the general character and position of the Leonardtown loam.

As has been indicated in the comparison of this soil with the residual soils of limestone areas, the Leonardtown loam is a type best adapted to the production of grass and grain crops, and certain portions of the area found in St. Mary County are at present producing good hay and grain crops. The gradual introduction of live stock should largely increase the producing capacity of this soil, since the crops best suited to the soil can be fed directly to cattle. The saving in the fertilizer bill in this connection is an important item in farm economics.

The following analyses show the texture of the Leonardtown loam soil and subsoil:

Mechanical analyses of Leonardtown loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5114	3 miles W. of Leonardtown.	Yellow silty loam, 0 to 12 inches.	2.41	Tr.	.89	1.33	5.09	11.37	58.26	19.90
5116	1 mile S. of Loveville.	Yellow silty loam, 0 to 12 inches.	2.24	0.00	Tr.	3.16	17.62	18.76	47.75	9.69
5118	4½ miles E. of Leonardtown.	Yellow silty loam, 0 to 10 inches.	2.97	Tr.	1.38	1.91	3.87	21.90	58.46	10.06
5127	2 miles SW. of Newmarket.	Yellow silty loam, 0 to 9 inches.	2.11	Tr.	3.05	4.19	9.79	16.54	55.70	8.03
5115	Subsoil of 5114	Yellow loam, 12 to 34 inches.	1.96	Tr.	.76	1.19	5.26	13.92	55.02	21.94
5117	Subsoil of 5116	Yellow loam, 12 to 30 inches.	3.07	0.00	Tr.	3.28	9.08	11.96	49.24	22.59
5119	Subsoil of 5118	Yellow loam, 10 to 30 inches.	2.44	.67	1.24	1.83	4.63	15.46	53.39	20.37
5128	Subsoil of 5127	Yellow loam, 9 to 30 inches.	1.56	2.22	4.78	8.49	15.97	10.77	36.42	19.20

SUSQUEHANNA GRAVEL.

The layer of gravel which almost uniformly underlies the upland soil types, particularly the Leonardtown loam, reaches the surface along all the more deeply cut stream valleys and along the slopes separating the upland from the low-lying foreland border. The gravel works down across the slopes wherever it reaches the surface, and forms long, narrow bands of a distinctly gravelly soil. While of no great importance either in area or in agricultural value, it forms a marked feature of the land surface. In some instances the component materials are coarse enough to form stony bands and patches along the slopes. In other cases the finer gravel accumulates sufficiently to form small areas of poor or almost useless soil. This is the case on some of the smaller hills of the northeastern part of the county, where broken fragments of iron crust mingle with the gravel and sands.

Grapes are cultivated to advantage on similar soils in other regions, and their adaptability to this soil should be tried on a small scale in St. Mary County. In general, it would be better to allow forest growths to occupy the larger, more intractable areas.

The proportion of gravel in some of these areas is as high as 50 per cent, and with so coarse a texture it becomes almost impossible to maintain a sufficient supply of moisture to mature any long-growing crop. This is especially the case where the gravel areas lie on steeply sloping surfaces.

WINDSOR SAND.

The Windsor sand areas are found only in the northern portion of St. Mary County. They are marked by a strong growth of pitch pine and by the gravelly and sandy texture of the soil. At present these areas are imperfectly tilled to tobacco and grain crops, or occupied by small land holdings devoted to producing garden crops for household consumption.

The soil consists of a coarse to medium sand, containing considerable gravel. It extends to about 10 inches in depth, and is underlaid by an even coarser sandy and gravelly subsoil, frequently containing iron crusts in sheets and in broken fragments.

The value and capabilities of this soil have not been recognized as yet in this region. Its coarseness of texture, while precluding the profitable cultivation of grain crops, adapts it especially to the culture of early truck crops and peaches. The latter crop when raised on the Windsor sand produces a superior quality of fruit both in color and taste, and the orchards found on this soil in other localities are long lived, healthy, and profitable.

The Windsor sand areas of St. Mary County are all located within easy hauling distance of the present railroad points, and special crops of early fruits, vegetables, and peaches could find an easy and profitable market in the cities on connecting lines.

The surface of the Windsor sand is generally level and is little subject to washing on account of the porosity of the soil. It is easily cultivated and easily improved, and should form a valuable type for the special crops already discussed.

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

Mechanical analyses of Windsor sand.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5129	Newmarket	Coarse sand, 0 to 9 inches.	1.43	5.48	14.29	14.04	38.63	15.16	8.10	2.76
5130	Subsoil of 5129	Sand, gravel, and iron crust, 9 to 28 inches.	1.02	10.20	20.92	12.18	29.30	11.58	10.99	3.81

NORFOLK SAND.

The Norfolk sand illustrates the fact that a single soil type may arise from materials deposited at different geological periods. In St. Mary County, soil of this type is found along the sloping sides of

streams as an outcrop of some of the basal formations of the county; again it occurs along the lower courses of these streams as flat-topped terraces built up from the older material by river transportation; while small areas of it occur along the forelands as material carried still farther seaward. All these deposits present the same sandy nature and form the same general type of soil, but they vary greatly in geological age.

