

## SOIL SURVEY OF DUNKLIN COUNTY, MISSOURI.

By A. T. SWEET and B. W. TILLMAN, of the U. S. Department of Agriculture, and H. H. KRUSEKOPF, C. E. DEARDORFF, W. I. WATKINS, and E. W. KNOBEL, of the University of Missouri.

### DESCRIPTION OF THE AREA.

Dunklin County is located near the southeast corner of Missouri, adjoining the State of Arkansas, which forms its southern and the greater part of its western boundary. It is bounded on the northwest by Butler County, on the north by Stoddard County, and on the east by New Madrid and Pemiscot Counties. The St. Francis River follows the entire western border of the county, except for a short distance in the northwest, where a small part of Dunklin County lies south of this stream and a small part of Clay County, Ark., lies north of it.

In Dunklin County the terms "Little River Swamp," "East Swamp," and "East Bottoms" are used interchangeably to designate the low region in the eastern part of the county, but the first name is used throughout this report.

From north to south the county has a length of over 43 miles. It ranges in width from about 6 to 23 miles, being widest in the southern and narrowest in the central part. The county has an area of 536 square miles, or 343,040 acres.

In Dunklin County there are three distinct physiographic divisions: (1) Crowleys Ridge, or the "hill" lands; (2) the terraces or bench lands, including the sandy "ridges" and the "glade" lands west of Crowleys Ridge; and (3) the low bottom lands subject to overflow—the swamps.

Crowleys Ridge extends south from near the center of the northern boundary of the county to a point near Campbell, and thence west and southwest to the St. Francis River. It ranges from  $\frac{1}{2}$  mile to over 3 miles in width, the widest part being between Rush Creek Church and Campbell, and has a maximum elevation above the adjacent bottoms or terraces of about 150 feet. From the northern

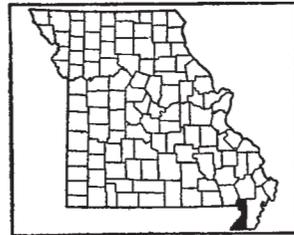


FIG. 54.—Sketch map showing location of the Dunklin County area, Missouri.

boundary of the county to a point about  $2\frac{1}{2}$  miles northeast of Campbell the crest of the ridge is very near its eastern edge. The eastern slope is steep and precipitous and in many places badly gullied. The western slope near the crest of the ridge is also in many places steep and gullied, but as it extends west it becomes more gradual, and the ridge finally merges into the lowlands or bench lands with such a gentle slope that in some places it is difficult to determine the exact boundary line between the soils of the ridge and those of the lower division. This line between the upland and lowland has been obliterated in places by soil washed down from the ridge over the foot of the slopes. On the east side of the ridge this washed or colluvial material forms a continuous narrow belt of small overlapping deltas or alluvial fans of sandy material. On the west side the streams are larger and carry more material, transporting much of it far out into the lowlands to form low ridges or swells. Frequently the streams become so choked with their own deposits that new channels are formed.

From a point east of Tompkins School to the St. Francis River the crest of Crowleys Ridge is near the west side, the shorter streams flowing northerly and westerly, while the longer ones flow southerly and easterly. The slopes along the northwest side, however, are not so steep as those on the east side farther north.

In places along the more gradual slopes of Crowleys Ridge there are fragments of an old high terrace or bench which lies approximately 50 feet above the lower adjacent lands. The town of Campbell is located on a portion of this terrace. This bench was built by stream action when the overflows attained a higher level than at present. It is probable that this terrace formerly had a much greater extent, but has since been reduced in size by the cutting of small streams until these small, flat-topped fragments are all that remain.

West and southwest of Crowleys Ridge the topography is practically level to within a short distance of the St. Francis River. Near the river there are low ridges having an elevation above the adjacent lowlands of from 3 or 4 to as much as 10 feet. These vary in width from only a few rods to almost half a mile, and in the northwest part of the county are cut into detached areas. There are also the alluvial fans and deltas at the foot of Crowleys Ridge, already mentioned, and the low ridges deposited along the stream courses or along former stream courses far out in the lowlands. There are a few shallow, meandering small stream courses and at least two broad, rather shallow depressions extending well out into this flat lowland. One extends nearly north and south half a mile west of Glennonville and the other extends northeast from Wilhelmina. The general slope of this lowland is to the south and south-

west. On the river side of the low ridge the drop to the level of the river flood plain is in most places quite abrupt, the fall ranging from 10 to 20 feet. In other places it is not so sharply defined, there being narrow lower terraces subject to frequent overflow.

The topography of that part of Dunklin County which lies south of the St. Francis River does not differ essentially from the lowland on the opposite side, and consists of a low, flat terrace or bench bordered on the river side by a low, broad ridge. Below this ridge there is a sharp drop to the river flood plain. South of Crowleys Ridge there are small areas which correspond rather closely to the level lowland west of the ridge. The remainder of this higher portion of the "lowlands" or terrace is a part of a sandy strip or "ridge" which has its northern extremity near Dexter, in Stoddard County, and extends south beyond the Missouri-Arkansas line. On the east it is limited by the Little River Swamp, from which it is separated by a sharp, well-defined bench ranging in height from about 6 to 15 feet. This line is so well defined that it is used as the boundary line between Dunklin and New Madrid Counties and south of the New Madrid line is in many places used as an established land line. On the west the sandy ridge extends almost to the foot of Crowleys Ridge and farther south the ridge extends to the overflow land along the St. Francis River.

A part of the sandy ridge has been cut off from the main body and to some extent subdivided by narrow strips of swamp into islands, of which the most important are Two Mile Island, Eagle Island, and Ten Mile Island. Within Varney River Swamp there are several small islands having an extent of only about 100 acres each, or less. The remainder of the sandy ridge does not occur as a continuous terrace, but is subdivided by numerous broad strips of lowland, swamp, or sloughs, which vary in width from only a few rods to half a mile. Throughout the narrow part of the county, especially near Holcomb and Whiteoak, narrow, low belts of this kind are very numerous. In the southern part of the county they are not so numerous, but are wider and longer. With very few exceptions, they have a southwesterly trend. The surface of the sandy ridge between the lowland belts is fairly level throughout the greater part of the area, but in some places there are long, low swells. The surface of the low belts which include the sand ridge is more uneven than that of the adjacent slightly higher land and consists of small depressions, faint swells, and low mounds and sand blows. In the southern part of the county the entire surface of the sand ridge becomes somewhat more uneven and in many places has a pitted appearance, caused by numerous sand blows.

The Little River Swamp extends from a point 4 miles south of Clarkton on the east side of the county in a gradually widening area,

the maximum width of about 9 miles being attained at the southern limits of the county. It is all at times subject to overflow, and a large area near the channel of Little River is flooded each year, the water coming from Little River and other streams which enter the lowland belt farther north. Water from the Mississippi also at times enters this lowland.

The lowland region along the west side of the county is not so well defined, the St. Francis River in many places covering in times of high water a considerable but very irregular lowland belt or series of belts. Some of them, like Varney River, are old distributaries or streams flowing out of the river and maintaining a separate channel for a considerable distance and then entering it again.

South of the point where the St. Francis River passes through Crowleys Ridge the banks gradually become lower, but the stream has a clearly defined channel the greater part of the way to West Kennett. There are long stretches in which the water has a depth of from 10 to 15 feet and flows with a current of from 2 to over 3 miles per hour. At frequent intervals, however, drift has accumulated, until at the present time there are many large drifts entirely across the river, so that a passage even for a canoe can not be found around them. Some of these drifts are 100 yards or more in length and have been in place so long that they are overgrown with weeds. (See Pl. LXVII, fig. 1.) Between Browns Ferry and West Kennett there are probably 12 or more such drifts in a stretch of 10 miles. On account of these obstructions and the meandering course of the river it can carry the normal run-off only with difficulty. In times of unusual precipitation large volumes of water turned from the natural channel are thrown against the adjacent levees, which often break, with disastrous results to the adjacent farms.

As the stream extends farther south this lowland gradually becomes wider, and the line between land which is subject to overflow and that which is not is often very indefinite.

With the exception of the upper course of the St. Francis River and a few small intermittent streams which drain Crowleys Ridge, there are no streams in the ordinary sense of the term in Dunklin County. Instead there are broad, low belts with fairly well defined limits which are flooded during wet seasons. These are heavily forested with cypress and tupelo gum (see Pl. LXVII, fig. 2), and in places with other trees, such as soft maple and ash, which are able to withstand rather wet conditions. These low belts, or sloughs, follow definite courses and are dendritic in many places. Their general trend is with the slope of the land to the south and west. In Little River Swamp there are sloughs somewhat different in character from those on the sand ridge. These in places have rather well

defined channels with long water holes bordered by willows and cypress. During periods of overflow they carry large volumes of water.

With the exception of Crowleys Ridge, nearly all parts of Dunklin County have been drained directly or at least greatly benefited through the drainage of low-lying adjacent areas. The lowlands of the eastern and southeastern parts of the county lie within the Little River drainage district, on which work is now in progress. A ditch and levee are also under construction along the St. Francis River, and a district which will drain Varney River Swamp has been organized and actual work will probably begin within a short time. Work is also being done on other smaller projects. Very little land is tile-drained. In many places the slopes of Crowleys Ridge have been so severely gullied by erosion as almost to unfit them for agriculture (see Pl. LXVIII, fig. 1).

During the unusual high water of 1915 much damage was done both in Dunklin County, Mo., and in Clay County, Ark., by overflow from the St. Francis River. At the present time steps are being taken to have the St. Francis River dredged and straightened by the Government or to obtain permission from the Government for its opening by the owners of the adjacent lands.

Sections of Dunklin County have been settled for approximately three-quarters of a century, the earlier settlements being made on Crowleys Ridge and on the higher portions of the sand ridge. The old Chalk Bluff Road, which runs parallel with and near the crest of Crowleys Ridge and which was used by the early pioneers in going from Cape Girardeau south, is still in use, except a small section near the Chalk Bluff Ferry, which, on account of travel going to St. Francis, has been abandoned within the last two years. Many of the early settlers came from Tennessee, Kentucky, Virginia, the Carolinas, and Georgia, and many residents of the county are descendants of these pioneers. With the development of lumbering there was considerable immigration from the northern and eastern States, and later, as the land was cleared and drained, a good many farmers came into the county from other sections, especially from Illinois, Indiana, Ohio, and northern Missouri. According to the census reports the county had a population of 30,328 in 1910, as compared with 21,706 in 1900, showing an increase of 8,622. The following table gives the population of the principal towns of the county in 1900 and 1910.

*Population of the principal towns of Dunklin County in 1900 and 1910.*

	1900	1910		1900	1910
Kennett.....	1,509	3,033	Cardwell.....	502	874
Malden.....	1,462	2,116	Clarkton.....	100	682
Campbell.....	737	1,781	Hornersville.....	240	390
Senath.....	241	1,029	Holcomb.....	189	279

Since 1910 the population of the county has continued to increase rapidly, Kennett in 1914 having an estimated population of over 4,000.

