

# SOIL SURVEY OF CAPE GIRARDEAU COUNTY, MISSOURI.

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## DESCRIPTION OF THE AREA.

Cape Girardeau County is located in the southeastern part of Missouri, midway between the Missouri River to the north and the Arkansas State line to the south. It is bounded on the north by Perry County, on the east by the Mississippi River, on the south by Scott

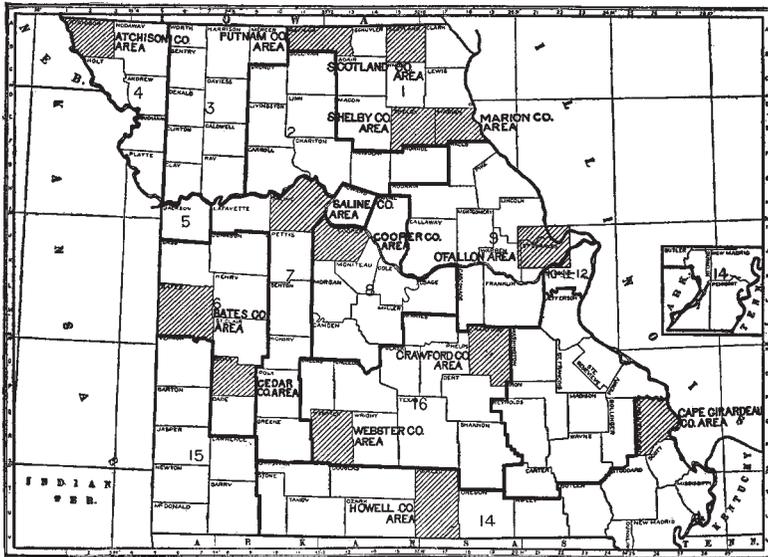


FIG. 31.—Sketch map showing location of the Cape Girardeau County area, Missouri.

and Stoddard Counties, and on the west by Bollinger County. It is situated between parallels  $37^{\circ} 30'$  and  $37^{\circ} 42'$  north latitude, and between meridians  $89^{\circ} 30'$  and  $89^{\circ} 57'$  west longitude. Its latitude, therefore, is about the same as that of Springfield, Mo., and Richmond, Va., and the longitude the same as that of St. Louis, Mo., and Memphis, Tenn. Excepting the western border, the county is irregular in outline. Its greatest length north and south measures 31 miles, and its greatest width east and west 23 miles. The land surface is equal to 574 square miles, or 367,360 acres.

Physiographically Cape Girardeau County may be divided into two divisions—the upland and lowland. The former is by far the most important and comprises about six-sevenths of the total area. It varies in topography from hilly to gently rolling. The hilly portion rises abruptly in the form of bluffs 200 feet or more in height along the Mississippi River. It is confined to the eastern part of the county and occupies a territory from 4 to 6 miles in width and extending from the city of Cape Girardeau north along the river to Apple Creek. Receding westward from the river the hills become lower and lower until an undulating country is reached, which includes practically all of the remainder of the upland. Along the western border of the county, south and west of Burfordville, the surface again becomes moderately hilly. The nature of the topography is determined primarily by the underlying geology—the softer rocks giving rise to rolling areas, while the harder rocks are indicated by the more broken areas.

The average altitude of the upland is about 495 feet above sea level, which is about 200 feet higher than the average altitude of the lowland. The general slope of the upland is to the south, but in the eastern and northeastern parts of the county it is to the east. The highest land in the area is the broad ridge followed by the Chester, Perryville & Ste. Genevieve Railway, extending from Daisy to Pocahontas.