Along the shallow stream channels of the forest area of the county narrow borders of this sandy soil are frequent. In the northern part of the county the streams have also cut into the sandy layer, which is the original source of this material. The covering of other materials has been washed away and considerable areas of Norfolk sand are exposed. Wherever found, this soil is recognized as well adapted to the Maryland type of tobacco, and it shares with the Norfolk loam in the reputation of producing a good grade and a reasonable quantity of the crop.

The soil consists of a red or brown sandy loam, having a depth of about 9 inches. This is underlaid by an orange or red sand to a depth of 3 feet or more. The natural growth on this soil includes chestnut, oak, and laurel. The Norfolk sand is a typical early truck soil, and has been very successfully farmed in truck crops all along the Atlantic coast. It produces a quick growth and early maturity, and is therefore much better adapted to the trucking business than to the production of grain crops, which require a longer growing season. Peaches, pears, early potatoes, and the common garden vegetables should be raised much more extensively than at present upon this soil whenever transportation facilities permit of marketing. The wild fruits like the blackberry, which flourish so remarkably on this soil, should be replaced by the cultivated varieties of the same fruits.

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

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5133	4 miles E. of Leonardtown.	Fine yellow sand, 0 to 14 inches.	1.44	Tr.	2.74	7.38	38.57	21.77	22.37	4.82
5135	1¾ miles SW. of Hillville.	Medium yellow sand, 0 to 10 inches.	1.36	1.94	8.74	13.60	34.69	18.76	15.89	4.87
5134	Subsoil of 5133....	Medium red sand, 14 to 36 inches.	1.72	Tr.	2.31	5.88	34.91	20.66	22.52	11.96
5136	Subsoil of 5135....	Red sand and gravel, 10 to 28 inches.	2.00	4.30	12.65	13.69	31.22	10.10	10.12	15.23

SASSAFRAS LOAM.

This soil type occurs in St. Mary County at an elevation of from 60 to 90 feet above tide in the form of flat-topped terraces. It is generally completely cleared and well cultivated. It forms the best corn producing soils of this and other areas and is well fitted for general farming purposes. It is formed from a mixture of sand and clay derived from much older strata and reworked and redeposited by stream action.

The soil consists of a slightly sandy yellow or brown loam, having a depth of from 8 to 12 inches. This is underlaid by a heavier yellow loam to a depth of nearly 3 feet. This subsoil forms a good storage reservoir to maintain a moisture supply during the growing season without retaining enough water to interfere with cultivation or plant growth. Wheat, corn, and the grasses do well on this soil, while a fair tobacco crop can be raised on it; but it approaches more nearly to an easily worked medium grade of soil for general farming purposes. Pears and other fruits, together with tomatoes, asparagus, and canning crops should be introduced to give a greater variety in crops with increased opportunities for profits.

The use of lime and of green manures and stable manures will benefit this soil, though not so essential as in the case of heavier types.

The following table gives the mechanical analyses of Sassafras loam:

Mechanical analyses of Sassafras loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5137	1½ mile W. of Sotterly.	Yellow silty loam, 0 to 9 inches.	2.22	1.21	4.51	4.57	14.94	13.26	49.87	9.45
5139	1 mile S. of Great Mills.	Yellow silty loam, 0 to 9 inches.	2.43	1.02	3.12	4.53	13.35	13.14	49.68	12.80
5138	Subsoil of 5137	Yellow sandy loam, 9 to 30 inches.	1.87	.84	4.51	5.79	22.62	10.54	33.84	19.61
5140	Subsoil of 5139.	Heavy yellow loam, 9 to 30 inches.	2.17	Tr.	2.45	4.02	13.72	12.63	50.56	14.16

SASSAFRAS SANDY LOAM.

Sassafras sandy loam occupies the low-lying forelands along the Patuxent and Potomac rivers and along the shores of the numerous estuaries and creeks tributary to those rivers. In fact, this soil formation extends as a discontinuous belt of choice farm land almost entirely encircling the county.

Lying between the more elevated uplands and the tide-water courses

of the chief rivers of the section, the Sassafras sandy loam slopes gently down from an elevation of about 35 feet nearly to water level, and presents a very nearly flat, though gently inclined, surface. Areas located on adjacent forelands are usually separated from each other by lower-lying strips of meadow lands located along the margins of the minor streams. To the rear of each area the surface usually rises with quite a steep slope to the more elevated plateau region.

The soil itself is probably a stream deposit, laid down at a time when the relative level of tide water in this region was at least 40 feet higher than at present, though the plateau portion of the county existed as dry land even then. The deposition of material derived from the upland by the streams of that day took place closely adjacent to the land area which existed there, and the coarser sands were deposited in those stream courses as noted elsewhere. The finer sand and silt, carried to a greater distance seaward because of the lightness of individual grains, were deposited in the region of tide water, with the coarser materials falling in shallower water near shore, as is the case with the present deposition in all regions. Thus, small sandbars and spits would be formed, and organic matter from the mainland and from the tidal flats usual along low shore lines would be commingled with the sand and silt of the bottoms of the estuaries. In such a manner the sandy loams of this foreland portion of the county most probably originated. As the relative elevation of land and sea changed, this new-formed soil became exposed, and encroaching land vegetation further aided in the preparation of the loam for agricultural purposes.

