

SOIL SURVEY OF THE CRYSTALSPPRINGS AREA, MISSISSIPPI.

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LOCATION AND BOUNDARIES OF THE AREA.

The Crystalsprings area is located in the northeast part of Copiah County and the northwest part of Simpson County, Miss. The greater portion of the area lies in Copiah County, and includes most of the famous Crystalsprings trucking district.

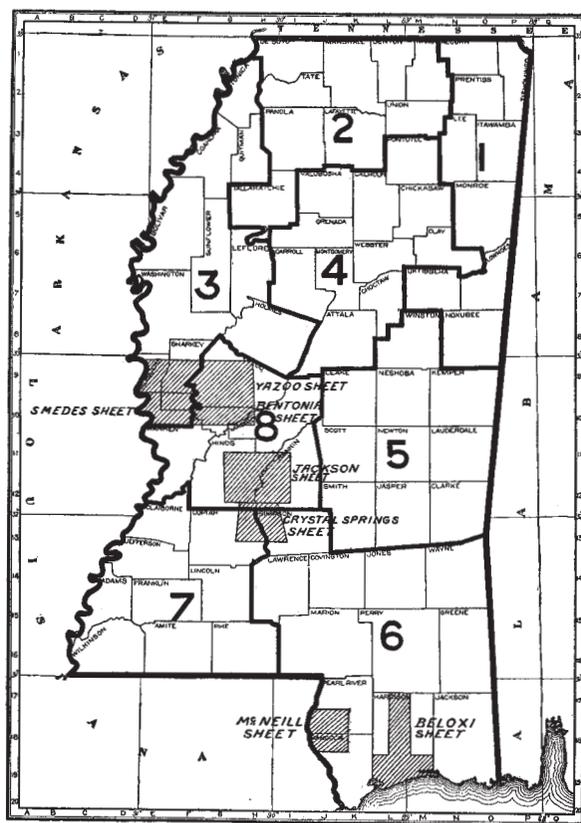


FIG. 19.—Sketch map showing location of the Crystalsprings area, Mississippi.

The area is about 150 miles north of New Orleans, and approximately 770 miles south of Chicago. It is traversed from north to south by the Illinois Central Railroad, and is served by Crystalsprings, Gallman, and Hazlehurst as shipping points.

The area contains 147,840 acres, or 231 square miles, and is bounded on the north by the Jackson area, surveyed in 1904.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Prior to 1819 the territory of the present counties of Covich and Simpson was claimed by the Choctaw Indians. During that year the Indian claim was extinguished, and four years later (1823) Covich County was organized with boundaries that included Simpson County and a part of Lincoln. In 1824 Simpson County was organized, with Pearl River as the boundary between it and Covich. When Lincoln County was formed, in 1870, a narrow strip of territory on the south side of Covich was included in the new county, thus leaving Covich County with its present boundaries. Gallatin was the first county seat of Covich County.

With few exceptions, the white population of the Crystalsprings area is strictly southern, and has had a southern ancestry for generations back, the original settlers having immigrated from Virginia, North Carolina, Maryland, South Carolina, Georgia, Kentucky, Tennessee, and other Southern States.

The earliest settlers came to this part of the State between 1810 and 1820. Land was cheap, and soon large tracts became the property of men who had nothing on their arrival. The land was largely forested, and much valuable timber was destroyed in the development of new homes. It was the custom, and is yet in some places, to open up new fields, "wear them out," and clear up others. Thus the early agriculturist, without any attempt to perpetuate the fertility of his soil, gradually moved over his wide acres, cultivating only the new and best land and allowing the older, worn-out fields to wash away or grow up in pines. To-day thousands of acres of barren, gullied fields, covered with scrub pines, stand out as a warning against this practice.

Prior to 1860 the only occupation in this part of the State was general agriculture. Cotton was and is the staple crop, while rice, corn, potatoes, etc., were usually produced in sufficient quantity to meet the demands of home consumption. Practically no crop except cotton was sent to market. In 1853 the line now operated by the Illinois Central Railroad was built through this area, placing the people in direct communication with the Great Lakes and the Gulf of Mexico, and the future development of the adjacent country was practically assured.

The civil war delayed the development of the section many years; but at its close the people of this area began experimenting along various lines of agriculture, some growing truck, others fruit, with varying degrees of success.

In 1875 it was discovered that tomatoes, beans, peas, etc., could be grown with profit in this part of the South, and from that time the trucking industry claimed more and more attention, until nearly every farmer within easy reach of Crystalsprings or Gallman finally became a truck grower. In 1903 the industry had assumed such proportions in this area that of the total acreage of truck in the Mississippi Valley more than one-half was located within a radius of 7 miles of Crystalsprings.

All kinds of truck crops suited to this latitude are successfully grown, though the leading products are tomatoes, cabbage, peas, beans, strawberries, and turnips, of importance in the order named.

Market gardening was fostered in its infancy by a few business men at Crystalsprings, around which place it has its greatest development; but recently the towns of Hazlehurst and Gallman have encouraged the growing of truck on a larger scale, and the business bids fair to have a much larger development in the near future.