Over a large part of the county the population is quite dense, ranging from 50 to more than 75 persons to the square mile. The longer settled parts of the sandy ridge are the most densely populated in the county, the number of houses to the square mile in some sections ranging from 10 to over 15. In the newly settled sections, near the St. Francis River, the population is not so dense, although it is rapidly increasing. In the "glade" lands, west of Crowleys Ridge and east of the settlements near the river, it is very sparse. In the Little River Swamp, where there were formerly no permanent settlements, a few clearings and improvements have recently been made, owing to the prospect of this region being drained and opened for settlement in the near future.

Kennett, the county seat and largest town, is situated near the center of the county. It has waterworks, a lighting plant, substantial school buildings, and various industrial enterprises. Malden, Campbell, and Clarkton, in the northern part of the county, and Senath and Cardwell, in the southern part, are rapidly growing, progressive towns. Glennonville, Wilhelmina, Gibson, Holcomb, Frisbee, Whiteoak, Hornersville, Bucoda, and Hollywood are smaller towns of local importance.

Dunklin County is unusually well supplied with transportation facilities, there being no point which is more than 5 miles from a railroad, while more than one-half of the total area of the county lies within 3 miles of a railroad. The main line of the St. Louis & San Francisco Railroad crosses the county from north to south, and, with its branch lines, gives nearly all parts of the county good connections with St. Louis, 200 miles north of Malden, and with Memphis, 112 miles southeast of Kennett. The main line of the St. Louis Southwestern (Cotton Belt) Railway crosses the northern part of the county, and a branch of this line crosses the southern part of the county. The Deering Southwestern, extending from Hornersville to Caruthersville, in Pemiscot County, crosses Little River Swamp. The St. Louis, Kennett & Southeastern extends from

Kennett to Piggott, Ark., where it connects with the main line of the St. Louis Southwestern.

The public-road system is extensive. A road follows almost every section line in the more thickly settled sections. Owing to the loose sand of which most of the roads are constructed, they are not in good condition. An abundance of excellent material for building sand-clay roads is accessible in nearly all parts of the county and such roads could be built at a very low cost.

Memphis and St. Louis are the principal markets of this region for cotton and cotton products. Watermelons and cantaloupes are shipped north, principally to St. Louis, while lumber and other forest products go north and east.

#### CLIMATE.

Although there are no very marked peculiarities of climate in the lowland region of southeast Missouri as compared with the central and northern parts of the State, there are differences in the amount and distribution of rainfall and in temperature which are of considerable importance to the farmers. In this respect Dunklin County has an advantage even over the counties but a short distance farther north. These differences permit the successful growing in Dunklin County of certain crops which can not be grown farther north, the growing of two crops in certain rotations in the same season, the cutting of four and sometimes five crops of alfalfa, and the placing of certain crops on the market earlier than may be done in the northern part of the State. The use of pastures is also prolonged, so that the storage of large quantities of hay, ensilage, and roughage is unnecessary. Although stock requires protection, mainly from rain, the winters are much less severe than in the northern part of the State.

The mean annual temperature in the extreme southeastern part of the State is about 60° F., which is 10° higher than the mean in the extreme northwest. The mean temperature for July, which is the warmest month, is 80.8° F., and for January, 38°.

The average date of the last killing frost in the spring in this section is April 24, and of the first in the fall October 20, giving an average growing season of nearly six months. The date of the earliest recorded killing frost in fall is September 30, and of the latest in spring May 24. Cotton is occasionally slightly injured by late spring or early fall frosts.

The average annual precipitation is about 51.76 inches. August, September, and October are the months of least rainfall. Among the other months it is almost equally distributed. It is interesting to note that although the rainfall is greater and more uniformly dis-

tributed throughout the season the number of rainy days in this part of the State is markedly less than in the northern section. That this region seems so wet, especially during the winter season, is due to the occurrence of the heaviest precipitation at a time when absorption and evaporation are slowest, and to the level topography, which makes rapid run-off impossible. With the complete establishment of artificial drainage little injury need be feared from excessive rainfall.

As no climatological observations have been recorded within the county, the records from the nearest Weather Bureau station, located at New Madrid, in New Madrid County, are given in the following table. These are fairly representative of the conditions in Dunklin County.

*Normal monthly, seasonal, and annual temperature and precipitation at New Madrid.*

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	41.6	72	- 3	4.48	6.72	2.61
January.....	38.0	67	- 8	5.27	1.53	6.05
February.....	38.1	75	-18	4.14	3.15	1.35
Winter.....	39.2	75	-18	13.89	11.40	10.01
March.....	50.0	83	16	6.11	3.79	9.82
April.....	60.3	90	33	3.88	3.39	3.15
May.....	68.9	93	40	4.90	2.38	7.39
Spring.....	59.7	93	16	14.89	9.56	20.36
June.....	78.2	100	47	4.40	1.21	6.23
July.....	80.8	106	55	4.38	2.96	7.00
August.....	80.5	107	54	3.79	5.21	6.82
Summer.....	79.8	107	47	12.57	9.38	20.05
September.....	74.0	103	32	2.95	2.98	7.12
October.....	59.9	93	29	2.72	2.85	7.24
November.....	49.8	75	12	4.74	2.16	3.67
Fall.....	61.2	103	12	10.41	7.99	18.03
Year.....	60.0	107	-18	51.76	38.33	68.45

#### AGRICULTURE.

When settlers first came into this region almost the entire area now forming Dunklin County was heavily forested, the only exception being parts of the sandy ridge section, and even these supported

numerous clumps of post oak and black oak. Small clearings were made on Crowleys Ridge and on the sandy ridge land and some of these have been in cultivation for over three-quarters of a century. Many of the early settlers, however, depended as much upon fish and wild game, which were to be found in great abundance, as upon the products of the farms. There was also an abundance of open range for stock. Cattle were fattened upon the "prairie" and glade lands during the summer, and in many cases lived throughout the winter on the blue cane of the swamps. Hogs ran at large, fattening on the rich mast of the forests.

For many years the extension of these settlements was very slow, but since the establishment of the lumber industry in this region, about 25 or 30 years ago, the population has greatly increased and large areas have been cleared, drained, and placed under cultivation. Plate LXVIII, figure 2, shows recently cleared land ready for cultivation.

Dunklin County is the principal cotton-producing county of the State, the annual production for the last few years being nearly as large as that of all other counties of the State combined. In 1879 the county produced 7,361 bales of cotton; in 1909 the output was 24,852 bales. Since 1903 the production has been fairly uniform from year to year, the average being about 28,000 bales. The lowest production, that of 1907, was 20,495 and the highest, that of 1911, was 40,975 bales.

The increasing importance of this crop has been due largely to the high prices which prevailed for some time prior to the outbreak of the European war, and to the fact that most of the farmers of the county have had little experience with other crops or with live stock. Perhaps the most important cause, however, is the prevailing system of land tenure, under which land is held in large tracts by owners who require tenants to put in a large acreage of cotton or to pay such high rental that they can not afford to grow other crops. The custom of accepting cotton as collateral for loans and of making accounts, notes, and mortgages fall due at cotton-picking time has also had much to do with restricting agriculture mainly to the production of this crop.

Land which has been newly cleared is usually put into corn one or two years or more before being planted to cotton. Three principal methods are used for planting cotton. Some farmers merely plow out ("throw out") the old cotton or corn ridges, forming new ridges between the rows of the preceding year. These are smoothed with a harrow before the cotton is planted. The most successful cotton growers, however, flat-break the soil to a depth of 5 to 8 inches and thoroughly disk it. Some then smooth it with a drag or harrow and plant on the level surface. The greater number, however, ridge the

fields and plant on the ridges. Cotton is planted as early in the spring as frost will permit and is cultivated almost continuously until it is laid by early in July, usually receiving from four to six cultivations. It is planted thick and thinned by chopping to one plant for every 12 to 16 inches. It is also hoed two or three times, and the weeds are chopped out after horse cultivation has been discontinued. Practically no fertilizers of any kind are used, and many fields have been in cotton continuously for 25 years or more. In such cases not even the stalks are returned to the soil, but instead are raked in piles and burned, nor have the fields been protected by winter cover crops. Big-boll varieties of cotton are planted almost exclusively. Very little attention has been given to seed selection or to the improvement of varieties. Most farmers plant mixed seed purchased from the gins. Christopher Big Boll, Trice, and other varieties are used, but there is not the familiarity with cotton varieties that is found in cotton-growing sections farther south.<sup>1</sup>

Probably over three-fourths of the entire crop is sold in the seed, and to this custom is due, no doubt, the lack of interest in varieties and grades of cotton grown. The principal needs, especially on the lower lying and heavier soils, is for varieties which mature quickly and have scant foliage. Very few tests have been made to determine the effects which commercial fertilizers would have, but it seems probable that a moderate use of fertilizers high in phosphates to hasten maturity would prove beneficial, especially on the heavier soils.

Yields range from as low as one-fifth bale per acre on the lighter sand in dry seasons to 1½ bales on the heavier sandy and silty soils under favorable seasonal conditions. When the sand is plowed deep, crops rotated, and the organic matter and nitrogen supply maintained by plowing under green manuring crops a maximum yield of 1 bale per acre may be obtained, with an average of about one-half bale. On the brown fine sandy loam, very fine sandy loam, and some of the better drained areas of silt loam yields range from three-fifths to 1½ bales or more per acre, the average being about 1 bale. This region has not yet been visited by the boll weevil.

Corn ranks second in importance among the crops of Dunklin County. In 1913 there were planted 52,367 acres, which produced 1,361,542 bushels, an average of 26 bushels per acre. Although, on account of unusually droughty conditions, this yield is low for the county, it is higher than that of the State or of the southeast section as a whole. Corn as a rule receives much less attention than cotton. Cotton is always planted on the most productive and best

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<sup>1</sup> A cotton variety experiment by the Missouri experiment station in 1913 near Kennett showed that the Texas Storm Proof variety led in yield of both seed cotton and lint. Christophers Improved, Covingtons Toole, Ozier, Triumph, and Rowden yielded well.



FIG. 1.—DRIFT IN CHANNEL OF ST. FRANCIS RIVER.



FIG. 2.—CYPRESS AND TUPELO GUM, VARNEY RIVER SWAMP.



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FIG. 1.—ADVANCED STAGE OF EROSION ON CROWLEYS RIDGE, SHOWING LOESS AT TOP, COASTAL PLAIN DEPOSITS UNDERNEATH.