The upland of Cape Girardeau County is generally considered a part of the Ozark region of south Missouri, but should more properly be classed as part of the Ozark border in distinction from the Ozark center of this region. The Ozark border is lower than the Ozark center, its rocks contain less flint, and its surface is not as rough as the rest of the Ozark region. It is a comparatively narrow belt in the eastern part of the State, covering the first tier of counties along the Mississippi River. In the western part of the State it includes a much larger territory, but since it differs from the eastern region in many of its soil and physical features, a description of one region will not be applicable to the other. The western boundary of Cape Girardeau County may be considered in general the western edge of the Ozark border, for all the country west of this boundary possesses all the characteristics mentioned above as being common to the Ozark center. Jefferson, Ste. Genevieve, and Perry Counties belonging to the Ozark border, and containing the same geological formations as Cape Girardeau County, resemble the latter in their physiographical and soil features. Therefore any conditions described or suggestions made for the upland of Cape Girardeau County will also be applicable to these counties.

The lowland region in the southern part of the county is a part of the great Mississippi embayment, which includes all of southeastern Missouri, eastern Arkansas, western Tennessee, all of Louisiana and Mississippi, and parts of Texas, Alabama, and Georgia. During late Cretaceous times this entire region was covered by an extension of the Gulf of Mexico and owes its origin to this condition and the subsequent action of the Mississippi, Ohio, and other rivers. That part of the embayment, commonly known as lowland, found in Cape Girardeau County is, in general, a smooth plain, with a slight slope to the south and southwest. Its average altitude is about 335 feet above sea level. It begins at a point on the Mississippi River about 1 mile south of the city of Cape Girardeau, trends westward and slightly southwestward by way of Dutchtown and Whitewater, and leaves the county 5 miles north of the south county line. The bluff border on the north of the lowland is nearly everywhere precipitous, so that the line between upland and lowland is very distinct. From Cape Girardeau to 1 mile beyond Dutchtown the bluff maintains an average height of 75 feet, but then becomes lower and loses its precipitous nature. Included within the lowland and completely surrounded by it is Hickory Ridge, an isolated hill. Its outline also is sharply distinct from the lowland, but with the exception of the southeast side its bluff line is in general a gradual slope. Hickory Ridge stands about 75 to 125 feet higher than the surrounding lowland. It is very regular in outline, and has the form of an oval with an average width of  $1\frac{1}{2}$  miles and a length of 7 miles. Figure 32 shows the extent of the lowland region in Cape Girardeau County and in southeast Missouri.

The lowland in Cape Girardeau County owes its origin to the action of the Mississippi River during early times. There is every reason to believe that the bluff line in the southern part of the county and along the north side of Commerce Hills, in Scott County, was at one time washed by the Mississippi River which, through changes brought about by itself, finally made the valley it now occupies. The old stream bed and flood plain were soon filled with sediments brought down by the river and by streams from the adjoining upland. The belt of lowland between the upland and Hickory Ridge was probably the result of the combined action of the Mississippi and Whitewater Rivers and Crooked Creek.

At various places along the Mississippi River, and also near the mouths of some of the larger streams, there are found high bottoms which seemingly are remnants of the old flood plains of the streams when they occupied a higher level. These bench lands are most prominent along Indian Creek and at Cape Girardeau. These terraces contain pockets of sand, which were undoubtedly deposited by water. The terraces vary from a few rods to one-fourth mile in width and are 25 to 50 feet higher than the adjoining bottoms.

The surface of Cape Girardeau County is essentially a plain sloping gently southeastward. The northwestern portion lies at an elevation of about 500 feet and the southeastern portion at about 400 feet.

From the point of view of drainage arrangement, as well as surface relief, it consists of an eastern and a western portion. The boundary line between the two follows the boundary line separating the Pocahontas and Clarksville silt loams to where it is overlapped by the Knox silt loam. From this point it bears southeastward to