The Crystalsprings area not only has the largest acreage of truck in the Mississippi Valley, but is the largest shipping point for truck in the South. That its importance as a truck-growing district is rapidly increasing is evidenced by the fact that statistics show the number of carloads of vegetables to have risen from 523 in 1902 to 961 in 1904, a gain of 438 carloads or more than 80 per cent in two years.

CLIMATE.

While the Crystalsprings area is located wholly within the rain belt of the Mississippi Valley, and has over 50 inches of rainfall during the year, periods of drought are likely to occur during the growing season, greatly reducing the yield of crops. These dry periods usually come in July and August, when cotton and corn need a large amount of moisture. According to the observations of some of the oldest settlers, unusually wet springs are followed generally by dry summers and wet falls, and at intervals of six or eight years there may be expected an unusually cold winter and late spring.

The accompanying table, showing the normal monthly and annual temperature and precipitation, reveals the fact that most of the rainfall occurs during the months January to August, and comparatively little in September, October, and November, thus favoring the harvesting of cotton and corn. The table giving last and first killing frosts shows a growing season of seven months, beginning with April. This, together with the fact that most of the precipitation occurs in the spring and early summer, enables the farmer to take advantage of the moisture conditions and avoid the midsummer drought.

The following table is compiled from Weather Bureau records kept

at Crystalsprings, situated within the area surveyed, and Vicksburg, 33 miles northwest of the area:

Normal monthly and annual temperature and precipitation.

Month.	Vicksburg.		Crystalsprings.		Month.	Vicksburg.		Crystalsprings.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	In.	°F.	In.		°F.	In.	°F.	In.
January.....	47.3	5.54	47.7	5.79	August.....	80.1	3.52	80.8	4.50
February....	52.6	4.65	48.4	5.30	September..	75.3	3.49	76.2	2.42
March.....	58.0	6.45	58.3	4.66	October.....	65.3	2.62	66.6	2.49
April.....	65.8	5.86	65.7	4.58	November..	55.4	4.85	56.5	2.98
May.....	72.6	4.94	73.6	4.02	December...	50.6	4.96	48.3	5.96
June.....	79.2	4.31	79.7	5.04	Year..	65.3	55.66	65.3	53.96
July.....	81.3	4.47	81.5	6.22					

Dates of first and last killing frosts.

Year.	Vicksburg.		Crystalsprings.		Year.	Vicksburg.		Crystalsprings.	
	Last in spring.	First in fall.	Last in spring.	First in fall.		Last in spring.	First in fall.	Last in spring.	First in fall.
1896.....	Mar. 20	Nov. 9	Apr. 3	Nov. 6	1901.....	Mar. 16	Nov. 16	Apr. 21	Nov. 6
1897.....	Feb. 2	Nov. 17	Feb. 27	Nov. 17	1902.....	Mar. 6	Dec. 6	Mar. 18	Oct. 29
1898.....	Feb. 22	Oct. 27	Apr. 7	Oct. 18	1903.....	Feb. 19	Oct. 25	Mar. 26	Oct. 19
1899.....	Mar. 7	Nov. 3	Mar. 29	Nov. 3	Average.	Mar. 3	Nov. 10	Mar. 28	Nov. 1
1900.....	Mar. 16	Nov. 12	Apr. 1	Nov. 4					

PHYSIOGRAPHY AND GEOLOGY.

The greater part of the Crystalsprings area is included in the main divide between the Mississippi and Pearl rivers, and has an elevation of approximately 400 feet above sea level. The area has two general slopes, one to the south and southeast, the other to the west and northwest. East of a line coinciding with the Illinois Central Railroad the drainage is southeast into Pearl River, which flows in a general southeasterly direction. West of this line the run-off is to the west and northwest into Bayou Pierre, which flows toward the northwest and west into the Mississippi River. The area thus has three physiographic divisions, viz, first, a broad ridge running in a general northeast and southwest direction and constituting the main divide; second, the "breaks" or deeply dissected slopes to the east and west of this divide, embracing the main streams tributary to Pearl River and Bayou Pierre; third, the bottom lands along the streams. The dividing ridge is about 2 miles wide at Crystalsprings, but gradually narrows toward the south, until at many places between Gallman and Hazlehurst the streams flowing east and west have cut their channels back to within less than a quarter of a mile of each other. The surface of this ridge or divide at Crystalsprings, and as

far south as Gallman, is gently rolling, but becomes more rugged farther south, where it has suffered more from erosion. Some parts of this divide are so level as to be but poorly drained, but there is usually sufficient relief quickly to remove the water from the surface.