86530

FIG. 2.—RECENTLY CLEARED LAND READY FOR CULTIVATION.

drained areas and is thoroughly cultivated, while the low, wet, and sometimes half-cleared ground is used for corn, and much of it, especially where planted late on new ground, receives only one or two cultivations. It is often planted on new clearings where there are many stumps and much standing timber, and even under such conditions yields of 50 to 75 bushels per acre are frequently obtained. This is due largely to the high percentage of organic matter in the soil of newly cleared land and also to the abundant moisture supply, especially on the low-lying soils. Corn is grown to some extent on the light sandy soils, but the yields are low, ranging from 15 to 25 bushels per acre. It does best on the heavier brown sandy soils and on the low-lying strips of gray and black sandy, silty, and clay soils. It is nearly all drilled and the method of high ridging generally used with cotton is followed. Much of the crop, especially on the newly-cleared areas, is cultivated with one-horse implements. Owing to the long seasons, corn may be planted as late as the 10th of July and yet mature, but the earlier plantings usually give the better yields. Boone County White, Johnston County White, St. Charles White, and Reids Yellow Dent are the principal varieties grown. Corn is inclined to make a large plant growth, with ears high on the stalks. Little attention is given to the selection of better seed or to obtaining varieties which will produce smaller stalks.

Next to cotton and corn, cowpeas are at present the most important crop. They grow luxuriantly on all the soils of the county (see Pl. LXIX, fig. 1). Cowpeas may follow a crop of wheat, oats or melons, or may be sowed earlier on corn or cotton land. They are cut from the last of August up to the time of frost, yielding from a ton to over 2 tons of hay per acre. Yields of 8 to 20 bushels of seed per acre are obtained. When the first crop is cut early the second or volunteer crop makes good pasturage and may sometimes be cut or plowed under for green manure. Cowpeas are also planted in the corn, usually at the time of the last cultivation, and pastured after the corn is gathered, or hogged down with the corn.

Soy beans are also well suited to the soil and climatic conditions of the county, but are grown to a much less extent than cowpeas. Cowpeas and soy beans grown for seed are receiving little attention, many farmers spending large sums for seed each year.

Wheat is not a very important crop, but with the clearing of the stump land and the adoption of a more diversified system of farming it will undoubtedly increase in importance. In 1913 there were 1,594 acres sowed to wheat, which produced 25,504 bushels, or an average of 16 bushels per acre. This crop is grown principally on Crowleys Ridge and on the gray lands west of the ridge. It can be grown, however, in any part of the county. In growing this crop some

farmers apply from 100 to 150 pounds per acre of a fertilizer high in phosphates. Yields of 25 to 30 bushels per acre are common, the quality of the grain being good.

Oats are grown to about the same extent as wheat, only 2,493 acres being sowed in 1913, with an average yield of 30 bushels per acre.

Watermelons are extensively grown. During the last few years the number shipped has averaged about 800,000 per year and an increasing acreage is being planted. This crop is grown almost exclusively on the light fine sands or fine sandy loams. Watermelons are planted as early as the season will permit and shipping begins about the last of June or the 1st of July, following the southern crop and preceding that from the Missouri melon regions farther north. The ordinary yield is about one-half car per acre and the net profits average \$30 to \$40 per acre. Cowpeas are usually sowed in the melon fields at the last cultivation, giving a hay crop after the melons have been removed. In 1914 several acres of cantaloupes of good quality and excellent flavor were grown in the vicinity of Campbell, from which fair returns were received.

Several small fields have been sowed to alfalfa during the last few years, and the result has been quite satisfactory. Four and sometimes five cuttings, yielding from one-half to 1½ tons each, are obtained. Difficulty in curing the hay and the choking out of the alfalfa by crab grass are the principal drawbacks to the successful growing of this crop. The soils naturally best suited to alfalfa seem to be the brown fine sandy loams and very fine sandy loams, where they are well drained and have a fairly heavy silty subsoil at a depth of about 15 to 20 inches. On the loose, sandy soils there is danger of the plants burning out before they become deeply enough rooted to obtain moisture from the subsoil. The low-lying and poorly drained soils are not naturally suited for alfalfa on account of their water-logged and sour condition, but many areas may be made suitable by thorough drainage and liming. Alfalfa can also be successfully grown on the better areas of light-brown silty soil on Crowleys Ridge.

In 1910 the census reported 511 acres of clover and 1,933 acres of timothy and clover mixed. These crops are well suited to the better hill soils and, with the exception of the loose sandy soils, to the better drained areas of the sandy ridge and the lowlands. On many areas that are too wet for red clover, alsike clover, white clover, and lespedeza can be successfully grown. When acid the soils should be limed.

On all parts of Crowleys Ridge which are not under cultivation there is a thick growth of lespedeza or Japan clover. It is also found in the lowlands in many places along the railroads and public roads. This is a true legume, with the power of collecting nitrogen

from the air. Bermuda grass grows luxuriantly and makes excellent pasturage. Much prejudice exists against it in this section because it is rather difficult to eradicate. White clover is also found in many places in the lowlands along roads and around old camp sites.

Sweet potatoes are also well suited to the sandy soils. Although the crop can be easily grown and yields of 100 to 200 bushels or more per acre are obtained, sweet potatoes rarely sell on the local market for less than \$1 per bushel. It would seem, therefore, that their production might be profitably extended.

Still other crops which might be profitably grown are strawberries and raspberries. Strawberries succeed on a wide range of soils, including sandy soils and heavy soils. Brier berries do particularly well on the sandy soils. These crops might be grown in sufficient quantities to attract buyers. The climate and soils seem especially favorable for the development of an important trucking industry.

In Pemiscot and New Madrid Counties sunflowers are grown to a considerable extent as a field crop and have proved fairly profitable. They yield from 800 to 1,200 pounds of seed per acre, which sells for  $2\frac{1}{2}$  to 4 cents per pound. The cost of cultivation and handling is not much more than for corn.

Sorghum is grown to a considerable extent to make sirup for home use and to supply the local market. It is also used to some extent as roughage or as a hay crop. Where the crop is grown on the light-colored soils the sirup is said to be of superior quality. From 75 to over 100 gallons of sirup per acre are produced, which retails at about 50 cents per gallon. It would seem that the making of a high grade of sorghum molasses might become a profitable industry.

With the wide range of leguminous crops which can be grown, the long growing season, mild winters, and abundant water supply, Dunklin County is well suited for the raising of live stock, especially hogs, and for dairying. The grade of stock is improving. The 1910 census reports 13,370 head of cattle and 34,749 hogs in the county. The value of all domestic animals, including cattle, hogs, horses, mules, asses and burros, sheep, and goats, amounted to \$1,408,288.

As a result of the continuous clean cultivation accompanying the prevailing system of cotton farming the organic-matter content of the soils is rapidly depleted. In order to restore and maintain the productiveness of the soils, it is necessary to adopt systematic crop rotations in which leguminous crops have place. Much land which is at present water-logged and sour can be reclaimed by keeping the drainage ditches clear and constructing laterals. Although under

the present methods of farming injury to crops sometimes results from periods of drought following heavy rains, this injury can to a considerable extent be avoided by thorough drainage, deep plowing, by disking clay soils before breaking, by level cultivation or at least the use of low ridges on the well-drained sandy land, and by frequent shallow cultivations of all intertilled crops.

The 1910 census reported 51.4 per cent of the total land area of the county in farms, of which 80.1 per cent was improved land. There were 2,873 farms of an average size of 60.7<sup>1</sup> acres. Of these 67.4 per cent were cultivated by tenants, 32.3 per cent by owners (see Pl. LXIX, fig. 2), and the remainder by managers.

Good cotton land rents for \$6 to \$8.50 an acre, the average being about \$7; it is seldom that less than \$5 an acre is asked. When land is rented on shares the owner usually receives one-fourth of the cotton and one-third of the corn. In some cases the owner furnishes the teams, feed, seed, and farming implements, and pays one-half the cost of picking the cotton, receiving one-half the crop. Most tenants prefer to rent for cash. Considering the value of the land and the character of the improvements, the rents are high, and there is much changing of tenants from year to year.

Land values range from about \$30 an acre for the unimproved cut-over lowlands to \$100 for the well-located and well-improved land.

#### SOILS.

Twenty-four distinct types of soil are mapped in Dunklin County. These have been grouped into nine series, the members in each of which differ mainly in texture. The series may be divided broadly into four groups: (1) The upland, or Crowleys Ridge, soils; (2) the sandy terrace soils; (3) the "glade-land," or heavy terrace soils; and (4) the bottom-land, or swamp, soils. In some places the line of separation between these is clearly and sharply marked; in others it is so indefinite that it is almost impossible to determine to which of these classes certain soils belong.

The soils of Crowleys Ridge are the oldest in the county and are made up of two distinct formations of widely separated origin. In Stoddard County the steep northwest slope of Crowleys Ridge exposes rock beds like those underlying the hills of the Ozark Region. It is possible that this rock core extends as far south as Dunklin County, but if so it is entirely covered by deposits of other material. Along the east slope of the ridge, and in some places on the west and northwest slopes where short streams have cut deep, ragged gullies resembling miniature badlands, there are exposed beds of

<sup>1</sup> The census tabulates each tenancy as a "farm."

waterworn gravel, sands of various grades and colors, and gray and purplish clay. These are usually well sorted and stratified, and excellent examples of cross-bedding are common. In some places on the crest of the ridge the gravel beds are also exposed. These beds are fragments of the Coastal Plain deposits which extend across the Gulf Coast States farther south and were laid down in an embayment or arm of the ocean which extended north into this region. The soils from this formation are much older than the other soils of the county and are characterized by their sandy and gravelly nature and by their reddish-brown color, especially in the subsoils. They belong to the Ruston series, shown on the map by inclusion symbol in Memphis silt loam color. Along the foot of the steep slope which forms the eastern edge of Crowleys Ridge is a series of overlapping colluvial fans made up almost entirely of material washed down from the ridge, but which, on account of having been reworked and redeposited, have been grouped with the sandy terrace soils. In a few places on the west slope of the ridge small quantities of this sandy material have been carried out into the west lowlands, one such area being near the northeast corner of section 32,  $2\frac{1}{2}$  miles northwest of Campbell, but these are usually quite small.

The second and much more important upland formation is the loess, deposits of which occur in many places on the hills adjacent to the valleys, along the Mississippi and Missouri Rivers and other large streams. This soil material is not stratified, and covers the entire surface, regardless of the topography, frequently being thickest on the crests of the hills. It is also usually deeper and lighter in texture or coarser on the side adjacent to the stream and thins out and becomes more clayey away from it. The loess is characterized by its light-brown color, by its velvety texture, and usually by its productiveness. It is supposed to be of wind-blown origin and to have been deposited under different climatic conditions from those existing at present. The loess soils of this region cover residual and Coastal Plain deposits and have given rise to soils classed as Memphis silt loam.

Along the western edge of Crowleys Ridge, and in a few places along the eastern and southeastern edge, material has been washed from the loess and redeposited. This soil has been classed as Olivier. It also occurs in the valleys of the small streams on the ridge. A low bench or terrace which occurs in places along the lower slope of the ridge and as low ridges in the valleys has been classed as Lintonia. This is composed largely of loessial material. The Olivier soils differ from the Lintonia in having a mottled grayish and yellowish compact subsoil. Both are naturally forested soils.

The most important soils, considering present agricultural conditions, are the sandy terrace or "sand-ridge" soils. These soils stretch in a broad, almost continuous body entirely across the county from north to south. This belt, where it enters the county on the north, has a width of about 4 miles, extending from near the east slope of Crowleys Ridge to Little River Swamp. It maintains this width to the vicinity of Kennett, below which point it gradually widens, and at the southern limits of the county has a width of over 13 miles.