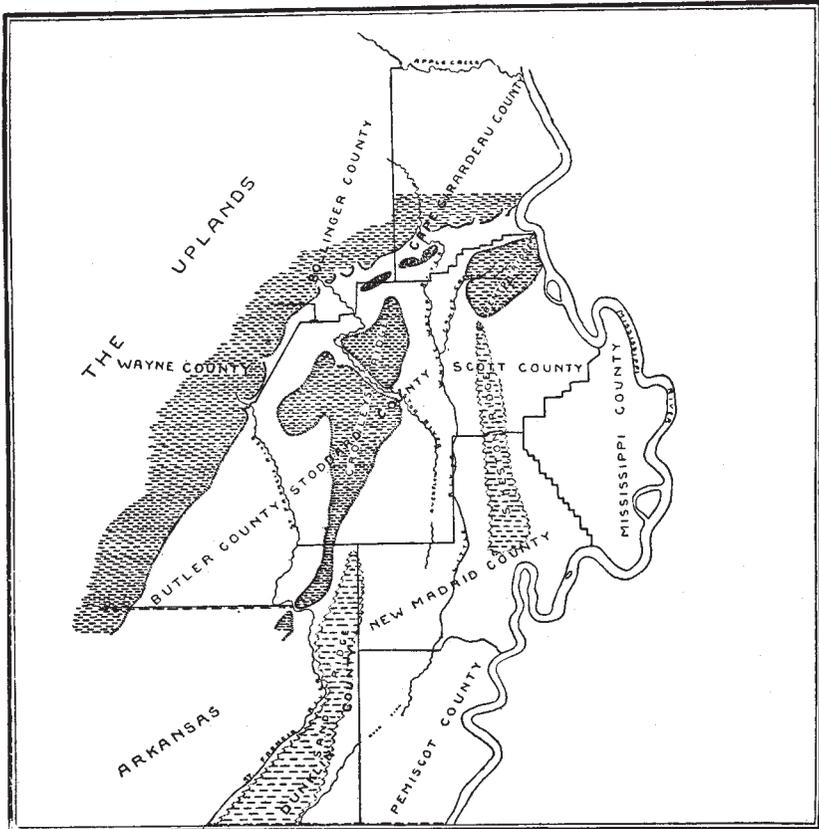


FIG. 32.—Extent of lowland region in Cape Girardeau County and in southeast Missouri.

the Mississippi River 2 or 3 miles above Cape Girardeau. At the southern end the differences between the two become faintly marked and the boundary indefinite.

That part of the plain lying east of this line is highest along the extreme western boundary and slopes eastward in the northern portion and southeastward in the southern. The highest part of its western edge stands probably not less than 350 feet above the Mississippi River flood plain, while its eastern border stands about 200

feet above the same datum. It is thoroughly dissected. The depth of dissection in any locality varies with the elevation of the upland surface, the distance from the river, and the size of the streams. In general, it is deepest along a belt lying parallel to the river and a little less than half way from the river to the western boundary.

This is the roughest portion of the county, its nearness to the Mississippi River making both the completeness and depth of the dissection possible.

The western portion of the Cape Girardeau County upland is not so uniformly simple in its main surface features, but its details are less pronounced, so that in general appearance it is simpler than the eastern portion. This is merely because it is smoother.

In general features it consists of four faintly marked north and south belts. The easternmost belt is a lowland when compared with the country on either side. Its surface rises gradually westward and merges into the former, but steeply eastward up to the boundary of the latter. Its eastern boundary is a sharply defined one, while its western is indefinite. It varies in width from 1 to 4 miles. It is moderately well defined in the northern portion of the county, becoming gradually less pronounced southward. The two villages, New Wells and Pocahontas, lie in it. Fruitland lies just west of it. It corresponds approximately to the eastern half or two-thirds of the belt of Pocahontas silt loam. A large part of the area is under cultivation.

West of this lies the main central belt of the county. It is the main watershed ridge of the county, and probably rises higher in the vicinity of Oak Ridge than in any other part of the county. It slopes eastward to the Pocahontas belt and westward to the Millersville belt. Southward it becomes gradually lower and narrower, so that at the southern boundary of the upland it is narrow and not perceptibly higher than the Pocahontas belt on the east and the Millersville belt on the west. It has an undulating to rolling surface, with low hills along the larger creeks. The greater part of its surface is under cultivation. It was occupied by settlers earlier than any other large area of the county.