The "breaks" or dissected slopes on each side of the divide have very irregular surfaces. They are cut and carved in every direction by the large streams and their tributaries, which have their origin in deep gulches and ravines in the adjacent hillsides. These inequalities of surface vary from 10 to 30 feet near the headwaters and the narrow intertributary divides to from 100 to 150 feet adjacent to some of the main streams. Along Copiah, Brushy, Turkey, and Long creeks and their main tributaries there are thousands of acres of land still in forest and with little or no agricultural value at present on account of the exceeding ruggedness of surface. All of these inequalities have been developed by erosion, which is still very active. The streams all flow rapidly, and are continually deepening their channels. Among these hills, however, and along some of the intertributary divides are found comparatively large areas of land with topography permitting cultivation, and some parts are level enough to be worked by the use of machinery. Much farming is done on the rough land also, some of the cultivated land lying at an angle of nearly 40° .

The Crystalsprings area is well watered. Pearl River is sufficiently wide and deep to float boats of 100 tons capacity and 3 or 4 feet draft, while its tributaries are seldom more than 20 feet wide. The bottoms along the streams, however, are unusually wide as compared with the size of the streams, varying from less than a quarter of a mile along the tributaries to from 1 to 3 miles along Bayou Pierre and Pearl River. Along the last-named streams the lowlands are flanked on each side by low escarpments, which in a few places, notably northeast of Ruby and northwest of Georgetown, culminate in precipitous bluffs. In many places the escarpment almost entirely disappears, the adjacent uplands assuming a gentle incline toward the streams. Along the south sides of the tributaries of these streams the bluff lines are very pronounced, attaining at some points an elevation of 100 feet or more within less than a quarter of a mile of the stream.

The surface of the bottom lands is usually level to gently rolling. The shifting of the currents during flood time has left some inequalities, but the highest hillocks and ridges are hardly more than 5 feet above the surrounding level lands. Several oxbows and bayous occur in the bottom lands along Pearl River and Bayou Pierre. The bottom lands are often poorly drained, and are generally subject to overflow.

Nearly all the geological formations affecting the soils of this area belong to the Tertiary. The whole area seems to have been covered by a thin mantle of silty material, designated by Hilgard and McGee ^a as the "yellow loam" of the Columbia formation, though later geologists think it identical with the loess of the upper Mississippi Valley. Under this superficial covering are found the beds of interstratified sands, gravel, and clay of the Lafayette formation. The materials of which the sands and gravel are composed are always some form of silica, as quartz or chert. Both sand and gravel are well rounded, and in all probability once formed the shingle of an old shore line.

In the eastern part of the area there occurs a series of strata of interbedded fine sandstones and arenaceous shales that in all probability belong to the Grand Gulf formation. These strata affect the soils very little, however, since they come to the surface in only a few places.

SOILS.

All the upland soils of the area, except the Memphis silt loam, are developed by erosion. The Memphis silt loam, or the material from which it is derived, seems to have formed at one time a continuous mantle over the whole area, with the possible exception of the Pearl River bottoms. This superficial covering has since been so dissected by erosion that only the fragmentary remains are now found scattered irregularly over the area. The other upland soils, being developed by the erosion of materials that lie one above the other, have a rather irregular occurrence, owing to the unequal resistance offered to erosion by the beds from which they are derived. Each of the upland soils grades into the other, and well-defined boundary lines are many times difficult to trace.

Eight soil types were recognized and mapped in the area—four being upland and the four bottomland types.

Area of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk gravelly loam	48,768	32.9	Meadow	3,328	2.3
Memphis silt loam	46,016	31.2	Swamp	3,072	1.9
Waverly silt loam	25,088	16.9	Lufkin clay	448	.3
Orangeburg fine sandy loam..	17,280	11.8	Total	147,840
Waverly fine sandy loam	3,840	2.7			

MEMPHIS SILT LOAM.

The soil of the Memphis silt loam contains a large percentage of silt, is of a light-gray to yellow color, friable when in good physical condition, easy to till, and is recognized as the strongest of the upland

^aState Geol. Rept. La., 1899.

soils. The depth of the soil varies from 2 to 10 inches. The relatively large amount of silt as compared with clay gives it some of the characteristics of a very fine sandy loam, although the sand content is negligible. The line of contact between the soil and subsoil is quite well marked. In the older cultivated areas this type of soil contains little organic matter and easily gets out of condition.

The subsoil is considerably heavier than the soil, containing more clay and less silt. It usually extends to depths greater than 3 feet and is always of a yellow or reddish color where well drained. When drainage is poor, both soil and subsoil may contain quantities of iron concretions and assume a light-gray color. For this reason it is locally called "white buckshot land."

The Memphis silt loam has great water-holding capacity, and properly managed can be made to conserve enough moisture from the winter and spring rains to tide a crop over the occasional droughts that occur during July and August.

The Memphis silt loam has light phases here and there where erosion has begun to develop one of the other types. Sometimes sandy and gravelly spots occur, which, on account of their small size, could not be shown on a map of the scale used.

By reason of its peculiar structure the Memphis silt loam has a tendency to puddle and form a surface that sheds water easily, and farmers can readily construct upon it fish ponds and small reservoirs for watering cattle. The tendency to puddle is much less on new lands, which contain larger amounts of vegetable matter.