The soil is a dark-brown sandy loam, having an average depth of about 14 inches. The subsoil is heavier, in most instances consisting of a yellow or reddish-yellow sandy loam. At 30 inches depth the subsoil is normally succeeded by a reddish sand, though frequently this is wanting and a silty drab layer is found, which extends nearly or quite to tide level.

This soil is so well recognized as a desirable farming land that all original tree growth has been removed and the area is occupied by cultivated fields. Corn, wheat, and tobacco are raised on the Sassafras sandy loam, and the yield of each is somewhat higher than the average yield for the county. The average wheat crop will consist of about 15 bushels per acre; that of corn about 7 barrels, or 35 bushels; while the tobacco will grow to 1,600 pounds per acre, and will sell at 5 or 6 cents per pound. Of course, much larger crops are raised under favorable conditions, while unfavorable conditions of season or culture will correspondingly cause a decrease in yield.

In the Cedar Point area the production of green peas, tomatoes, and of sweet corn for canning purposes has been undertaken. The climatic and soil conditions are favorable to profitable production of these and other crops classed as truck or canning crops. Along the

Patuxent River, near Forrest Wharf, the culture of broom corn is being undertaken. The success of this attempt has not been learned.

Owing to the location of this soil along the shore near shipping points, as well as to its texture and general properties, it is well adapted to the raising of fruits, vegetables, and general truck crops which derive value from being placed on an early market. Its position also makes irrigation possible whenever the necessity for intensified cultivation shall manifest itself in this community.

The general character of the Sassafras sandy loam is indicated by the following mechanical analyses. It is noticeable that the subsoil in each case contains quite a large percentage more of clay than does the corresponding soil.

Mechanical analyses of Sassafras sandy loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct*	*P. ct.*
5141	1¼ miles SE. of Stone Wharf.	Brown sandy loam, 0 to 16 inches.	2.55	Tr.	1.56	4.30	34.34	11.86	36.62	8.36
5144	2½ miles S. of Leonardtown.	Brown sandy loam, 0 to 9 inches.	2.22	1.72	10.83	18.96	19.85	6.44	31.94	8.56
5147	1¾ miles NE. of Trap.	Brown sandy loam, 0 to 8 inches.	3.50	3.49	12.30	9.40	5.88	10.16	48.62	6.24
5149	¼ mile NE. of Cohouck Point.	Brown sandy loam, 0 to 12 inches.	2.93	4.87	17.49	11.83	11.08	9.82	30.59	11.55
5142	Subsoil of 5141	Heavy brown loam, 16 to 34 inches.	1.66	.75	2.67	6.79	45.80	5.87	17.06	19.30
5145	Subsoil of 5144	Red loam, 9 to 30 inches.	2.53	1.58	12.36	18.69	15.99	4.62	30.43	12.80
5148	Subsoil of 5147	Yellow loam, 8 to 30 inches.	2.71	.99	7.03	6.15	3.76	11.20	51.80	16.48
5150	Subsoil of 5149	Yellow sandy loam, 12 to 30 inches.	2.15	2.98	13.72	12.18	9.74	8.78	26.13	24.20

MEADOW.

The natural meadow lands of St. Mary County are usually flat or gently inclined areas occurring along stream courses or on the low flat forelands bordering the tide-water areas. The meadows are usually rather wet, and in many instances they differ from adjoining soil types in their relation to drainage rather than in their texture.

The natural forest growth over the meadows includes white oak, willow oak, sweetgum, and poplar, with frequently a matted undergrowth of shrubs and vines. The meadows furnish a rather coarse, rank grass for grazing and, owing to the mild climate of the region, cattle frequently find pasturage throughout the winter.

The large meadow areas of the forelands are frequently cultivated to the general farm crops, but in wet seasons they are difficult of tillage, and even in the most favorable seasons they produce only wheat

and grass to good advantage. They require extensive underdrainage; even open ditches are inadequate, for the soil is so dense and so near water level that surface drainage fails to lower the level of standing water sufficiently to aerate the soil thoroughly. The presence of excessive water in the soil thus tends to keep the ground cold and to delay seed germination and plant growth. Then, too, the organic acids tend to accumulate to excess, proving harmful to plant life and not fulfilling their function in the preparation of mineral matter to serve as plant food.

Proper underdrainage by lowering the water level will not only drain off surplus moisture, but will also permit a circulation of air, and thus aid in the natural improvement of the soil.

Many thousand acres of meadow land, now producing only a rank growth of grass or an uncertain crop of grain, can be made highly valuable by relatively cheap methods of underdrainage.