West of this lies the Millersville belt. It is lower as a whole than the Oak Ridge belt, but is somewhat more cut by drainage than the latter. It is essentially, therefore, an undulating to rolling plain, rather thoroughly cut by shallow valleys. The villages of Friedheim, Daisy, Millersville, Tilsit, and Gordonville lie in it, and Dutchtown is at its southern end. It trends southeastward from the northwestern corner of the county to county midline, where it is cut off by the northern boundary of the lowlands. It slopes upward uniformly both eastward and westward from its axial line. A smaller propor-

tion of its area is cultivated than of either the Pocahontas or Oak Ridge belts.

Along the western county boundary lies another hilly belt somewhat higher than the Millersville belt. It rises westward, the rise continuing westward beyond the county without a break to the top of the Ozark upland. It trends southeastward and rises westward or northwestward, so that its extreme eastern boundary in the northwestern corner of the county is probably as high as the maximum elevation in the southwestern corner, although the latter lies some 6 miles west of its eastern boundary. As a whole, it is rougher and less cultivated than either of the three central belts, and is somewhat more cultivated and less rough than the eastern belt of the county.

Burfordville lies in Whitewater River Valley within this belt. Gravelhill and Crump are two small villages within it. Whitewater lies on its southern boundary. An isolated outlier of this belt lies out in the lowlands, south of Whitewater. It is a hilly island, rising steeply from the lowland surface all around it, having the same rocks and the same surface characteristics as the upland north of Whitewater. It is known as Hickory Ridge.

The southern boundary of the upland runs from about 2 miles south of Cape Girardeau westward by Dutchtown to Whitewater, and from the latter place southwestward to the northwest corner of sec. 8, T. 29 N., R. 11 W. South of this line lies the lowland portion of the county. It is sharply differentiated from the upland, not only in character of surface and origin, but in the sharp rise along the boundary between them.

The surface is practically a featureless plain, sloping gently southward from the foot of the bluff along the northern boundary. Aside from the Hickory Ridge Island, described above as a part of the upland of the county, there are a few low ridges in the southwestern portion of the county. They are usually less than 10 feet high, and are remnants of a terrace lying at about that height above the lower land to the east.

The whole lowland is merely a portion of an abandoned valley of the Mississippi River.

There are two main drainage areas in the upland portion of the county—an eastern and a western. In each the drainage arrangement is dendritic. In the eastern, corresponding mainly to the easternmost of the physiographic belts, the drainage is eastward directly into the Mississippi. In the western the northern end is drained northward into Apple Creek, while the main body is drained southward. The drainage water from this region, although finally reaching the Mississippi, does not reach it until the Mississippi wanders over to the western side of its valley at Helena, Ark., and picks it up as a part of the St. Francis River.

The northward and southward drainage throughout this belt is in striking contrast to the eastward drainage in the eastern belt. It is in harmony, however, with the nature and lie of the rock beds and seems to have been determined by the latter.

The lowland is very poorly drained. A considerable portion of the water discharged into it by the small upland streams stands for long periods of time on the surface or flows slowly southward in ill-defined channels. Only the larger streams that come from the uplands maintain definite channels across the lowland. These all run southward.

With the exception of the high bottom between Hickory Ridge and the upland nearly all of the lowland is too wet to permit the cultivation of the ordinary farm crops with success. With the exception of Hubble Creek Overflow and Big Field Bog, south of Arbor, none of the lowland is covered with water except during the time of freshets. To reclaim this large area of land, as well as that to the south of Cape Girardeau County to the Aarkansas line, an extensive drainage project has been proposed and will undoubtedly be constructed within the next few years. The plan comprises in general a system of storage basins by which the waters from White-water River and Crooked and Hubble Creeks, and minor streams, are controlled and regulated with floodways and channels to carry this regulated flow into the Mississippi River. These works are located along the general parallel line of the upland. Ditches draining south from this diverting channel are to carry all surface water that is to be removed from the southern part of the lowland. Figure 3 shows the outline of the proposed drainage in so far as it is to affect Cape Girardeau County.