The greatest development of the Memphis silt loam is found along the divide between the headwaters of the streams flowing east and west. The largest areal extent is found around Crystalsprings and southwest as far as Gallman. Southeast of Gallman, around the headwaters of the main branch of Copiah Creek, and about 2 miles west of Hazlehurst, along Whites Creek, are relatively large areas of this soil. Other but smaller areas of this "clay land" occur scattered at various points over the area, following narrow divides, capping hills of other types, and skirting the base of slopes. It is found to a greater or less extent all over the area in small patches of an acre or two, where, having been protected by topographic position and held in place by forest growth, it has escaped erosion. It is frequently found intermingled with the material composing the other types, giving them heavier phases than they would otherwise possess.

The surface of the larger areas of the Memphis silt loam is level to gently rolling. Occasional deep, narrow gulches are found where this type grades into one of the other types. Where the areas are small, however, there is often developed a dendritic system of drains that open out into deep ravines. There are scores of acres of this

type so dissected as to be beyond practical reclamation. The soil washes readily, and where the surface is steeply inclined lack of humus, shallow plowing, absence of terraces, and ridge cultivation all combine to accelerate the denudation of the fields.

As a whole, the Memphis silt loam is well drained, but some small areas occur, notably around Crystalsprings, where skillful tiling is necessary in order to lower the water table sufficiently to grow early truck.

The Memphis silt loam is derived from a buff and yellow silty deposit, commonly known as loess, which varies from nothing to about 15 feet in depth. It is a sedimentary or transported soil, and probably little or no change in its mechanical composition has been affected by weathering, as in the deepest exposures the material has the same composition from top to bottom, except that the subsoil has a slightly higher clay content than the soil.

The Memphis silt loam is well adapted to such staple crops as cotton and corn. As a soil for vegetable growing it is found to be well suited to the production of Irish potatoes, English peas, and cabbage. It is probably the best upland soil for salad crops, asparagus, and turnips. Large yields of good tomatoes can also be produced, but they are liable to come on the market too late, except for canning purposes.

The staple crops grown on this soil are cotton and corn, with an average yield of from one-half to two-thirds of a bale of cotton and about 20 bushels of corn to the acre. Some farmers use this soil as pasture land, since Bermuda grass, carpet grass, crab grass, and lespedeza, or Japan clover, thrive upon it. Considerable trucking is done around Crystalsprings, the principal crops being cabbage, peas, turnips, and strawberries.

The average results of mechanical analyses of the Memphis silt loam, as it occurs in the Crystalsprings area, are shown in the following table:

Mechanical analyses of Memphis silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12716, 12433.....	Soil.....	0.3	1.6	1.2	1.6	2.3	75.7	16.9
12434, 12717.....	Subsoil....	Tr.	1.1	1.0	1.5	1.6	67.0	27.7

NORFOLK GRAVELLY LOAM.

The Norfolk gravelly loam is about 10 inches deep and of a gray color. The texture varies considerably, being lighter or heavier, according as it is more or less influenced by silt from the erosion of the overlying silt loam. It always contains large amounts of sand and gravel, the proportion of the latter varying from 10 to 75 per cent. The gravel and stones vary in size from small particles to boulders

from 4 to 6 inches in diameter. The subsoil is composed of much the same material as the soil, the color ranging from gray to yellow and red.

The Norfolk gravelly loam lies wholly west of Pearl River and covers the broad slopes east and west of the main divide. It has a greater extent than any other soil in the area, and always occurs around the headwaters of and in close proximity to streams where erosion has removed the overlying silty material. The occurrence of this type is somewhat irregular, in that small patches of it are found scattered through the other upland types, and even on the bottom lands it is intermingled with the alluvium where the streams skirt the bluffs.

The surface of the Norfolk gravelly loam varies from heavily rolling to hilly and rugged, and the drainage is good. In the vicinity of all the larger streams are hundreds of acres too rough for cultivation and allowed to remain forested. The most rugged areas are found along Copiah, Brushy, Turkey, and Long creeks, where many of the ridges and hills are more than 100 feet high, with sides almost precipitous. In the western part of the area, between Long and Turkey creeks, the surface is cut into an intricate maze of ravines and gulches, with intervening ridges, hills, and knolls that are locally called mountains. Comparatively few people dwell in these rough districts.

The Norfolk gravelly loam is a sedimentary soil, derived from the Lafayette formation, which in the Crystalsprings area is composed of interstratified beds of sand, gravel, and clay. The clay content of these beds is small as compared with the amount of sand and gravel. The gravel beds are thick, sometimes attaining a depth of as much as 80 feet. There are frequent occurrences of ferruginous sandstones and conglomerates, the latter being composed of masses of sand and gravel held together in a ferruginous matrix. Its loose texture, perfect drainage, both as to air and water, topography, elevation, together with the climatic conditions and shipping facilities, make the Norfolk gravelly loam an excellent soil on which to develop the peach industry. There seems to be no reason why the production of this fruit should not be taken up concurrently with the present trucking business. There are thousands of acres of this type which are at present almost worthless except for orchards.