The soils of the sandy terrace are alluvial in origin, having been deposited by overflow water, possibly of the Mississippi River. Through some process of development, either by a deepening or straightening of the drainage channels or by a reduction in volume of water carried, the level of the old drainage water dropped to the lower level of Little River Swamp, leaving the "sand ridge" as a terrace or second bottom. Why this terrace should carry such a heavy deposit of sand is not known, but it seems probable that the cutting away of the sandy Coastal Plain deposits along the east side of Crowleys Ridge may have furnished much of the material.

The soils of this terrace may be divided into three broad groups—the brown soils, the gray soils, and the black soils. From a short distance south of Kennett to the north boundary of the county the predominant type is a light yellowish brown fine sand or light fine sandy loam, in which a heavier subsoil is reached at a depth of about 30 inches or somewhat less. This type has its best development from Clarkton north. South of Kennett this light-textured soil gradually gives place to a brown to dark-brown fine sandy loam or very fine sandy loam which embraces some of the most productive soils in the county and reaches its best development in Grand Prairie, which extends south from Vincit to Hornersville. As the brown soils extend south "sand blows," which are found to some extent throughout the greater part of the county, become more numerous. South and southwest of a line drawn from Hornersville through Bucoda to the river these sandy spots are so numerous that they have an important influence on the agricultural value of the land. Another gradation may be noted from east to west across the sand ridge. The best and most uniform development of fine sand and fine and very fine sandy loam occur on the side adjacent to Little River Swamp, and as they extend west they grade into soils having gray subsoils or into soils which are grayer from the surface down, and the areas of soils of any particular type are smaller. The brown soils of the terrace belong to the Lintonia series.

Extending through the sandy terrace are numerous broad, shallow, low belts, or sloughs, into which narrow, shallow depressions lead.

There are other broad, poorly drained areas. The predominating soil in such areas is gray. The gray color seems to have been brought about by poor drainage. In nearly all cases the gray soils have a heavy silty or clayey subsoil, and in many places iron concretions and a compact stratum in the subsoil are common. The gray soils not subject to overflow have been classed as Calhoun soils.

In portions of the depressions occupied mainly by the gray soils there are strips of dark-brown to black soils. These usually occur as long strips on one side of the depressions or in basinlike widenings of the depressions. In general, they occupy the low areas in which flooded conditions are most apt to exist, although in many cases this does not hold true, some areas frequently covered by standing water having gray soils and others rarely under such conditions having black soils. These dark-brown to black soils have been classed as Wabash.

The "glade-land" soils extend from the west slope of Crowleys Ridge almost to the St. Francis River. A small body also lies south of Crowleys Ridge southwest of Campbell. They are characterized by their light ashy gray, almost white color, their light, silty texture at the surface, and their heavy, compact subsoil. They are alluvial in origin and were evidently deposited by the stream which formerly flowed through Mingo Swamp northwest of Crowleys Ridge and by the St. Francis River, the overflow water then reaching a higher stage than at present. Like the soils of the sandy terrace, they are no longer subject to stream overflow, although their flat topography and impervious subsoil impeding run-off and underdrainage result in their being practically under overflow conditions during rainy seasons. They have been considered as terrace or second-bottom soils and the gray soils classed with the Calhoun series. The low ridges of brown silty soils near the St. Francis River belong to the Lintonia series.

The lowland or first-bottom soils subject to frequent or occasional overflow stretch as a narrow strip or belt along the entire west side of the county and as a broader belt along nearly two-thirds of the east side.

Along the St. Francis River from the Stoddard County line to a point a short distance south of St. Francis, Ark., there is a low first bottom subject to frequent overflow. The soils are yellowish brown in color, closely resembling the Lintonia soils of the same texture, but they are of recent origin and are added to from year to year. They have been classed with the Vicksburg series.

South of this point the St. Francis spreads out over a wide, swampy, and in places poorly defined, flood plain. Arms of this extend through the Varney River Swamp and into numerous sloughs

or distributaries of the river. The soils of this flood plain range in color from gray to dark gray, with some black and yellowish-brown soils. They are also quite variable in texture, ranging from sand to heavy clay loam. These gray, first-bottom soils are included in the Waverly series. This series is the first-bottom equivalent of the Calhoun. In many places, however, especially in the low, broad sloughs and near the edge of the areas subject to overflow, there is no sharp line by which the gray Waverly soils may be separated from the gray Calhoun soils of the same texture.

Little River Swamp, which enters the county along the east side, 4 miles south of Clarkton and widens toward the south, having along the Arkansas line a maximum width of over 9 miles, may all be considered lowland or first bottom. In places this area is subject to annual overflows, and in other places, where it stretches as a broad belt along Little River, it is inundated most of the time. Other areas of considerable size are inundated only during periods of unusually high water.

The soil of the greater part of this region is a dark-brown to black, heavy, tenacious clay, with a drab or mottled gray and brown subsoil. Much of this heavy soil, however, carries sufficient sand through the entire soil section to give it a gritty feel, and in many places the percentage of sand in the surface 6 inches is quite high. In many places throughout this entire lowland there are low ridges of lighter colored soil, usually also lighter in texture. These range in color from light to dark gray and in texture from fine sandy loam to clay loam. They are most numerous in the region east of Kennett and north of the east line of the St. Louis & San Francisco Railroad, but some areas of this kind occur throughout the entire east lowland region. The dark-colored soils with drab subsoils have been correlated with the Sharkey series. The gray soils belong to the Waverly series.

“Sand blows” or “sand spots” have already been referred to in connection with the sandy terrace soils. Their occurrence, however, is not confined to any soil or class of soils, the only areas in which they are not found being Crowleys Ridge and the areas covered by wash from the ridge, and the frequently overflowed bottoms of the St. Francis River.

Sand blows are low, circular or elongated mounds varying in extent from only 2 or 3 yards to as many rods, and in height above the general level of the ground from about 6 to 18 inches. In most places they seem to be scattered irregularly over the surface, but frequently a definite trend may be noted in their arrangement, and in some places they occur as long ridges or mounds. These “blows” are composed of sharp, usually rather coarse, yellowish sand. Around the



S6635

FIG. 1.—PLOWING UNDER HEAVY CROP OF COWPEAS ON SAND FOR FERTILIZER.



S6629

FIG. 2.—TYPICAL IMPROVEMENT WHEN OWNER LIVES ON FARM.



outer edge of the mounds the heavier underlying soil can frequently be reached within the 3-foot section, but near the center the sand is almost invariably found to be of greater depth.

The fewest sand blows are found in the northern part of the county. They also seem to be slightly less numerous near the edge of the terraces bordering Little River Swamp and to increase toward the south and west, although they occur in great numbers within the lower part of Little River Swamp. When the sand blows become so numerous as to cover from 25 to 60 per cent of the area an attempt has been made to separate the areas so covered, indicating them on the map by symbol. It will be seen, however, that any such separation must be rather arbitrary.

Another variation which is rather indefinite is the gradation from soils having brown subsoils to those having gray subsoils. Such changes are of frequent occurrence, with little or no surface indications to show where one leaves off and the other begins. Not only are there frequent changes from brown to gray or black, but within any soil series there are also frequent changes in texture. The frequency of such changes is well shown along newly constructed ditch banks, or where rows of postholes have recently been dug. Frequently rows of such holes at intervals of 1 rod will show distinctly different soil types for each separate hole. This is in marked contrast with the popular idea that almost level alluvial soils are very uniform in texture and structure. They are supposed by many to be also uniformly productive, which in many cases is far from true.

In the overflow region along the St. Francis and along Little River considerable areas were at the time the survey was made practically inaccessible on account of their wet condition. In the remainder of Little River Swamp the only means of determining the character of the soil was by the forest growth and by numerous borings with a sampling auger. Under such conditions soil mapping can not be done with a great degree of accuracy, and it is often necessary to approximate boundaries and to include with each type soils which may not be truly representative of it.

In the following chapters the various soil types are described in detail. The table below gives the name and actual and relative extent of each soil type mapped in Dunklin County.

## Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Sharkey clay .....	60, 736	21. 1	Olivier fine sandy loam.....	8, 576	2. 5
Sandy phase.....	11, 776		Olivier very fine sandy loam..	7, 296	2. 1
Lintonia fine sandy loam.....	39, 680	15. 2	Calhoun very fine sandy loam..	4, 160	2. 0
Deep phase.....	12, 480		Deep phase.....	2, 816	
Lintonia fine sand <sup>1</sup> .....	50, 688	14. 8	Waverly silt loam.....	6, 912	2. 0
Calhoun sandy loam.....	24, 256	7. 1	Calhoun silt loam.....	4, 928	1. 4
Calhoun silty clay loam.....	21, 568	6. 3	Waverly fine sandy loam <sup>3</sup> ...	4, 608	1. 3
Waverly loam.....	16, 384	4. 8	Lintonia silt loam.....	4, 224	1. 2
Lintonia very fine sandy loam	12, 736	3. 7	Wabash clay.....	4, 032	1. 2
Olivier silt loam.....	10, 432	3. 1	Vicksburg silt loam.....	2, 560	. 8
Wabash loam.....	10, 240	3. 0	Calhoun clay.....	1, 856	. 5
Memphis silt loam <sup>2</sup> .....	10, 112	3. 0			
Waverly silty clay loam.....	9, 984	2. 9	Total.....	343, 040	.....

<sup>1</sup>Including Lintonia loamy sand.<sup>2</sup>Including Ruston sandy loam.<sup>3</sup>Including Waverly fine sand.

## LINTONIA SERIES.

The soils of the Lintonia series are brown, light brown or yellowish brown in color and are underlain by slightly lighter brown subsoils. They are alluvial in origin, occupying stream terraces standing above overflow. They thus represent old alluvium, deposited when the overflows of the streams attained higher levels than at present.

In Dunklin County the Lintonia series is represented by five types—the very fine sandy loam, fine sandy loam, fine sand, loamy sand, and silt loam.

## LINTONIA VERY FINE SANDY LOAM.

The Lintonia very fine sandy loam in its typical development consists of a brown, mellow very fine sandy loam, underlain at about 10 to 12 inches by light-brown very fine sandy loam, which, in turn, usually grades into light-brown fine sandy clay loam. This is underlain generally at about 20 to 28 inches by yellowish-brown, compact, rather tough silty clay, which usually contains sufficient very fine sand to make it slightly friable. Gray mottling is often noticeable in this lower stratum.

In a few places the type includes some flattish "sand blows" in which the soil is of a lighter color, less loamy texture, and decidedly lower in agricultural value than the typical soil.

This type usually occurs as long, rather narrow strips which follow the edge of the terraces adjacent to swamps or sloughs, the most typical development being along the slightly higher land formed apparently as natural levees of streams. Away from this it thins out and grades into the adjacent soils or develops a gray subsoil.