To protect the lowland from overflow by the Mississippi River during periods of high water the Federal Government has constructed a levee which extends from the foot of the upland, 3 miles southwest of Cape Girardeau, to the Commerce Hills in Scott County. All land east of the levee is subject to occasional inundation.

Cape Girardeau is one of the oldest counties in Missouri as regards settlement and colonization. France by virtue of discovery claimed the country as early as 1541. In 1794 Louis Lorimer and followers made the first settlement at the place now occupied by the city of Cape Girardeau, which was the fourth settlement made west of the Mississippi River. In September, 1762, France ceded to Spain all country west of the river. In order to encourage and aid settlement, grants of land were given to the settlers by the Spanish Crown. The size of the grant was regulated by the wealth and importance of the settler, the size of his family, and his ability to cultivate land. Except for special services, a concession rarely exceeded 800 arpents, which

is equal to 680 acres. Under these inducements many people came from Virginia, North Carolina, and Kentucky and located in and around Cape Girardeau. This was in reality the first purely American settlement west of the Mississippi River. The Spanish grants were confirmed by act of Congress and are maintained to the present time. The grants cover practically all of the southern part of the upland, though isolated grants are found in all parts of the county. They range in extent from 20 to 300 acres, with an average of 80 acres.

In October, 1800, the Louisiana country was retroceded to France, and in April, 1803, was sold to the United States. Cape Girardeau district, as organized October, 1812, embraced a large part of southeast Missouri, but in 1849, by act of Missouri Legislature, was reduced to the present dimensions of Cape Girardeau County. Burfordville was settled in 1797. Cape Girardeau became important as early as 1835 on account of the steamboat traffic on the river.

Beginning with 1834 there was a great influx of immigrants, mostly Germans. In 1810 the population numbered about 4,000. Although slaves were kept, Cape Girardeau County remained loyal to the Union during the Civil War. After the close of the war and up to 1871 there were again many German immigrants, but after this time immigration ceased almost entirely. In recent years the population has been increasing steadily, and Cape Girardeau County is one of the few counties in Missouri that has made a fair increase during the last decade. It is estimated that the Germans and those of German descent compose about 70 per cent of the population. The total population of the county, according to the census of 1910, is 27,621. This is evenly distributed in all parts of the county.

Cape Girardeau, with a population of 8,475, is the largest town in the county. Among its chief industries are railroad shops, cement and brick plants, brewery, shoe factory, flour mills, and stave, lumber, and veneer mills. The State normal school for southeast Missouri, established in 1873, and St. Vincent's College, founded 1843, are located here. Jackson, the county seat, is a town of about 2,105 people. Its chief industries are flouring mills and brick plants. It is a distributing point for all the northern and western parts of the county. Gordonville, Dutchtown, Allenville, Whitewater, Delta, and Randles are villages in the southern part of the county. Crossroad villages in the northern half of the county are Millersville, Burfordville, Oak Ridge, Fruitland, Pocahontas, Appleton, Daisy, and Friedheim. Neelys and Bainbridge are landings and stations along the Mississippi River.

Cape Girardeau County is well supplied with railroads. The St. Louis, Iron Mountain & Southern passes through the southwest

corner of the county. The St. Louis & San Francisco, following the banks of the Mississippi River, crosses the county. Branches of the same road extend from Cape Girardeau to Poplar Bluff and to Thebes. The Cotton Belt operates 9 miles of road through the lowlands. The Chester, Perryville & Ste. Genevieve, entering the county near the northwest corner, extends to Cape Girardeau. No part of the county is more than 10 or 12 miles from a railroad. The large markets—St. Louis, 100 miles; Memphis, Tenn., 200 miles; and Cairo, Ill., 50 miles—are thus brought within easy reach. Large quantities of freight are shipped by boat. No doubt the deepening of the Mississippi River channel would give an impetus to this phase of transportation.