The usual crops grown on the Norfolk gravelly loam are cotton and corn; the heaviest phases produce good yields when the land is new, though late-planted corn is liable to be caught by the midsummer droughts. The average yield of cotton is one-third to one-half bale and of corn 10 bushels to the acre. Some farmers grow tomatoes, beans, and peas on this type, and in general the soil is an excellent one for these and other such truck crops as require a warm season. It is well suited to early potatoes, melons, cucumbers, sweet corn, and condimental plants.

The average mechanical analyses of the fine earth of the Norfolk gravelly loam, as it occurs in this area, are given in the following table:

Mechanical analyses of Norfolk gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12720, 12435.....	Soil.....	2.1	12.2	11.3	13.5	3.9	43.9	12.9
12436, 12721.....	Subsoil....	1.7	12.6	12.3	11.9	2.9	35.7	23.8

ORANGEBURG FINE SANDY LOAM.

The Orangeburg fine sandy loam is a sedimentary soil composed chiefly of fine sand, silt, and clay, and with fine gravel frequently scattered through it. It is about 10 inches deep, of a gray color, and contains little organic matter. Like the Norfolk gravelly loam, this type has heavy phases, due to the unequal erosion of the overlying silty material. The subsoil is a red, sticky, fine sandy loam to sandy clay. It is always more than 3 feet deep and usually becomes less coherent with depth, changing to almost pure sand at 4 or 5 feet.

The Orangeburg fine sandy loam has its greatest extent in the eastern part of the survey, in the vicinity of Pearl River. Other but smaller areas occur at various points in the central and western parts of the survey.

The surface of the Orangeburg fine sandy loam is hilly and broken. Large areas of it in the vicinity of the river are cut up by deep ravines and gulches, while those areas in the central and western parts of the survey are heavily rolling to hilly, with only an occasional small area where the surface is comparatively level.

A large part of this soil is cultivated, but it is usually too steep and rough for the use of any but the simplest forms of implements. There are large areas both east and west of Pearl River that are too rough for general agricultural purposes, and are therefore allowed to remain forested. Many of the ravines are 100 feet deep, with sides almost precipitous. This soil has perfect drainage, both as to air and water.

The origin of the Orangeburg fine sandy loam is similar to that of the Norfolk gravelly loam. It is derived from the sands of the Lafayette formation, and is developed through erosion of the overlying gravel beds that give rise to the last-named type. While the materials composing the lower portions of these Lafayette beds are interstratified sands, gravel, and clay, the proportions of gravel and clay are relatively so small that they affect the soil very little.

The Orangeburg fine sandy loam is an early, warm soil and well suited to such vegetables as tomatoes, sweet potatoes, beans, and

melons. Early planted corn does moderately well, and good peaches could doubtless be produced.

The staple crops of the area are those usually grown on this soil. Yields are always low, even with moderate amounts of fertilizers, the average being from one-third to one-half bale of cotton and from 10 to 15 bushels of corn per acre.

The following table gives the average results of mechanical analyses of the Orangeburg fine sandy loam:

Mechanical analyses of Orangeburg fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12724, 12722.....	Soil.....	0.0	1.1	5.1	44.9	4.6	33.4	11.2
12725, 12723.....	Subsoil.....	Tr.	.9	5.2	54.9	3.7	15.9	19.3

LUFKIN CLAY.

The soil of the Lufkin clay type is usually thin, varying from nothing, where the subsoil is exposed, to 5 or 6 inches deep. It is composed of the finer grades of sand, silt, and clay. The color is usually light gray. The subsoil is a stiff clay, containing a smaller percentage of silt, but about the same proportions of fine and very fine sand. The color varies from gray to red.

The Lufkin clay is all found east of Pearl River and northeast of Ruby. The total area is small, being less than 1 square mile. The surface is gently to heavily rolling, with an occasional deep ravine. The type has good surface drainage, but the subdrainage is poor, owing to the imperviousness of the clay.

The Lufkin clay is a sedimentary soil and is derived from the weathering of the interbedded fine sandstones and clays of the Grand Gulf formation. The type is all forested and has little agricultural value. It is probable that certain kinds of fruit, such as apples and pears, would do well on it.

The following table gives the results of mechanical analyses of the soil and subsoil of the Lufkin clay:

Mechanical analyses of Lufkin clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12714.....	Soil.....	0.0	0.7	0.5	7.3	11.0	53.3	26.9
12715.....	Subsoil.....	.0	.2	.1	4.5	14.1	22.8	58.3

WAVERLY SILT LOAM.

The Waverly silt loam is the most productive soil in the area. It is usually a friable silt loam, but varies in its composition from almost pure sand, in small areas near the stream channels, to almost pure silt, over the larger areas back from the streams. Along the small streams it is usually a light soil, while along the larger ones it becomes heavier. Being an alluvial deposit, its composition naturally varies with the changing currents during floods.

The soil varies in depth from 15 to 30 inches. It is ordinarily dark-gray in color, owing to the relatively large amount of organic matter it contains, though light-gray and yellow areas frequently occur. The subsoil stratum has a thickness of from 2 to 5 feet, and is always underlain by beds of sandy material. The color of the subsoil grades from gray to yellow, depending upon the position of the water table.