Areas of Lintonia very fine sandy loam in which sand blows occur are shown on the map by symbol. In some places 25 per cent or

more of the entire soil surface is covered by these sand blows. The principal area of this sand-blow variation of the Lintonia very fine sandy loam extends along the edge of the sand ridge in the vicinity of Hornersville. A few smaller areas have been outlined farther west in the southern part of the county.

The largest development of this type occurs in the southern part of the county between the St. Francis and Little Rivers. Numerous small areas are found south of Campbell and southwest of Frisbee.

As a whole, this is the best general farming soil in the county. It is friable and easily cultivated, does not bake or crack, and holds moisture well. It is used almost exclusively for corn and cotton and gives good yields, from four-fifths to  $1\frac{1}{2}$  bales of cotton and 40 to 60 bushels of corn per acre being obtained. It is also well suited to clover and alfalfa, potatoes, and garden truck of all kinds. Practically every field of alfalfa seen in the county was on this type. In areas where sand blows occur the soil between the blows is productive.

#### LINTONIA FINE SANDY LOAM.

The Lintonia fine sandy loam as typically developed is a brown fine sandy loam or loamy fine sand underlain at about 15 to 30 inches by light-brown fine sandy loam or heavy fine sandy loam. Frequently at about 30 inches yellowish-brown heavy fine sandy loam to fine sandy clay is reached. Within a few inches this passes into yellowish-brown rather plastic silty clay containing a rather small quantity of fine sand. In such places the soil is usually a brown fine sandy loam or loamy fine sand underlain by yellowish-brown fine sandy loam, mottled with other shades of brown, which in the lower part of the 3-foot section passes into yellowish-brown plastic clay, mottled with gray and rusty brown.

This type includes numerous sand-blow areas like those in the Lintonia very fine sandy loam.

On account of its large extent, wide distribution, and productiveness this is considered the most important soil type of the county. It is used extensively for cotton and corn and under favorable seasonal conditions from 40 to 50 bushels of corn and four-fifths to one bale of cotton per acre are obtained. Clover does well, and the soil, especially where well drained, is also well suited to alfalfa, although none was seen growing on it during the survey.

The largest continuous area of Lintonia fine sandy loam extends from a point near Vincit southwest to the vicinity of Hornersville, forming the Grand Prairie. Other smaller bodies occur throughout the county, mostly in the southern half.

Lintonia fine sandy loam areas with numerous sand blows are shown on the map by symbol. The material of the blows consists

of grayish to pale-yellowish, rather loose sand, which may extend to a depth of 3 feet or more or may be underlain within the 3-foot section by a fine sandy clay or mottled yellowish and rusty-brown, rather tough silty clay.

These sand-blow areas are confined chiefly to the southern part of the county. The largest continuous body lies between Hornersville and Hollywood, and numerous smaller ones occur in the vicinity of Bucoda, Cardwell, and Paulding. In the vicinity of Paulding more than 50 per cent of the entire soil surface in places is covered by sand blows.

Much of this land has been recently cleared and some is being cleared at the present time. Where uncleared it supports a rather dense forest of white, red, and willow oak, sweet and black gum, soft maple, ash, elm, hickory, sycamore, cottonwood, ironwood, pawpaw, and dogwood. There is also a dense growth of blackberry bushes and wild muscadine grapes, and many other vines and shrubs.

*Lintonia fine sandy loam, deep phase.*—The deep phase of the Lintonia fine sandy loam consists of a brown fine sandy loam to loamy sand, which becomes somewhat lighter in color at a depth of about 10 or 12 inches. Usually at about 20 to 36 inches light-brown or yellowish-brown fine sandy loam to fine sandy clay is encountered. A few included areas have a very fine sandy loam texture in the surface soil.

The principal areas of this type occur in the central part of the county, between Frisbee and Vincent. Many areas too small to be shown on the soil map may have been included with the surrounding Lintonia fine sand.

This phase usually occupies low, broad depressions, which extend across areas of Lintonia fine sand. The topography is characteristically faintly undulating or billowy. The soil is well drained, and crops are likely to suffer for lack of moisture during protracted dry spells.

Cotton is the principal crop grown. Cowpeas, peanuts, sweet potatoes, and several other crops also do well. Although yields are not so high as on the fine sandy loam or very fine sandy loam, they are usually better than on the adjacent sand, which is more likely to suffer from drought. During dry seasons land of this phase can frequently be distinguished from the adjacent sandy soils by the higher growth of cotton which the former supports.

#### LINTONIA FINE SAND.

The Lintonia fine sand as typically developed is a light yellowish-brown fine sand, with a relatively high percentage of very fine sand. At a depth of about 8 inches it becomes slightly lighter in color, and

at about 12 inches grades into a fine sand of distinctly lighter yellowish brown color, the color and texture remaining the same to a depth of 3 feet or more.

The principal area of this type extends from a short distance south of Kennett north to the county line east of Crowleys Ridge. South of this main body there are many small areas, some of which have been included with the Lintonia fine sandy loam.

The surface of the main body of this type is nearly level, but in many places, especially near the edge of the terrace on which the type occurs, there are long, faint ridges, swells, and intervening depressions. On these ridges the soil is lighter in texture and more droughty than on the more nearly level areas.

Formerly this type was devoted principally to the production of cotton. Some areas were used almost exclusively for this crop for many years, and as a result of continuous clean cultivation their productiveness was considerably reduced. At present large quantities of watermelons and cantaloupes are grown for the market. Sweet potatoes, cowpeas, and peanuts do well. On the lighter and less productive areas cotton often yields as low as one-fifth bale per acre. On newly broken land and on land which has been kept in a good state of tilth by plowing under leguminous crops yields of four-fifths to 1 bale per acre are often obtained. Corn yields on the older cultivated soils are low, ranging from 15 to 25 bushels per acre.

#### LINTONIA LOAMY SAND.

Included with the Lintonia fine sand and shown on the map by the inclusion symbol are areas of Lintonia loamy sand. This is a brown loamy fine sand to loamy sand, underlain by yellowish-brown material of about the same texture. Rounded chert and gravel are common on the surface and throughout the soil profile. In places the soil is lighter colored, ranging to yellowish brown or grayish yellow in the surface portion. There is also some variation in texture, the sand being rather coarse near the foot of Crowleys Ridge.

This type occupies a long, gentle slope between the bottom lands or level terrace lands and the foot of Crowleys Ridge. There seems to be no doubt that the close approach to level land is in a measure the result of stream action and that the rise in slope toward the ridge is due mainly to the accumulation of colluvial material from the ridge. The fine material giving the loamy texture to the soil probably is derived largely from the Memphis silt loam occupying Crowleys Ridge, but the sand and gravel come apparently, in part at least, from the strata of Coastal Plain material lying beneath the Memphis silt loam. The type is then clearly not a typical Lintonia soil, at least in point of origin, but is a colluvial phase which carries

more of the characteristics as regards color, drainage, and topography of the Lintonia series than of any other established series.

This type is well drained and is used for oats, corn, cotton, and cowpeas, but owing to the high content of sand it does not withstand drought well. Yields are usually low.

#### LINTONIA SILT LOAM.

The typical Lintonia silt loam consists of a brown or light-brown silt loam which passes at about 8 to 12 inches either into yellowish-brown silty clay loam, in places faintly mottled with gray, or into yellowish-brown silt loam, faintly mottled in the lower part with gray and rusty brown. Usually silty clay loam is encountered within the 3-foot section. Where this lies within the lower part of the section it is often mottled rusty brown and drab or gray.

This type occupies terraces lying adjacent to Crowleys Ridge. Nearest the ridge it is probably influenced some by colluvial wash.

In areas of this type which have a level or nearly level surface the drainage is poor, resulting in the rapid formation of a white or light-grayish subsoil, and when such conditions become extreme the surface soil also assumes the lighter color, thus forming areas of Calhoun soils surrounded by the better drained brown soils. West of Crowleys Ridge, near the St. Francis River, long, low ridges have been built up by deposits from overflow water, but these are not at present subject to overflow. The soil of these ridges, although of more recent origin, resembles quite closely the brown soils of the terraces around the lower part of Crowleys Ridge and has been correlated with them as Lintonia silt loam.

The Lintonia silt loam is a deep, well-drained soil, rather well supplied with organic matter, and suited to all the crops of the section, including wheat, oats, corn, cowpeas, and grasses. No fields of alfalfa were noted on this type, but in many places it supported a good growth of red clover. Corn yields from 25 to 50 bushels and cotton from three-fifths to 1 bale per acre.

#### OLIVIER SERIES.

The soils of the Olivier series are characterized by the grayish-brown to brown color, mellow structure and prevailing silty character of the surface soils, and by the usual yellowish and drab mottled color of the subsoils. Yellow is the most pronounced color, especially in the upper subsoil; but drab, bright yellow, and various shades of yellow and brown are usually discernible through the subsoil material. The soils are derived from old Mississippi alluvium and are characteristically developed along the outer margin of the bottoms. They lie a little higher than the Iberia series and have much

better drainage. They are no longer subject to overflow, at least in their typical development, occupying low terraces and natural levees. The surface is nearly flat to slightly undulating. Some areas need ditching to hasten the removal of surface water, but the drainage is mainly well established.

OLIVIER VERY FINE SANDY LOAM.

The Olivier very fine sandy loam consists of a brown very fine sandy loam, passing at about 8 to 10 inches into dark-drab or dark-gray very fine sandy loam or very fine sandy clay loam, which grades at about 20 to 30 inches into rather tough silty clay of a gray or drab color, mottled with rusty brown, yellowish brown or ochereous yellow.

The ochereous-yellow mottling represents principally ferruginous material, which is noticeably friable in character. This lower clay substratum is tough and impervious and undoubtedly has much to do with the light color of the upper subsoil material, having prevented thorough oxidation by retarding drainage. Land of this kind occurs as level areas, a little lower usually than the typical Olivier very fine sandy loam. The gray material lies nearest the surface in the lowest, poorest drained situations. There are some "sand blows" here and there, the material of which consists of grayish to yellowish sand or fine sand, underlain at about 18 to 24 inches by mottled drab and rusty-brown silty clay. In places where the surface covering is thin this type approaches closely the Calhoun very fine sandy loam.

The largest areas of this type occur in the vicinity of Octa, Senath, and north of Europa. Smaller areas, many of which have been included with the surrounding Lintonia fine sandy loam and very fine sandy loam, occur throughout the county.

This type is used extensively for the production of cotton, corn, and cowpeas, and fair yields are obtained. It is also well suited to Alsike clover, redtop, lespedeza, and timothy. Owing to the impervious texture of the subsoil this type is not well drained. Its lime requirement is high, and for this reason it is not in its present condition well suited for the growth of red clover or alfalfa.

OLIVIER FINE SANDY LOAM.

The surface soil of the Olivier fine sandy loam is a brown fine sandy loam, which usually passes at about 6 to 12 inches into a gray fine sandy loam, mottled with different shades of yellow. The upper portion of the subsoil is a fine sandy clay of the same color as the subsurface layer, changing at about 24 to 30 inches to a yellowish, plastic, rather tough silty to fine sandy clay, mottled with gray and

drab. There are a few sand blows and occasional whitish spots throughout this type. In many places the sand blows are numerous. Where the gray subsoil comes near the surface this type approaches and frequently grades into the Calhoun sandy loam.