The wagon roads are good and are well distributed. As a rule, they follow the natural contour lines instead of land lines. The main roads leading out from Cape Girardeau and Jackson are usually macadamized or graveled. The large quantities of gravel found in many of the streams, the pockets of silica, and the limestone rock occurring in numerous outcrops all supply good road-building material.

The area now included in Cape Girardeau County was originally covered with a heavy growth of timber. The prevailing varieties were black and white oak, gum, poplar, elm, hickory, walnut, cherry, and persimmon. Poplar was most abundant in the central part of the county. Cottonwood, maple, and sycamore were confined to the creek bottoms. In the lowlands, ash, gum, elm, cypress, birch, hickory, and pecan predominated. As late as 1840 the greater part of the county was still covered with forest, but at present the only timbered areas are the lowland and the river hills. In the upland practically all merchantable timber has been removed, although railroad ties are made to a considerable extent. At present rate of encroachment the 70 per cent of timbered lowland will be without forests in a few years. Numerous portable sawmills are distributed throughout the wooded areas. Besides ties and rough lumber, large numbers of logs and bolts are exported. The latter are used in the manufacture of staves, hoops, ax handles, etc. The value of all the forest products of the county in 1910 was estimated at \$677,640.

Nearly the entire population is engaged in agricultural pursuits, and appearances indicate a degree of prosperity not exceeded anywhere in south Missouri. The farmhouses are as a rule commodious one-story cottages. The more general use of paint and in many cases the placing of the barns and feed lots behind rather than in front of the houses would add much to the general appearance of the country. Barns and other outbuildings are generally small and of cheap construction. This condition is probably explained by the

absence of severe winters and the system of farming which does not necessitate the housing of the crops. Modern farm machinery is used throughout. The old-time rail fences are being replaced by modern woven-wire fences and in a few cases by Osage-orange hedges. Schools and churches are well distributed in all parts of the county. Telephone lines connect the country homes with the towns and villages. With a more intensive agriculture, and when once the lowland is reclaimed and cultivated, Cape Girardeau County can support many times its present population.

As the oldest agricultural section in Missouri, if not in all the country west of the Mississippi River, the agricultural practices have had time to adjust themselves, so that those in vogue now are probably the most profitable and practical under the existing conditions. Few farms change hands, and the people are assuming that stability in their methods of living which is characteristic of a long-settled community.

#### CLIMATE.

The climate of Cape Girardeau County, like that of all southeast Missouri, is distinctly humid. The winters are short and mild, and the summers are long and hot. The temperature ranges from a few degrees below zero during the coldest winter weather to 105° F. during the hottest periods of summer. Autumn is characterized by open, pleasant weather of 6' to 10 weeks' duration. Zero weather before Christmas is rare. Light snowfalls occur every year, but the snow rarely remains on the ground for more than a day or two. Late frosts occur in April and May and are often damaging to fruit. Moreover, peaches are often winterkilled, owing to the frequent periods of open, warm, sunny weather during winter, which cause the buds to swell. They are then killed by the almost invariable severe cold snap in February or March.

The precipitation is fairly uniform throughout the year, but is most abundant during the growing season, from March to August. In general, the precipitation of this region is about 5.5 inches above the normal for that of the State. The average annual rainfall is about 44 inches, but varies from 37 to 62 inches for different years. The average annual snowfall is about 15 inches.

The following tables, compiled from the records of the Weather Bureau station at Jackson, represent approximately the climatic conditions of Cape Girardeau County. The precipitation averages are for a period of 18 years, while those of the temperature are for 9 years.