The Waverly silt loam is always found along the streams, its greatest extent occurring along Pearl River, Bayou Pierre, and their larger tributaries. The surface of the type is level to gently rolling. Few of the ridges and knolls made by the shifting currents during flood seasons are more than a few feet high. In the larger areas the surface is sometimes cut by old stream channels, sloughs, bayous, and marshy places.

Practically all of the Waverly silt loam is subject to overflow, and a large proportion of that lying along Bayou Pierre is swampy and too wet for cultivation most of the year. The water table is from 1 foot to 5 feet below the surface, fluctuating with the season and amount of rainfall. Much of the type would be greatly benefited by both surface and tile drains. The streams usually flow several feet below the general level of the land, thus affording a ready natural outlet for the discharge pipes or ditches.

Much could be done to prevent overflows by straightening stream channels which at present pursue a tortuous course through the bottom lands. This is being done by individual farmers along some of the smaller streams, and a movement is now on foot for cooperation in the straightening of the Bayou Pierre.

The Waverly silt loam is an alluvial soil and owes its origin to the wash from the surrounding uplands. The material of which the hill lands are composed is clay, silt, sand, and gravel. This type has, therefore, a heterogeneous composition, but since the superficial covering of the uplands was once largely silt, this material predominates.

When well drained the staple crops (cotton and corn) make good yields on the Waverly silt loam. It is also well suited to the growth of cabbage, carrots, beets, onions, salad crops, and English peas. It has long been observed by the farmers that large crops of

sugar cane were easily obtained on this soil, from 300 to 500 gallons of sirup being a not uncommon yield for an acre of land. The cane makes excellent table sirup, and recently some of the farmers and business men of the area have been arranging to develop the sirup industry along with the trucking interests. Should the production of sirup become an established industry, these low, moist, rich alluvial bottoms will return their owners many hundreds of dollars, where now large areas produce nothing.

Cotton and corn are the chief crops grown on these bottom lands. The yields range from one-half to 1 bale of cotton and from 15 to 25 bushels of corn to the acre. Good cabbage and peas are also grown. The lighter phases will produce good tomatoes and beans, but the heavier areas are too cool for crops in which early maturity is a desideratum.

The following table shows the average results of mechanical analyses of the soil and subsoil of the Waverly silt loam, as it occurs in the Crystalsprings area:

Mechanical analyses of Waverly silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12431, 12726.....	Soil.....	0.4	1.9	2.4	6.2	7.1	61.8	19.8
12432, 12727.....	Subsoil....	.2	1.5	2.1	4.4	4.6	55.3	31.6

WAVERLY FINE SANDY LOAM.

The Waverly fine sandy loam consists of a gray-colored fine sand or fine sandy loam about 20 inches deep and containing little organic matter, underlain by a subsoil usually of the same color and texture as the soil, though it is occasionally somewhat heavier and sometimes red in color. The type in this area is a light soil and has little value for general farm crops unless fertilized.

The Waverly fine sandy loam is found in the southeastern and eastern parts of the area along Pearl River and Copiah Creek, being an alluvial type deposited by these streams. It always lies near the stream channels and where the overflow currents are swiftest. The surface is level to gently rolling, but all is level enough for cultivation with machinery. It has excellent subdrainage, and, although always subject to overflow, when the flood waters subside the water table soon reaches a point at which plants suffer no injury.

The Waverly fine sandy loam is a loose, warm soil and well suited to early truck. Tomatoes, beans, and watermelons do well. The usual crops grown are cotton and corn, with some oats. The yields are very low, except when commercial fertilizer is used.

The following table gives the average results of mechanical analysis of the soil and subsoil of the Waverly fine sandy loam as it occurs in this area:

Mechanical analyses of Waverly fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
12718.....	Soil.....	0.0	0.6	8.8	52.1	12.7	20.3	5.3
12719.....	Subsoil....	.0	1.0	14.2	43.0	10.3	19.4	11.5

MEADOW.

The Meadow type of soil in the Crystalsprings area is very indefinite in its composition, being composed of small areas of both the lowland types of soil, irregularly thrown together. Some of this type is under cultivation, but a large proportion is swampy and cut by oxbows, bayous, and sloughs. It occurs along Pearl River, is subject to overflow, and has comparatively little agricultural value.

SWAMP.

The Swamp includes those large areas of land along the Pearl River that are always too wet for cultivation and are under water most of the year. They are all in forest and some have valuable timber growing upon them.

HARDPAN.

In the Waverly silt loam there sometimes occurs at from 24 to 30 inches below the surface a hardpan stratum composed of very fine sand, silt, and iron concretions. These materials are firmly compacted, so that movement of water is greatly impeded. This compact stratum sometimes comes to the surface, and such areas are known as "white oak land." It is of a light ashy gray color and always unproductive. It is probable that the best remedy for this hardpan land is deep ditching and underdrainage. Deep plowing is also recommended in areas where it comes to the surface.

AGRICULTURAL METHODS.