The soil of the meadow areas usually consists of 8 to 10 inches of gray silty loam underlaid by a subsoil of ash-gray clay loam. The soil mass is apt to be cohesive and clay-like when wet, but when subjected to the action of the frost and air it becomes powdery and crumbly, and is very much improved in texture. Drainage and liming should be resorted to in order to produce this result on a large scale.

The texture of this soil is shown by the following analyses:

Mechanical analyses of meadow.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5151	2 miles SE. of Briscoe Wharf.	Gray loam, 0 to 8 inches.	1.84	Tr.	0.88	0.83	3.76	23.35	59.59	9.58
5153	One-eighth mile W. of Short Point.	Brown silty loam, 6 to 7 inches.	2.32	1.41	3.33	4.12	6.46	15.41	58.54	8.32
5152	Subsoil of 5151	Drab clay, 8 to 30 inches.	2.89	0.00	Tr.	1.73	5.38	16.30	47.55	25.77
5154	Subsoil of 5153	Drab clay, 7 to 32 inches.	1.61	Tr.	2.01	2.61	7.11	11.40	60.11	14.74

SWAMP.

There are three types of swamp lands in St. Mary County—the tidal flats, which are wholly or partially submerged at each high tide; the fresh-water marshes, subject to frequent or constant inundation by streams; and the fresh-water bogs and swamps, due to incomplete head-water drainage or to natural or accidental artificial ponding back of stream waters.

The salt marsh at the head of Chaptico Bay and the flats at the head

of Breton Bay are the most extensive examples of the first class occurring in St. Mary County. Except at especially high spring tides these areas lie about 5 feet above the water level. They support a growth of marsh grass and reeds and possess a silty soil mixed with partially decayed vegetation. Some marsh hay is cut over these areas, and cattle and hogs find pasture where the surface is sufficiently firm to support their weight.

These marshy areas are formed by the deposition of fine sand, silt, and clay, brought down by streams and by the higher tides, together with the decaying remains of the vegetation which gains a foothold on the drier areas. These marshes are constantly growing in extent, and in many instances cattle are feeding on marshy meadows where small-sized boats floated in the early days of the colonization of the county. Farther from the mouths of the larger tributary streams, above the highest reach of the tide, the fresh-water marshes occur, as is the case along the Chaptico Creek, McIntosh Run, and many of the streams flowing into the Patuxent River. These marshes are similar to the salt marshes, except that they are only subject to irregularly occurring inundations below fresh water instead of periodic submersion by the tides.

The third class of swamps occupies positions at the heads of some of the main streams and along the upper courses of the majority of the smaller ones. The head waters of the St. Mary River drainage, found in the forest area around St. Andrew's Church, illustrate this condition markedly, though many other localities are very similar.

The surface in this forest area is slightly irregular and consists of Leonardtown loam and Norfolk sand. The hollows in both of these formations are swampy and grown up to gum trees. In wet seasons small ponds exist, which become dry, or nearly so, during the latter part of each summer. A slight clearing out of the natural drainage ways, connecting these ponds with stream courses, would destroy the ponds in most cases. Frequently the obstruction to drainage consists of a rank growth of vegetation, fallen tree trunks, and the accumulation of dead leaves and soil wash. In some few cases the grading up of highways or embankments constructed for proposed railways through the county has caused accidental artificial ponding of waters. These are of small extent and may be easily remedied by underdrainage.

CONDITIONS OF AGRICULTURE.

The condition of agriculture in any community depends upon four factors—soil, climate, transportation facilities, and the mental and physical energy of the population. The first two of these factors are natural, while the last two are to a great degree artificial. Usually it does not lie within the power of any community, however energetic, to modify the soils or the climate of a region to any marked extent. The great exception to this statement is in the arid States,

where irrigation has been introduced, transforming desert areas into fertile farms.

The actual conditions of the soil, the climate, and the transportation facilities of St. Mary County have been treated separately in other chapters, but a general resumé of the interrelationships of these factors and a slight reference to certain social and economic conditions prevailing in the county are necessary to a full appreciation of the present status of the county by its own inhabitants as well as by strangers.

The usual farm practice in St. Mary County is based on a rotation of crops, including tobacco, corn, wheat, and grass, or a season of fallowing. This rotation is observed on all soils in all parts of the county, though some individual farmers have modified it. Thus, in a great majority of cases, the fundamental factor of soil differences is neglected. The success of the rotation in the county has depended upon the highly accidental factors of the location of the farm and the energy of the farmer. Thus, the energetic man located on the proper soil for the tobacco crop will be highly successful, while his no less energetic neighbor located on the wrong soil may be unsuccessful, and the unenergetic man may absolutely fail.

The natural selection of farm lands dependent upon these conditions has led to the abandonment of large areas of the Leonardtown loam to forest occupation, for the soil is not adapted to the culture of the quality of tobacco which buyers expect from the county. On the other hand, the Norfolk loam is tilled over almost every acre of its extent, because it is adapted to the production of this chief crop.