*Normal monthly, seasonal, and annual temperature and precipitation at Jackson, Mo.*

Month.	Temperature.			Precipitation.			
	Mean.	Average for 9 years.		Mean average for 18 years.	Total amount for 1909.	Total amount for 1910.	Average number of days with 0.01 inch or more precipitation (average for 9 years).
		Absolute maximum.	Absolute minimum.				
December.....	36.7	72	-24	3.34	2.80	2.04	7
January.....	33.7	77	-7	3.80	3.16	.97	7
February.....	33.9	72	-11	3.15	6.25	3.04	7
Winter.....	34.7			10.29	12.21	6.05	21
March.....	46.6	88	9	5.06	5.39	.16	7
April.....	56.4	87	22	4.40	7.37	4.26	8
May.....	65.3	95	29	4.42	4.07	2.67	9
Spring.....	56.1			13.88	16.83	7.09	24
June.....	73.5	102	44	4.45	2.23	2.62	10
July.....	76.2	111	53	3.39	3.99	10.33	8
August.....	75.5	102	49	3.12	1.73	3.32	8
Summer.....	75.0			10.96	7.95	16.27	26
September.....	69.2	98	36	3.40	8.46	2.16	7
October.....	56.6	90	27	2.77	1.14	7.98	6
November.....	45.5	80	12	3.65	3.65	.35	5
Fall.....	57.1			9.82	13.25	10.49	18
Year.....	55.7	111	-24	44.90	50.24	39.90	89

*Frost data, Jackson, Mo.*

Length of record.	Average date of last killing frost in spring and first in autumn.		Latest date of killing frost in spring.	Earliest date of killing frost in autumn.
	Spring.	Autumn.		
17 years.....	Apr. 22.....	Oct. 11.....	May 19.....	Sept. 13.

From the above table it is seen that the average growing season is approximately 6 months long, which is ample for the maturing of all farm crops.

Droughts of more than 3 to 6 weeks' duration are rare and easily withstood by the soil. The snowfall is inadequate properly to protect the wheat, but since severe freezes are rare and of short duration, little damage is done from this source.

## AGRICULTURE.

Of all counties in southeast Missouri Cape Girardeau County, from an agricultural standpoint, ranks first. This position is not due to the fact that the agriculture of the county is much older than that of the adjoining counties, but because of the many favorable physical features which tend to make the county preeminently an agricultural one.

The history of the agricultural development of Cape Girardeau County is practically the same as that of all the territory along the Mississippi River and extending from the lowlands on the south to the Missouri River on the north. The first settlers built their homes along the water courses and eked out an existence by hunting and fishing while they cleared the unbroken forest. The land first converted into farms was the belt of territory extending west from Cape Girardeau to Hubble Creek and as far south as the lowlands. Corn and wheat were the chief crops grown. Enough cotton, flax, and tobacco were grown to supply the home demand. The surplus products of grain were shipped by boat to St. Louis, Memphis, and New Orleans. Little attention was given to the cultivation of tame grasses for pasturage, as the extensive forest furnished an abundance of mast and forage for the live stock. Conditions were extremely favorable for stock raising, the numerous springs and water courses affording a plentiful supply of water.

Spring wheat was never grown, but winter wheat was the most important crop from the earliest time. The extensive growing of wheat resulted in the building of several water-power flour mills along the streams in various parts of the county. Several of these mills are in use at the present time.

During the Civil War the agriculture of the county was completely at a standstill. Many of the farm homes had been destroyed, and fully 50 per cent of the land was advertised for sale to pay taxes. This condition, together with the scarcity of labor, caused cotton growing to be abandoned, and it has not been revived to this day.

After the war many settlers came into the county and agriculture again became flourishing. By the year 1866 about one-sixth to one-seventh of the county was in cultivation, and the cleared area was rapidly extended. Wheat and corn were the chief crops. The cultivation of tobacco, flax, and barley had ceased entirely, and oats and rye were grown to a very limited extent. The completion of the St. Louis, Iron Mountain & Southern Railroad in 1870 gave an impetus to grain growing in the southwestern part of the county. The raising of live stock was carried on by most farmers in a more or less desultory manner, but the sale of grain constituted the chief source of income. This was largely due to the fact that most of the

settlers were Germans, who knew how to grow grain but did not take much interest in live stock.