The largest bodies of this type occur in the southern part of the county, north of Geneva, west of Europa, and at Holly Grove Church. Smaller areas are found elsewhere.

Cotton, which is the predominant crop, gives rather low yields. Corn makes fair yields. This soil is well suited to oats, wheat, timothy, redtop, and possibly Alsike clover. It is greatly benefited by artificial drainage, deep plowing, and the incorporation of cow-peas or other leguminous crops. Lime is also found beneficial.

#### OLIVIER SILT LOAM.

The soil of the Olivier silt loam is a pale yellowish brown or light-brown silt loam, having a smooth feel, which grades at a depth of about 6 to 10 inches into a pale-yellow silt loam mottled with gray or white, or into a white silt loam faintly mottled with yellowish brown or rusty brown. The subsoil, beginning at about 12 to 28 inches, consists of a silty clay loam mottled with white, gray or drab and brown, and frequently containing dark-colored oxide-of-iron concretions. These concretions in some places form fairly distinct layers, and brown and black mottlings, due to the presence of ferruginous material, usually increase with depth. The lower subsoil is frequently a compact, impervious, silty loam to silty clay. There are some included areas which are underlain at 12 inches or more by heavier material.

Along all the small streams which drain Crowleys Ridge there are broad, shallow valleys, the flat bottoms of which are occupied by the Olivier silt loam. The greater part of the land is not now subject to overflow, although rain water frequently remains for some time on the surface, except on the occasional gentle slopes along the outer margins adjoining the uplands. Where the streams extend into the larger valleys beyond the ridge they are bordered by brownish silt loam overlying lighter colored materials. These deposits are deepest near the stream channels and thin out away from them. They have also become narrower as the streams have changed their courses, leaving surface deposits of this brown soil to mark their former courses.

Immediately below the slopes which mark the limits of Crowleys Ridge there are in many places long strips of this soil which has gradually worked down the slopes. This material represents a coluvial phase which is not separated from the main type. Examinations of this soil reveal in many places an undesirable subsoil, al-

though the surface appearance would indicate a very desirable subsoil. Where the land is uncleared, the transition from a mixed timber growth to one almost exclusively of willow oak or water oak may be taken as a pretty sure indication of the presence of the rather impervious subsoil. Timber growth of this kind usually occurs where the heavy, light-colored or mottled subsoil is reached within 12 or 15 inches of the surface.

While portions of this type are fairly well supplied with organic matter and have fair drainage, much of it is deficient in organic matter and requires artificial drainage and liming. The soil is easily cultivated, and is fairly well suited to the general farm crops of the region. It is somewhat more productive than the Calhoun silt loam, which usually lies next to it. The better portions of the type give good yields of corn, wheat, cowpeas, timothy, and redtop. On well-drained areas clover does well.

In the following table are given the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Olivier silt loam:

*Mechanical analyses of Olivier silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
343354.....	Soil.....	0.0	0.3	0.3	0.7	3.5	88.2	7.2
343355.....	Subsoil.....	.0	.4	.4	2.2	5.3	83.6	7.9
343356.....	Lower subsoil...	.2	.9	.5	1.2	1.8	78.9	16.5

CALHOUN SERIES.

The soils of the Calhoun series are of gray color and heavy texture. The heavy clay subsoils are of gray or drab color and tenacious, waxy structure. Iron concretions are common, and in places there is a substratum of sandy material. These soils occupy poorly drained, flat stream terraces on which water stands after rains. They are not subject to overflow. The material is of alluvial origin, derived principally from the silty soils of prairie regions. In Dunklin County this series is represented by five types—the very fine sandy loam, silty clay loam, silt loam, sandy loam, and clay.

CALHOUN VERY FINE SANDY LOAM.

The Calhoun very fine sandy loam where typically developed consists of a mottled grayish and yellowish-brown or rusty-brown very fine sandy loam, underlain at about 5 to 8 inches by light-gray very fine sandy loam to clay carrying some very fine sand and mottled yellowish brown and rusty brown. Usually, at about 12 to 24 inches, a tough, drab to almost white clay, mottled with rusty

brown, is encountered. This is also rather impervious and accounts to a considerable degree for the poor drainage of the soil. In places the immediate surface soil is brownish in color. The type includes patches of Calhoun fine sandy loam which are too small to show on a map of the scale used. There are a few spots where clay lies very near the surface.

This soil is developed only to a small extent in Calhoun County. The largest area occurs in the northern part of the county. Other areas occur near Gibson, and some west of Kennett.

Most of this land is forested. In its natural condition it is best suited to lespedeza, redtop, and sorghum.

*Calhoun very fine sandy loam, deep phase.*—The deep phase of the Calhoun very fine sandy loam differs from the typical soil in the greater depth of the sandy surface soil, in its slightly higher position and better drainage, and in being more productive. The original forest growth included much sweet gum and white oak. Considerable areas are now cleared and farmed and produce good yields of cotton and corn. Where the heavy subsoil occurs below about 24 inches clover does well. Corn yields from 25 to 45 bushels and cotton from three-fifths to 1 bale per acre.

The largest area of this phase occurs about 3 miles west of Townley, but numerous smaller areas, many of them too small to be shown on the soil map, have been included with the main type.

Below are given the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the deep phase of the Calhoun very fine sandy loam:

*Mechanical analyses of Calhoun very fine sandy loam, deep phase.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
3433105.....	Soil.....	0.0	1.2	1.6	16.2	34.6	38.2	8.2
3433106.....	Subsoil.....	.1	1.2	1.4	16.3	37.7	34.5	8.4
3433107.....	Lower subsoil...	.4	1.0	1.1	18.4	26.2	37.0	15.8

CALHOUN SANDY LOAM.

The surface soil of the Calhoun sandy loam consists of a mottled grayish and brownish or yellowish loamy sand to light sandy loam which passes abruptly into mottled gray and yellowish-brown sandy loam to fine sandy loam extending to a depth of about 24 to 34 inches. The subsoil is a drab sandy clay, mottled with yellowish brown or rusty brown and rather plastic in structure. Some areas included with the type are coarser textured. On the occasional slight hummocks the soil is more of a brownish color to a depth of

about 5 to 8 inches and the sandy clay subsoil may not be reached within the 3-foot section.

Iron concretions are common throughout the soil and subsoil, especially in the more poorly drained situations. In places these are very abundant and are cemented into an iron hardpan, which restricts drainage. Where this hardpan is sufficiently near the surface to be reached by the plow it readily weathers and breaks down.

The Calhoun sandy loam usually occurs as long, rather narrow strips occupying slight depressions which extend considerable distances across the county. In the central part of the county, between Kennett and Holcomb, these low belts are especially numerous, but areas of the type are encountered throughout the greater part of the county.

The surface is nearly level, except for occasional hummocks, and drainage is poor.

This type is suited to corn, oats, sorghum, timothy, and redtop. Corn is the principal crop grown and yields from 25 to 45 bushels per acre. In the southern part of the county, where the type is not confined to such a great extent to the depressions, it is used more extensively for cotton. Frequently the boundary between this type and the adjacent higher and better drained Lintonia soils also forms the boundary between corn and cotton in the same field.

Areas of Calhoun sandy loam having sand blows are shown on the map by the sand-blow symbol. These occur throughout the type in varying quantities, being usually more numerous than on the adjacent Lintonia soils. Southward they increase in number and in the extreme southern part of the county are so numerous as to diminish the crop value of the soil seriously. It is estimated that south of an east and west line through Bucoda from 25 to 50 per cent of the entire area of this type is covered by sand blows.

The results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Calhoun sandy loam are given below:

*Mechanical analyses of Calhoun sandy loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
3433111.....	Soil.....	1.0	17.0	15.1	40.4	6.9	12.9	6.6
3433112.....	Subsoil.....	.7	17.4	7.2	52.6	5.3	11.2	5.6
3433113.....	Lower subsoil...	.4	11.6	14.0	52.0	4.7	9.1	7.9

CALHOUN SILT LOAM.

The Calhoun silt loam consists of a gray or brownish-gray to grayish-brown silt loam, underlain at about 10 to 14 inches by gray-

ish to yellowish-brown silt loam or silty clay loam, usually mottled with rusty brown or shades of yellow. The lower subsoil often consists of a yellowish-brown, compact, impervious silty clay. There are included areas in which the immediate surface soil to a depth of several inches is a brown silt loam, but this almost invariably passes abruptly into light-colored or mottled subsoil. There are occasional hummocks and better drained higher spots in which the soil either consists of Lintonia silt loam or closely approaches that type. These could not be shown on the map on account of their small size.

The principal area of this type lies south of the lower slope of Crowleys Ridge along the St. Louis Southwestern Railway between Campbell and the St. Francis River. Smaller bodies occur near the river west of Crowleys Ridge, along the slope east of the ridge, and in other parts of the county.

This type occupies nearly level terraces and drainage is poorly established.

The original forest growth on this type was more mixed than on the Calhoun silty clay loam and included sweet gum, red oak, water oak, willow oak, elm, maple, and ash. This type is also used to a greater extent for farming than the silty clay loam. The principal crops grown on it are corn, oats, wheat, timothy, and cowpeas. It is well suited to small grains and grasses. Yields depend very largely upon the season, a season of average rainfall seeming to give the best results. Corn yields 15 to 40 bushels and wheat 10 to 25 bushels per acre. Sorghum makes good yields, and the sirup is said to be lighter in color and of higher grade than that made from sorghum grown on the darker colored soils.

#### CALHOUN SILTY CLAY LOAM.

The Calhoun silty clay loam consists typically of a light-gray silty clay loam, mottled somewhat with rusty brown and underlain at about 12 to 20 inches by a tough gray or drab clay, which is frequently so impervious that the lower part is dry even when the overlying material is quite wet. Rusty-brown and yellowish-brown mottlings are of common occurrence and oxide-of-iron concretions are frequently present.

This type characteristically occupies the poorest drained depressions of the old stream terraces. The most representative areas are found west of Crowleys Ridge on the upper terrace as very level land. In places areas of considerable extent are slightly higher than the adjacent soils, the surface soil is slightly brownish, and a heavy, compact clay layer of a reddish shade is encountered at depths ranging from 8 to 15 inches. Post oak is almost the only tree growth on these areas and they are usually spoken of as

“post-oak ridges.” In many places the line between these ridges or swells and adjacent areas is quite sharp and can almost invariably be noted from the tree growth alone. These ridges are considered less productive than the adjacent areas on which there is a mixed timber growth or on which willow oak and water oak predominate.

In other places, especially near the courses of some of the small streams which find their way across the flats occupied by this type, the surface soil is deeper, and the forest growth includes sweet gum, maple, ash, and a variety of other trees. Where cultivated it is more productive than the typical soils.

The principal area of the Calhoun silty clay loam extends from the lower slope of Crowleys Ridge west almost to the St. Francis River and from the ridge north, covering in Dunklin County an area of about 30 square miles. There is one area of considerable extent south of the ridge, between Campbell and St. Francis, Ark.