In the same way natural selection has led to the extensive cultivation of the Sassafras sandy loam, and it is worthy of notice that the very first white settlers, as well as their Indian predecessors, located on this soil type chiefly because of its location near water transportation, but also probably in part because it is an excellent soil for general farming purposes. Contrasted with this soil are the large areas of meadow land still clothed with forest growth, though similarly located to the Sassafras sand loam. It is not entirely an accident that leads to these selections and to the introduction of new crops, such as peaches, on the Norfolk sand, or to the cultivation of canning crops and broom corn on Sassafras sandy loam. The climate of the region is suited to the crops, the soils are similar to those upon which the crops have been raised elsewhere, the facilities for transportation are in part equal to the necessities of the crops, while the energy required for their introduction is supplied by well-informed and progressive citizens of the county and of other regions.

A local and partly defined soil classification has been reached through this process of selection, though the areas suited to certain crops have not been located nor mapped over any part of the county until the present time. Nevertheless experience, often bought at a

dear price and confined to the few who have ventured their money and their time, has led to the partial classification already noted. It is hoped that the classification, the map, and the description of soil types contained in this report will facilitate further development along the lines of soil selection for special crops, will encourage the introduction of new crops, and will lead to a generalization of the experience gained by the few for the use of the many.

Closely associated with the adaptability of certain soil types to certain crops is the two-edged question of fertilizer, which is dependent for its answer upon the quality of soil to be fertilized and the kind of crop to be raised.

Probably every soil type in St. Mary County contains within 4 feet of its surface sufficient plant food to produce 100 crops of any kind which are raised or could be raised in the county. The necessity for fertilizer depends on the fact that much of this material is present in such chemical combinations and in such a physical state that some manipulation is required to release it and to bring it into solution in water so that the plant roots may absorb it. Certain chemicals found in commercial fertilizers and in stable manures tend to release this plant food and to form or supply soluble chemical compounds suited to the needs of the plants, while organic matter constitutes the best sponge for retaining the absolutely essential water supply in sandy soils, and acts equally well in loosening the too closely packed particles of heavier clay soils. The organic matter, through its decay, also furnishes actual plant foods and solvents for the preparation of other foods. The character of growth desired in special crops modifies the kind and amount of special fertilizers for those crops. For example, it is a generally accepted principle of tobacco culture in Maryland that liming land spoils the texture of the tobacco raised, causing it to spot and injuring the burning qualities for which it is so well known; therefore the use of lime on tobacco lands is precluded, though its use would be of undoubted advantage on all of the heavier soil types and upon most of the lighter types for other crops.

St. Mary County possesses large stores of carbonate of lime in the Neocene marl beds underlying all of the upland portion of the county and reaching the surface in nearly every cliff and stream cutting over the upper half of the region. This lime supply consists of the calcareous shells of marine shellfish which once lived upon the sea bottom when the ocean covered the county. The shells, buried in sand and elevated above water level, can be dug out by the wagonload and converted into excellent lime by sieving out the sand and burning the remaining shells, just as lime rock is burned to lime. The sifting would be unnecessary in the case of some of the deposits, since the small amount of sand present would be a benefit to the heavier types of land. The Leonardtown loam would benefit materially from such liming, except, of course, when tobacco is to be raised.

The plowing under of green crops, especially the leguminous plants

of the clover and cowpea varieties, furnishes another method of enrichment highly desirable on almost all the soil types of St. Mary County, and does not present the difficulties of liming, since this kind of fertilizer is of great benefit to the tobacco crop. These leguminous crops furnish a fair forage for cattle during a period of their growth, and if allowed to continue growing they produce a mass of organic matter for incorporation with the soil; and all the time, beneath the surface of the ground, certain minute bacteria, living on the roots, are taking nitrogen from the air and storing it in the soil, thus helping in the enrichment of the soil.

The ordinary practice of putting from 200 to 400 pounds of commercial fertilizer, costing from $18 to $40 per ton, upon the farms of St. Mary County has a double effect. It produces the crop, but it also enters a large item on the expense side of the farm account, and on some soils its continued use has the effect of burning out the soil, so that periods of fallowing become essential. For certain crops special fertilizers will always be necessary, and commercial fertilizers are to be commended highly, but in St. Mary County on all soils the use of stable manure and the plowing under of green crops are to be preferred, while on the soils least suited to tobacco the abandonment of that crop and the free use of lime in conjunction with organic matter have already become necessary, as is shown by the forest areas given over to nature's cultivation.

Many of the farm buildings of St. Mary County are of remote date. The farmhouses particularly are types of colonial structure, and the residence upon the farm at Sotterly is one built for the first governor of Maryland, while numerous other manor houses in the county are nearly as venerable. Even the less pretentious houses display the long sloping roofs, the gable windows, and the large end chimneys of the early colonial period. The atmosphere of antiquity, of romance, and of historic interest which surrounds these old residences and the equally venerable churches and farm properties gives a local color and a local pride to the county that can be shared only by other communities of equal age.