In the Crystalsprings area shallow plowing and cultivation are practiced on uplands, lowlands, light soils, and heavy soils alike. Ridge cultivation is universally followed and has been for fifty years past. This method of cultivation, together with the tenant system of farming, is causing thousands of acres of the uplands to become washed and eroded beyond reclamation.

All the hill lands are deficient in humus, and the bottom lands are frequently too wet for early truck or maximum yields of the staple

crops. Few farmers practice any rotation in their general farming operations or appreciate the need of such practice.

The fertilizers for all the general farm crops are compounded according to the same formula, and most of the truck growers use a complete fertilizer without reference to the specific needs of the individual crops. All the fertilizers are applied before the crops are planted, and especially on the lighter soils much is leached out and lost during subsequent rains. It is the general practice to use fertilizers on all the upland soils.

There are many reasons why there should be a difference in the management of light soils and heavy soils in this area, but since a detailed discussion can not be given in this paper, it may be briefly stated that the Memphis silt loam and the Waverly silt loam should always receive deep plowing and shallow cultivation. This practice should also be pursued in the management of the heavy phases of the other types. In the management of the lighter soils of the area shallow plowing should be practiced. The plow should always run at the same depth and be followed by relatively deep cultivation. These methods will increase the moisture-holding capacity and crop yields of both the heavy and light soils. The present method of ridge cultivation should be discouraged, especially on the hill lands. In the bottoms it may sometimes be practiced with profit, since the soil is often wet and the ridges aid in securing proper drainage. The ridge method is objectionable in several respects, among others the following: First, the method greatly accelerates erosion. The ridges or corn rows, etc., are placed at right angles to the slopes, and at various points along the hillsides slight depressions occur which are crossed at right angles. When heavy rains come, the ridges conduct the water to the depressions, and it breaks over and starts a wash, which may result in a gulch during one season. It is recommended that these hill lands be carefully terraced at, say, every 30 feet, depending on the steepness of slope, and that deep, level cultivation be practiced. These terraces should usually have as much as a 1 per cent gradient and should always discharge the water into wooded glens or ravines, where grass and shrubs are growing, in order that erosion in these places may be accelerated as little as possible by this surplus water. A second serious objection to ridge cultivation is the large amount of root pruning that necessarily attends it. The plant roots are not only cut off, but the feeding ground of the plant is greatly diminished, it being compelled to develop its roots and gather its sustenance within the confines of this narrow ridge. The development of the plant is thus curtailed and the crop yield greatly lessened. A third objection is that these ridges expose a much larger surface over which evaporation takes place, and the land frequently becomes so dry that the plant foods are thrown out of solution.

Neither can the small roots live in the dry soil. Again, the beneficial effect of deep and level cultivation is apparent in that the plant roots are forced to develop deeper, and, evaporation being decreased, the moisture content of the soil is increased. On the uplands of this area, where evaporation is very rapid during the long, hot days of July and August, it is recommended that plant roots in general be not allowed to develop within less than 3 inches of the surface and that the soil below this 3-inch mulch be left undisturbed, in order that the plants may have the greatest possible feeding ground.

All the upland soils that have been under cultivation for several years are of a gray to yellow and even reddish color. These light colors are due to a deficiency of organic matter. When the lands are first cleared up they are of a dark-gray color, of loamy texture, and produce good crops without fertilizers, but a few years of shallow plowing and shallow cultivation, keeping the vegetable mold on and near the surface, soon causes this mold to oxidize or "burn out," and the once productive new lands become light colored, nonproductive, and eroded, and are finally abandoned. New fields are then brought under the plow, only to undergo the same cycle of changes. When the organic matter disappears from the heavy soils they become difficult to till, beating rains cause them to puddle or "run together," and during cold seasons they heave badly, lifting grasses and fall-sown oats out of the ground.

A systematic rotation would effect a material change, both in the chemical and physical condition of these upland soils. It is recommended that on the Memphis silt loam a four-year rotation of cowpeas, corn, cotton, and oats be practiced, while on the lighter upland soils the best rotation would probably be one of three years only, in which corn should follow cowpeas and cotton should follow corn. In any rotation on the uplands it is imperative that some leguminous crop figure prominently, and this, together with as much other vegetable material as possible, should be turned under deeply—say 8 inches—so that the content of humus may be increased and maintained in these soils.

The bottom lands do not stand in as great need of crop rotation as do the uplands, but even here a five-year rotation, in which some leguminous crop plays an important part, is recommended.

In the business of truck growing the individual must select his own rotation, which will be determined by the varieties of truck he produces; but whatever rotation he adopts must include some leguminous crop, if the greatest benefit is to be derived from the system. Some of the most successful truck growers in the area claim that with the addition of potash and phosphoric acid they can grow early crops and maximum yields of truck on land seeded the previous year to

cowpeas. In this use of cowpeas not only large quantities of organic matter but much valuable nitrogen is secured. It is recommended by some of the best truck farmers in the area that no rotation be practiced in which garden or English peas, tomatoes, Irish potatoes, or cantaloupes are made to follow one another, asserting that it has been demonstrated that each of these crops may inherit the pests or diseases of the other.