The greater part of this type is not under cultivation, although in the vicinity of Glennonville and Wilhelmina and in the area south of Crowleys Ridge a considerable acreage of it is used for corn, wheat, timothy, redtop, and cowpeas. Wheat and grasses are fairly satisfactory crops. Corn and cowpeas are more uncertain, but under favorable seasonal conditions fair yields are obtained. Corn yields from 10 to 40 bushels and wheat from 12 to 25 bushels per acre. In Stoddard County during the season of 1914 an experiment in rice growing on this type was carried on, and the results are said to have been quite satisfactory.

#### CALHOUN CLAY.

The Calhoun clay is a light-gray to drab clay to silty clay loam, slightly mottled with brownish or yellowish, underlain at about 1 inch to 3 or 4 inches by stiff, tenacious, impervious clay of a mottled grayish or drab and yellowish color, slightly more silty below 30 inches in some places. The greater part of the type occurs as a broad depression 1 foot to 3 feet lower than the adjacent areas of Calhoun silty clay loam, but in some places it lies at the same elevation.

This type is of small extent, covering only 2.9 square miles. The largest two areas are located at Wilhelmina and west of Glennonville. Only small portions of these areas are under cultivation and are used principally for corn and wheat. The results obtained are about the same as on the Calhoun silty clay loam.

#### WAVERLY SERIES.

The soils of the Waverly series, like those of the Calhoun series, are alluvial in origin and light gray in color. They occur in the first bottoms of streams and are subject to frequent or occasional

overflows. The material consists of more recent deposits than the Calhoun soils and the subsoils are not usually so heavy or so impervious as those of the Calhoun series. Five members of this series were mapped, the fine sandy loam, fine sand, silt loam, loam, and silty clay loam.

#### WAVERLY FINE SANDY LOAM.

The surface soil of the Waverly fine sandy loam, to a depth of 18 to 30 inches, is a light ashy gray fine sandy loam, becoming gradually heavier with increase in depth, and containing numerous mottlings of yellow and yellowish brown. In places these mottlings are so numerous as to give the soil a yellowish or brown appearance throughout. The subsoil is a sandy clay loam or sandy clay, differing little from the surface soil in color, except that the mottlings are usually darker brown and more numerous. These mottlings in both soil and subsoil vary greatly in quantity within a distance of a few feet. In some places the sand of both surface soil and subsoil is medium rather than fine in texture, but such areas have been included with the fine sandy loam.

Areas of Waverly fine sandy loam occur as low, broad ridges or swells in Little River Swamp, the principal bodies lying north of the swampy area adjacent to Little River. These ridges have a general northeast and southwest trend, and are most extensive in the vicinity of Mackeys. The type, however, is not confined to the ridges but may occupy the slightly lower adjacent areas. The ridges are known as "white-oak ridges," the forest growth on them usually including many large white oaks. They also support growths of sweet gum, ash, maple, elm, and, in places, cypress. Where the larger trees are removed a dense undergrowth, consisting largely of shrubs and blackberry bushes, is soon formed.

In the southern part of Little River Swamp a few small ridges of brown sandy loam and fine sandy loam, which closely resemble the Lintonia soils but are subject to overflow, have been included with this type.

Very little of this type is in cultivation in Dunklin County, but in Stoddard County, where it has been drained and cleared, it is used quite extensively for corn, cotton, clover, wheat, and, in fact, for all crops of the region, and the results are quite satisfactory.

#### WAVERLY FINE SAND.

Included with the Waverly fine sandy loam type are areas of Waverly fine sand, which are shown on the map by inclusion symbol. These areas occupy rather flat land which is subject to inundation. The soil consists of light-gray to mottled brown or rusty brown and gray fine sand, with drab frequently appearing in the lower portion.

Dark material is present in the subsoil in places. On the higher situations and hummocks the surface soil is more uniformly brown in color. There are some included spots of mottled silty clay loam in the lowest depressions, the subsoil of which consists of a bluish to drab silty clay. Also there is some fine sandy loam included.

Tupelo, cypress, and willow are the common trees in the poorest drained situations, while birch, sweet gum, and black gum are the principal trees on the low ridges.

As a whole this type lacks uniformity, and in many places there is no definite line of separation between it and the adjacent higher Lintonia soils or the lower Waverly soils of heavier texture. It is usually spoken of in this county as "low sand." Not much of it is under cultivation, but it is used to some extent for late corn and large yields are often obtained, owing, no doubt, to the high organic-matter content of the new soil and to the abundant supply of moisture furnished by subirrigation.

#### WAVERLY SILT LOAM.

The Waverly silt loam is a light-gray to mottled grayish and yellowish silt loam, underlain at about 15 to 20 inches by gray or drab silty clay, usually showing some yellowish mottling. When dry the surface assumes a light ashy gray or almost white color, but becomes darker with cultivation and the incorporation of organic matter. The subsoil is not compact and impervious like that of the Calhoun types, but seems to permit of better underdrainage. The surface soil also seems to become slightly lighter in texture and the subsoil more open as the stream courses are approached. Small iron concretions are scattered over the surface and throughout the soil and subsoil. In places there seems to be a concentration of these at a depth of 12 to 15 inches, forming a loosely cemented hardpan.

This type was originally heavily forested, the growth consisting of large white oak, red oak, maple, ash, elm, sweet and black gum, sassafras, and sycamore, with a heavy undergrowth of muscadine and other vines and shrubs. Where the heavy subsoil occurs the mixed growth of trees gives place to small white and post oak, with some willow and water oak.

A large body of this soil extends from near the point where the St. Louis Southwestern Railway crosses the St. Francis River southward along this stream to Varney River Swamp. It was formerly subject to overflow, but has recently been protected by a levee. In some places the lower areas, which were formerly subject to overflow, are separated from the slightly higher areas by a distinct bench or terrace 2 to 6 feet in height. In other places there is no such well-defined boundary.

Where protected from overflow, well drained, and thoroughly cultivated this soil produces good yields of corn and cotton, and is well suited to wheat, oats, timothy, redtop, lespedeza, Bermuda grass, alsike clover, and white clover. Corn yields 30 to 60 bushels and cotton from three-fifths to 1 bale per acre. Cowpeas make a luxuriant growth and millet does well.

With thorough drainage and liming, it seems probable that red clover could be successfully grown.

#### WAVERLY LOAM.

The Waverly loam consists of brownish to grayish loam, underlain at about 8 to 18 inches by mottled grayish and yellowish or brownish sandy clay loam. The lower subsoil is usually a drab or gray plastic clay to sandy clay, mottled with rusty brown and yellowish. In places the texture ranges to a fine sandy loam or even to a sandy loam, but these patches could not be satisfactorily separated.

This type, as mapped, varies considerably in color, texture, and topography. In general it occupies low, broad depressions similar to those occupied by the Calhoun sandy loam, but as a whole somewhat lower. Within these the surface is uneven, being made up of numerous mounds and swells on which the soil is light in texture and frequently brown in color, with intervening depressions in which it is darker and heavier. Some of these depressions are subject to direct overflow by the St. Francis River. Others are inundated during the wet season each year, the water standing at depths varying from 1 foot to 3 feet, as shown by the water marks on the trees. Some of these areas have recently been drained and cleared and are used for corn, but the greater part of the type is covered by a dense growth of cypress. In other places tupelo gum is almost the exclusive growth. Where cypress or tupelo are not too thick, ash, maple, and in places a mixed forest growth are found.

The principal areas of this type occur near the central part of the county between Holcomb and Ipley and in the southwestern part.

#### WAVERLY SILTY CLAY LOAM.

A large body of land extending along the Varney and St. Francis Rivers in the west-central part of the county has been mapped as the Waverly silty clay loam. What appears to be the predominant soil is a gray to dark-gray silty clay loam, grading at a depth of 8 or 10 inches into silty clay loam of a gray to drab color, with mottlings of brown, light brown, and yellow. This passes below into clay. The soil seems to be well supplied with organic matter.

Included in this body and usually occurring as strips along the edge of the swamp and as low ridges within it, are areas in which

the soil is a fine sandy loam or loam. There are also included bodies of heavy black or mottled brown and drab clay or sandy clay, which, if they could be separated and outlined, would be classed as Sharkey clay or Wabash clay. These bodies of heavier soil usually occur in the lower parts of the area. In some places the soil is covered to a depth of 3 feet or more by a layer of partly decayed organic matter, roots, and muck, through which a soil auger can be readily pushed.

Much of this type supports a thick growth of cypress and tupelo gum. A large acreage is also covered by open water or by smart weed, "elbow brush," and other water-loving plants. None of it is under cultivation.

#### WABASH SERIES.

The Wabash series includes alluvial soils of dark-brown to black color and high organic matter content and slightly lighter drab or gray subsoils. The members of this series are typically developed in the first bottoms of streams of the Central Prairie States. They extend for long distances down the Mississippi River. The material is derived principally from the loessial and associated soils. In Dunklin County the series includes the loam and clay.

#### WABASH LOAM.

Typically the Wabash loam consists of a dark-gray to black loam, underlain at about 5 to 8 inches by dark-gray, dark-brown, black or dark-drab, rather plastic sandy clay, which is usually mottled with yellowish brown or rusty brown. The lower subsoil is in places quite sandy. Included patches consist of sandy loam, sandy clay loam, and clay. Sand blows are also found in places.

The type occurs in shallow drainage-way depressions, which do not as a rule have definite drainage channels, although they carry drainage water.

The principal areas of this type occur as long, narrow belts, slightly lower than the adjacent areas, a short distance east and southeast of Crowleys Ridge, and in the southwestern part of the county.

Most of the type is forested with sweet gum, maple, elm, and white oak. When thoroughly drained it is an excellent clover soil. Corn makes yields of 30 to 60 bushels per acre on this soil.

#### WABASH CLAY.

The Wabash clay is a black clay usually mottled immediately below the first few inches with rusty-brown and yellowish-brown shades. The mottling of rusty brown becomes more conspicuous in the lower part of the subsoil, which characteristically is a sticky, plastic clay, mottled rusty brown, yellowish brown, and drab or dark

drab. The rusty-brown mottling consists of ferruginous material of a somewhat crumbly character. In places the soil extends to a considerable depth as a black silty clay without much variation in color or texture. Layers of rusty-brown or dark-brown bog iron ore are common in the substratum.

This type occupies overflowed stream bottoms and drainage-way depressions, in which there are not always well-defined channels. The principal areas occur in the low depressions which extend through the central part of the county, the clay usually occupying the deeper parts of these depressions. Important areas also occur in the southern part of the county between Kennett and the Arkansas line.

These areas are practically all forested with tupelo gum or cypress. None of this type was found in cultivation in the county, but where cultivated in other counties it produces good yields of corn.

#### SHARKEY SERIES.

The soils of the Sharkey series are brown, yellowish brown or drab, with mottled bluish, drab, rusty-brown or yellowish-brown, plastic subsoils. They contain a high percentage of clay, especially in the subsoils. These soils occur as bottom lands subject to overflow. The component material was mainly deposited some distance back from the streams by quiet water. The content of organic matter is high.