Outbuildings are not so essential in this climate as in regions of heavier snowfall, so the older farms are provided only with the tobacco barn, smokehouse, and corncrib of the plantation, the large stock and hay barns being almost totally unknown. Cattle can graze upon the meadow lands in all but exceptionally severe weather, and the side of some existing building or the shelter of woodland protects them during the coldest weather.

The fences are mostly built of rails and poles cut in the native forests, though some barbed and other patent wire fences have been introduced. The Virginia rail or worm fence is the most common type, while the mortised post, into which the ends of the rails are fitted, is also common.

No account of the condition of agriculture in St. Mary County would

be complete without a reference to the common draft vehicle and beast. Owing to the steepness of the grades and to the general difficulties attending land transportation, the ox cart is usually employed for heavy hauling. It is no uncommon thing toward the latter part of June to meet from one to twenty 4-ox or 6-ox teams attached to heavy 2-wheeled carts, upon which one or two tobacco hogsheads are being drawn to the wharves for shipment. Each hogshead constitutes an unwieldy mass of about 800 pounds of tightly packed tobacco, and the successful transportation of some of these loads down the steep slopes from the upland to the wharf, under the existing road conditions, is no small feat of engineering.

The field labor is largely performed by the numerous colored population of the county, some of whom labored as slaves on the same farms where they now work as free men. The majority of the workers, however, belong to a more recent generation.

The wants of these workmen are few (a cabin, a garden patch, and the most elementary house furnishings), the forest lands giving free grazing to the cow, the horse, and the pig of the landowner, the tenant, and the day laborer alike. Added to these conditions are a mild climate and usually a free supply of firewood, together with fish and oysters from near-by waters. As a result, a fair subsistence is easily obtained with a minimum of labor, especially as the colored laborers and their families are free partakers, through the generosity of their white employers, in the partly worn clothing and in the surplus provisions of their white employers. So while the actual cash wages will average only 50 or 75 cents per day, this sum will have a purchasing and sustaining power far in excess of the same amount in the more thickly settled and colder regions of the North. Men, women, and even children work in the fields together, particularly in caring for the tobacco crop, which requires a large amount of hand labor for setting the plants, hoeing, curing, and stripping.

Some of the colored men own their own farms, but the majority find a more congenial employment in the less exacting task of devoting most of their time to caring for the crops of others. The limited capital they can usually accumulate confines the colored farmers to what are generally considered as rather undesirable farm lands, most frequently Leonardtown loam, meadow, or Windsor sand areas. A change in crop production and farm practice will some day make these lands equal in value to others more desired at present.

There are no large towns in St. Mary County. Leonardtown, the county seat, is the largest, while Mechanicsville, at the terminus of the railroad, does a thriving business, and Charlotte Hall is the seat of a well-known school of the same name.

The tendency of the white population is toward the enjoyment of the seclusion of large estates, and frequently the manor house or farmhouse is reached only by a long avenue leading away to a distance of nearly a mile from the public highway. On the other hand, the col-

ored population segregates into little communities, where land may be obtained cheaply, and little villages of frame and log dwellings are dotted over the county.

TRANSPORTATION.

A single line of railway, connecting Mechanicsville with a main line at Brandywine, is the only rail communication in St. Mary County with the markets and cities of the State and with the country at large. This lack of railroad communication is partly relieved by the steamboat service on the Patuxent and Potomac rivers and on the larger streams. As two lines connecting with Baltimore and Washington control the water transportation, this can scarcely be said to equal the needs of the county. The boats run only at long intervals and at rather irregular times, and the trip to Baltimore or Washington consumes from sixteen to twenty-four hours, depending upon the volume of freight carried.

For this reason the crops produced in the county are placed at a disadvantage with relation to markets when compared with those of other regions, and the variety of crops that can be raised with profit is considerably restricted. This is particularly evident in the case of fruit and truck crops and of dairy products. The truck lands of St. Mary County are excellent, so far as soil and climate are concerned, but no one cares to enter into their cultivation to any extent so long as the cost and uncertainties of marketing remain as great as at present. Again, the Leonardtown loam, the Sassafras loam, and the meadow lands are well adapted to dairying and to stock raising, but the time distance from markets and the actual uncertainty of any communication during winter months retard or prevent introduction of stock.

The waterways for extensive steamboat communication exist, grades well adapted for railway construction are to be found, and the construction of the roadbed presents only the simple engineering problem of cut and fill, with no consolidated rock formations to require blasting. The soils, the climate, and the natural advantages of geographical location all favor the upbuilding of the county. It is likely that outside influences have combined with a well-defined conservatism in the native population to retard the development not only of this but of other localities in the general region.

The internal communications of the county consist of highly varied wagon roads. The main roads follow the main divides, while public and private roadways lead out along the secondary divides and down to the lowland farms and to the wharves. Bridges are scarce, and the small streams are crossed by fords. The tide-water indentations along the coast and the marshes at their headward extremities separate the farms along the forelands, and it is possible to go only from one foreland to another by considerable detour inland, usually including a steep ascent to the upland and an equally steep descent to the adjoining foreland. Foot passengers can usually find a small boat to

transfer them across such obstacles, and many of the farmers own sailboats, but regular ferries do not exist. There is no regular ferry or bridge across the Patuxent terminating in St. Mary County.