In reply to the repeated question, "What kind of fertilizer shall we use on our truck soils?" it may be said that any specific recommendation, in the absence of practical field demonstration, is beyond the province of this paper. However, a few words of general advice may be given. In the first place, to get the full benefit from any fertilization good physical condition of soil and reasonably large amounts of humus are prime requisites. Having gotten the soil in good physical condition for the truck crop, there should be added, either in drill or broadcast, a certain amount—say 700 or 800 pounds to the acre, depending somewhat upon its natural fertility and previous treatment of the soil—of a mixture containing 4 per cent of available nitrogen, 8 per cent of available phosphoric acid, and 10 per cent of potash. This is designated by Voorhees^a as a basis mixture, and may be applied to any and all market-garden crops. The specific needs of the plants are to be supplied by top dressings after the plants are up. This basic mixture may be obtained in this area by the use of cotton-seed meal, with the addition of a small amount of potash and phosphoric acid.

In the fertilization of the general field crops—cotton and corn—the most important elements to use are phosphoric acid and potash, with a small excess of the former in case of cotton. In the rotations suggested and outlined above there need be little outlay for the expensive element nitrogen, since it may be secured in relatively large amounts from the use of cowpeas and other leguminous crops. Since there has been so much published on this subject by the General Government and the various experiment stations, it is deemed unnecessary to discuss it further in this connection. Reference is made to Farmers' Bulletins Nos. 14 and 48 of the United States Department of Agriculture, and various bulletins on the same subject issued by experiment stations of South Carolina, Georgia, and Louisiana.

AGRICULTURAL CONDITIONS.

The Crystalsprings area is well supplied with shipping facilities, telephones, and rural free-delivery routes. There is plenty of excellent road metal, and most of the main roads are graded. There are many rural schools, and country churches are of frequent occur-

^a Fertilizers, E. B. Voorhees.

rence. But in spite of all these favorable surroundings the condition of the farming class in general is not what it should be.

The majority of the farmers in the area are negroes. Few produce enough on their farms to support their families during the year, and are compelled to purchase food stuffs on credit, mortgaging their future crops as security. Within the last few years there seems to have sprung up a desire on the part of the colored people to own homes, and many of them have purchased small tracts of land, of which, however, many are still under mortgage, either as security for the purchase money or for food stuffs.

The price of farm land in the Crystalsprings area has advanced rapidly within the last few years. Land that sold for \$5 an acre ten years ago will sell for \$10 to-day. This advance is due partly to the increase in land values generally and partly to the attention attracted to this part of the State by the trucking industry.

The small farms purchased by the colored men rarely exceed 100 acres, and usually range from 20 to 40 acres. Some of the older plantations, comprising 3,000 acres or more, are still intact. Many of these are gradually being divided into smaller farms, and the old-time large plantation is passing away. The size of the farms in this area will range from 10 to 3,000 acres, with a general average of about 60 acres.

The labor problem seems to be the most serious one in the Crystalsprings area. White laborers are few and generally unskilled. Practically all landlords depend on the negro race for help. The negro is most skillful as a cotton grower; in the growth of crops with which he is not familiar he is less satisfactory. There are, however, a great many good farm hands among the negroes, and it is largely a matter of past education and experience that they are better adapted to the more simple and easy general farming—the growing of cotton and corn—than to the more intensive business of growing market-garden products.

Much labor might be saved here by the use of improved farm machinery. There are many good farms on which machinery can be used with profit, and wherever it is possible it should be done. Some farmers are introducing machinery of various kinds. The gang plow is sometimes seen, and the cotton planter, the single-row corn planter, and other light single-horse implements are becoming quite common. In the setting of plants it would be great economy to use the improved transplanting machines which are drawn by horsepower.

The most important farm products outside of the trucking district are corn and cotton. Such crops as potatoes, peanuts, sugar cane, and rice are grown, but practically none of these is put on the general market. In the trucking district the most important products are tomatoes, cabbage, peas, beans, radishes, etc.

Of the upland soils the Memphis silt loam produces the largest yields of cotton, corn, tomatoes, cabbage, garden peas, strawberries, apples, and such other crops as require a large amount of moisture in their production. The Waverly silt loam produces good yields of long-staple cotton, corn, cabbage, peas, radishes, and also other crops requiring a large amount of moisture; but if a product is wanted early it had better be put on some of the lighter soils of the area. Tomatoes make good yields, but come on the market later when grown on these heavy soils.

The Norfolk gravelly loam is an excellent soil for early tomatoes, beans, and corn. The Waverly fine sandy loam produces good yields of watermelons, cowpeas, sweet potatoes, and Kieffer pears. The Orangeburg fine sandy loam produces good corn, sweet potatoes, tomatoes, and beans.

The Crystalsprings area has excellent transportation facilities. The Illinois Central Railroad puts the shippers in direct communication with the northern markets, as well as those of the other Gulf States, and is prepared to handle all kinds of truck crops. The company has large icing plants at Crystalsprings and Gallman, and plans are now being made to put one at Hazlehurst.

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