#### SHARKEY CLAY.

The Sharkey clay is typically a mottled rusty-brown, yellow, and drab, plastic, silty clay which shows but little change in texture or structure within the 3-foot section. As a rule the drab coloring becomes more conspicuous with increase in depth. The lower subsoil often consists of drab to steel-blue silty clay, with but faint mottlings of rusty brown. In many places this type is so filled with decaying roots and leaves that it is very dark brown to almost black, approaching quite closely the Wabash clay in color as well as in other characteristics.

This is the predominating soil type in Little River Swamp, a strip of it extending from a point 5 miles south of Clarkton south to the Arkansas line, and eastward beyond the county line into Pemiscot County. Small areas of this type have been included with the surrounding types in Varney River Swamp and other parts of the county.

The type occurs in overflowed first bottoms, the most extensive areas being in the swamps of Little River. There are some sandy hummocks, but the areas in which the sand spots are most abundant have been separated on the map as a phase.

The Sharkey clay supports a mixed forest growth, cypress and tupelo gum predominating in the lower wet areas, while on the more level areas oaks of several varieties, hickory, sweet and black gum, maple, ash, elm, and cottonwood are found.

None of the type is under cultivation in Dunklin County, but near Deering, in Pemiscot County, a tract has been cleared, tile-drained, and farmed since 1910 with fairly satisfactory results. On this land corn yields from 40 to 60 bushels and cotton about one-half to three-fourths bale per acre. Cowpeas also do well.

Areas of Sharkey clay in which sand blows are sufficiently numerous are designated by the sand-blow symbols. These sand blows consist largely of yellowish-gray to brownish sand or loamy sand underlain by Sharkey clay material within the 3-foot section. They occur principally as mounds about 12 inches in height.

The principal sand-blow area extends as a broad belt from Goble, on the Deering Southwestern Railway, to the State line south of Hornersville. The sand spots are least numerous in the northern part of this area, where they cover approximately one-fourth of the surface, and increase in number toward the south. Near the State line in some places they cover from 60 to 75 per cent of the surface.

Crops as a rule give very poor results on the sand-blow spots throughout the Mississippi bottoms.

*Sharkey clay, sandy phase.*—The Sharkey clay, sandy phase, is a light-brown, yellowish-brown, brown, or almost black loam to clay loam, with mottlings of rusty brown or yellowish brown, and underlain usually at 1 inch to 3 inches by grayish-brown to drab, stiff tenacious clay, mottled with yellow, gray, and brown. There is present, particularly in the surface soil, sufficient sand to give the material a slightly friable texture. This sand rarely occurs in layers. In many places the subsoil below 30 inches seems to be slightly lighter in texture than the overlying soil. This phase, like the typical Sharkey clay, often has a surface covering of from 2 to 6 inches of brown silt loam deposited from recent overflows.

North of the swamp area immediately adjacent to Little River this phase is the predominant soil. None of it is under cultivation, but when protected from overflow and properly drained it will undoubtedly prove a productive, durable soil. It is well supplied with organic matter, and the sand it contains will make it fairly easy to cultivate and facilitate underdrainage.

#### MEMPHIS SERIES.

The Memphis series is characterized by the light-brown to yellowish-brown color and silty texture of the surface soils and by the slightly lighter color and more compact structure of the subsoils.

These soils are typically developed to the south of the latitude of St. Louis, being most extensive in the loessial belt following the east bank of the Mississippi River. Drainage is ordinarily well established. Erosion has been active and has resulted in a prevailing rolling to broken topography. A characteristic of the series is the tendency of the material to stand in perpendicular bluffs or sections.

#### MEMPHIS SILT LOAM.

The Memphis silt loam consists of a brown or yellowish-brown silt loam, underlain at 10 to 12 inches by a light yellowish brown silty clay loam. At about 24 inches the material is usually quite compact and often shows some gray mottlings. In places on the slopes the subsoil is exposed as a result of erosion.

This is the principal upland soil type of the county. Its boundaries are practically the same as those of Crowleys Ridge, except where the underlying residual and Coastal Plain soils have been exposed by erosion or the surface soils have been modified by gradual soil movement and deposition along the stream courses. The entire ridge was probably at one time covered by this type. The topography is gently rolling to hilly.

The forest growth, while including the black walnut and hard maple characteristic of the Knox silt loam, consists more largely of post oak and black oak. While the Memphis silt loam when properly handled is a durable, productive soil, in this county it seems to be somewhat less productive than is the Knox silt loam of other parts of the State.

No other soil of the county responds so readily to good treatment as the Memphis silt loam. It is in need of organic matter and suffers deterioration as the result of erosion. The yields of corn range from less than 20 to over 40 bushels per acre and of wheat from about 9 to over 20 bushels per acre. With proper handling and improvement the average yields could be materially increased. Clover yields from 1½ to 2 tons or more per acre. Cowpeas do well.

In the northern part of the State alfalfa and tobacco are successfully grown on the Knox silt loam, and it is considered the best soil in the State for fruits. It would, therefore, seem that the same crops would do well on the Memphis silt loam.

#### RUSTON SERIES.

The soils of the Ruston series are gray to grayish brown, and are underlain by reddish-yellow to yellowish-red or dull-red, moderately friable subsoils, prevailing of sandy clay. Occasionally the lower subsoil is mottled with gray and shades of yellow. This series is developed only to a very slight extent in Dunklin County, and is represented by the sandy loam type.

## RUSTON SANDY LOAM.

The inclusion symbols appearing on the map on areas otherwise indicated as Memphis silt loam represent areas of Ruston sandy loam which are too small to separate on a map of the scale used.

This soil also occurs on the slopes of Crowleys Ridge. Typically, it consists of grayish sand or loamy sand which passes within the 3-foot section into reddish-yellow, friable sandy clay. A part of this type is used for cotton and corn with fair results.

Some areas occurring along the steep slopes of Crowleys Ridge consist of a yellowish gravelly sandy loam or loamy sand, underlain at variable depths, usually at about 20 to 30 inches, by reddish-yellow or yellowish-red friable sandy clay to somewhat tough silty clay. Chert gravel occurs in abundance on the surface and throughout the surface soil, and to a less extent in the subsoil. These areas include patches of Norfolk sand, with a good many spots which have been influenced by colluvial wash from the Memphis silt loam above. Such areas are generally too steep and rough for cultivation. They are largely forested with post oak, with some hickory and sparkle-berry.

## VICKSBURG SERIES.

The soils of the Vicksburg series are characterized by the brownish color and prevailing silty texture of the surface portion and by the brown or dark-brown color and friable structure of the subsoil. The material represents alluvial deposits derived from brown loess or soils like the Memphis and Knox. Along some of the smaller streams much of the material is of colluvial character or partly colluvial, having been moved only a short distance from the adjacent slopes and lateral drainage ways, but the typical soils occur as first-bottom, frequently overflowed alluvium. Along some streams inundation is not always from the central or main stream channels, but from the smaller tributaries.

## VICKSBURG SILT LOAM.

The Vicksburg silt loam consists of a brown heavy silt loam mottled faintly with rusty brown. There is not much change in texture within the 3-foot section, but the lower portion is more intensely mottled, rusty brown, gray, and drab being the prominent colors.

This type occurs in a narrow strip, varying from only a few rods to over half a mile in width, in the low first bottom of the St. Francis River, extending from the Stoddard County line to a point a short distance south of the old Chalk Bluff Road, and is subject to frequent inundations. It is heavily forested with sweet gum, white oak, hickory, cypress, and other trees, with an undergrowth of shrubs and vines.

Most of the type is unfit for agricultural use under present conditions other than for the production of pasturage and hay. Only a few small areas are under cultivation, these being used for late corn. If protected from overflows it would be well suited to the principal crops of the region.

#### SUMMARY.

Dunklin County lies near the southeast corner of Missouri. It has an area of 536 square miles, or 343,040 acres.

The county has three distinct topographic divisions: (1) Crowleys Ridge, which has a maximum elevation of about 150 feet above the adjacent level land; (2) the high bottoms or terraces not subject to overflow; and (3) the low bottoms or swamps. The terrace lands are subdivided into the "glade" lands and the sandy ridges.

The population of the county was 30,328 in 1910. The population is increasing.

Transportation facilities are good, no point in the county being more than 5 miles, and more than one-half the county being less than 3 miles, from a railroad. The public roads, while extensive, are poor.

The average annual rainfall of approximately 50 inches is well distributed. The mean annual temperature is about 60° F.

Portions of the county have been under cultivation for about 75 years, but much of the land is comparatively new and additional areas are being drained and cleared each year.

Cotton is the principal money crop, with an estimated yield of 35,000 bales in 1914. The average yield for the county is about three-fifths bale per acre, although yields of over one bale are often obtained. No commercial fertilizer is used.

Twenty-four soil types, representing nine series, have been recognized in the county. The most important of these are the Lintonia, Calhoun, Waverly, Sharkey, and Memphis soils.

The Lintonia soils predominate on the sandy ridges, and are characterized by their light-brown or yellowish-brown color, fine sandy or silty texture, and loose, friable structure. They embrace some of the most productive soils of the county and are suited to a wide range of crops, including clover, alfalfa, cotton, corn, wheat, watermelons, cantaloupes, peanuts, sweet potatoes, and cowpeas.

The Calhoun soils predominate in the "glade" lands and in some of the long, narrow depressions within the sand ridge. They are characterized by the light ashy gray color and silty texture of the surface soils and the heavy, impervious subsoils. Only small areas of these soils are under cultivation. They are best suited to wheat, timothy, redtop, and other grasses. Under favorable seasonal conditions corn and cowpeas give fairly satisfactory results.

The soils of the Waverly series are also light gray in color, but usually are not quite so white or so loose and floury at the surface as the Calhoun soils. They have fairly good underdrainage and when protected from overflow give good yields of corn, cotton, and cowpeas, but need lime before being used for clover or alfalfa.

The soils of the Sharkey series are dark brown, drab or almost black in color, with mottled drab and brown, tenacious subsoils. They occur principally in Little River Swamp. None of the Sharkey soils are under cultivation, but when drained should produce good crops of corn and cotton.

The Wabash soils are dark brown to black in color and heavy in texture, especially in the subsoils. Limited areas of the Wabash loam are under cultivation and give excellent yields of corn. The heavier textured soils of this series have not yet been cultivated.

The Memphis silt loam is a loose soil which covers the greater part of Crowleys Ridge. Where the soil is deep and well supplied with organic matter it gives good yields of corn, wheat, and clover, and might be used for alfalfa. It is also a good fruit soil.

The Olivier silt loam is made up largely of material eroded from the Memphis silt loam and where deep and well drained is well suited to nearly all the crops of the region.

The Vicksburg silt loam is a light-brown soil occupying the first bottoms of the St. Francis River along its upper course. It is a strong, productive soil, well supplied with organic matter, but on account of frequent overflows is cultivated to only a very limited extent.



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