The wagon roads consist of sand, loam, or clay, as they happen to cross such materials, and the rain wash and the wear of travel have cut the roads down for long distances far below the surface of the country. In many places where the roadway has been washed to a state of impassability teams have driven around the gully and established a new highway, or an overturned tree is avoided similarly. One road district in particular has secured fairly good roads partly through the energy of its supervisor, partly because additional contributions above the annual tax have been given by residents of the district, and partly because the district contains better road materials than some others. The iron-stained gravels of the upland plateau should be used to a greater extent in surfacing its clay roads, but proper drainage and grading of most of the roads must precede any other work.

CLIMATE.

The following table of the climatic elements, compiled from the Maryland Weather Service, Vol. I, gives an indication of the average conditions to be expected in St. Mary County. No records for less than five years are considered, and consequently a few blanks remain in the table.

Average climatic conditions of St. Mary County.

CHARLOTTE HALL.

Month.	Normal monthly and annual temperature.	Normal maximum temperature.	Greatest departure above.	Greatest departure below.	Normal minimum temperature.	Greatest departure above.	Greatest departure below.	Mean daily range.	Highest recorded temperature.	Lowest recorded temperature.	Mean monthly and annual precipitation.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	In.
January	35	43	+ 4	— 4	26	+ 4	— 4	17	66	— 1	2.8
February	35	44	+ 4	— 9	24	+ 3	—10	20	70	.....	3.2
March	45	55	+ 5	— 8	34	+ 4	— 6	21	83	0	3.1
April	54	65	+ 5	- 3	43	+ 2	— 3	22	97	25	3.5
May	.....	.....	.....	.....	.....	.....	.....	.....	95	37	3.9
June	73	84	+ 3	— 5	62	+ 2	— 2	22	100	41	2.5
July	76	86	+ 3	— 2	65	+ 2	— 4	20	102	49	4.0
August	76	87	+ 3	— 4	65	+ 2	— 1	22	99	52	2.5
September	.....	.....	.....	.....	.....	.....	.....	.....	100	40	1.3
October	56	66	+ 2	— 2	46	+ 4	— 8	20	88	23	3.7
November	47	56	+ 8	— 4	38	+ 6	— 2	18	78	18	2.1
December	38	49	+ 1	- 3	29	+ 3	— 2	20	70	5	2.0
Annual	.....	.....	.....	.....	.....	.....	.....	.....	102	— 1	34.4

The last killing frosts in the spring have occurred at Charlotte Hall on April 21, 1897, and on April 6, 1898.

The first killing frosts in the fall have occurred at Charlotte Hall on November 13, 1897, with no record in 1898.

Average climatic conditions of St. Mary County—Continued.

CHERRYFIELDS.

Month.	Mean monthly and annual temperature.	Mean monthly and annual precipitation.	Month.	Mean monthly and annual temperature.	Mean monthly and annual precipitation.
	° *F.*	*Inches.*		° *F.*	*Inches.*
January	35	1.9	August	75	3.4
February	34	3.5	September	71	2.2
March	44	3.3	October	58	3.8
April	53	3.0	November	47	3.2
May	64	4.3	December	38	2.5
June	73	2.7	Annual	56	39.9
July	76	6.0			

ST. MARY.

January	35		August		
February	37		September	71	
March	43		October	58	
April	55		November	47	
May	62		December	39	
June	73		Annual		
July	76				

ST. INIGOES.

January	38	2.5	August	76	6.5
February	43	4.1	September	69	4.8
March	44	4.9	October	59	3.7
April	55	4.2	November	50	3.4
May	65	4.3	December	40	3.4
June	74	2.1	Annual	58	47.6
July	79	3.7			

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LIFE.

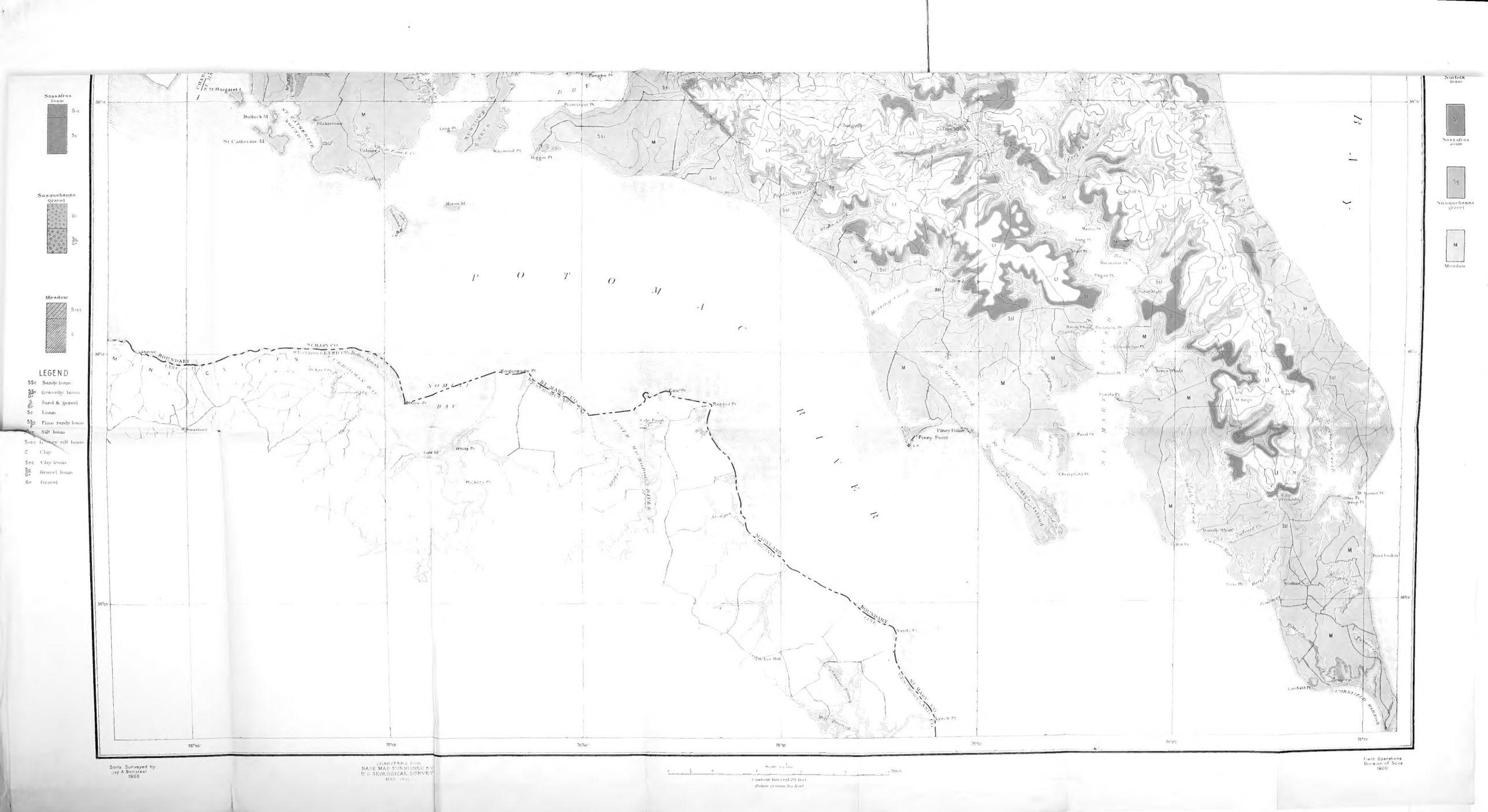
Jay Allan Bonsteel was born in Huntington, West Virginia, on April 13, 1873; removed to New York State in 1876; was educated in the common schools of that State; graduated from Ten Broeck Free Academy, Franklinville, New York, in June, 1890, and in June, 1891, secured a State scholarship in Cornell University. Mr. Bonsteel was graduated from Cornell University in June, 1896, with the degree of Bachelor of Science, securing Special Mention for work in the Geological Department and holding the position of Assistant in Geology from September, 1895, until June, 1898. During the summer of 1896 he accompanied the Cornell Greenland Expedition to the Upper Nugsuak Peninsula; was married in December of that year. From 1896 to 1898 a portion of his time was devoted to post-graduate work in the Geological Department of Cornell University. In July, 1898, he became connected with the Maryland Geological Survey and in September was matriculated at Johns Hopkins University. Mr. Bonsteel was appointed to a position in the United States Department of Agriculture, Bureau of Soils, on May 1, 1900, and has been employed upon field work for the Department, chiefly within the State of Maryland.

U S DEPT OF AGRICULTURE
DIVISION OF SOILS
MILTON WHITNEY, CHIEF

SOIL MAP
MARYLAND
ST MARY'S SHEET

MARYLAND GEOLOGICAL SURVEY
WM BULLOCK CLARK, DIRECTOR

MARYLAND AGRICULTURAL
EXPERIMENT STATION
H J PATTERSON, DIRECTOR


Sassafras loam
Susquehanna gravel
Meadow
LEGEND
SSc Sandy loam
SSgr Gravelly loam
Sgr Sand & gravel
Sc Loam
SSc Fine sandy loam
Slc Silt loam
Slcc Heavy silt loam
C Clay
Scc Clay loam
SLgr Gravel loam
Gr Gravel
Norfolk loam
Sassafras loam
Susquehanna gravel
Meadow
POTOMAC
RIVER
BAY
ST MARYS CO
CHARLES CO
Piney Point
Point Lookout
Scale 1:62,500
Contour Interval 20 feet
Datum is mean Sea level
Soils Surveyed by Jay A Bonasteel 1900
Field Operations Division of Soils 1900