With the exception of the river hills along the Mississippi River and the timbered portions of the lowland, practically the entire county is under cultivation. In area wheat is the most important crop. The total acreage devoted to this crop in 1910 was 39,153 acres, with an average yield of 12 bushels to the acre, or a total yield of 469,836 bushels, representing a value of \$502,725. The total yield of the county is one fifty-eighth of the total wheat yield in the State. Maximum yields of 35 bushels are reported. The varieties grown are invariably soft red winter wheats. The entire product is ground into flour in the mills located at Jackson, Cape Girardeau, Gordonville, and Whitewater. The soils of Cape Girardeau County, particularly those of the upland, are peculiarly well adapted to the growing of wheat. The silt and silty clay loams derived from limestone have always been recognized as producers of high-quality wheat.

In preparing ground for wheat plowing is done in late summer and early fall. The seed bed is prepared with harrow and disk. Seeding at the rate of 4 to 6 pecks per acre is done with drills from the 1st of October to the middle of November. Late sowing is often practiced to avoid injury by the Hessian fly, which usually makes its appearance in early fall. The crop is ready to harvest the latter part of June. On the smaller farms the crop is stacked, but in larger fields thrashing is direct from the shock. The practice of a few farmers to sow clover in the wheat in spring is not as common as it should be.

Not only are the soil and climate well adapted to wheat, but the nature of the topography makes the growing of small grains in preference to corn imperative. Moreover, most of the farmers are Germans, who prefer to grow small grains rather than corn and live stock. During the past two or three years the acreage of wheat has steadily decreased. Various reasons may be given for this. The decreasing fertility of the land, several years of small yields and low prices, ravages of the Hessian fly, and increased erosion of the land, due to frequent plowing, have all combined to discourage the growing of wheat. Many farmers are paying more attention also to the live-stock industry, which has resulted in some of the wheat land being converted into grass land.

Next to wheat, corn is the most important crop in the area. The total acreage devoted to this crop in 1910 was 31,732 acres, with an average yield of 30 bushels, or a total yield of 951,960 bushels. During the past 10 years the acreage in corn has practically remained the same, but there should be a large increase as soon as parts of the lowland are reclaimed for cultivation. Very little of the corn

is shipped out of the county, as it is used for feeding the live stock. Only a small part of the crop is cut and shocked. The greater part is either husked or snapped without being husked, and the stalks left standing in the fields. During the winter the stock browse on the standing stalks. In spring the stalks are cut up with a cutter and plowed under. Since farmers are beginning to appreciate the food value of fodder this method is being abandoned by many and more corn is cut and shocked each year. Only a few corn harvesters and binders are used.

Both white and yellow corn are grown, but the former predominates. In the lowland the St. Charles White is most generally grown. According to experiments conducted by the Missouri agricultural experiment station, Boone County White and St. Charles White for white corn, and St. Charles Yellow, Reid's Yellow Dent, and Leaming for yellow corn are the varieties best adapted to this section of the State. For the lowland and bottom lands large-growing varieties, such as the Boone County White and Leaming are recommended. More attention should be given to the proper selection, housing, and testing of the seed corn, for by this means the seed and yield could be greatly improved.

Oats is not an important crop in Cape Girardeau County. The total acreage devoted to the crop in 1910 was 5,725 acres. As a rule, every farmer sows a few acres of oats and uses the product for horse feed. The success with which the crop can be grown varies with the season, and occasionally it is almost a complete failure. It is frequently used as a nurse crop, for which it is well suited. Maximum yields of 65 bushels are reported, but 29 bushels is considered a good average. Spring oats are grown exclusively, but it is probable that winter oats would be a success. More attention should be given to the occasional introduction of northern-grown seed and the growing of rust-resistant varieties. The injury from smut can also be remedied to a certain extent by treating the seed with formalin.

Rye is a crop of no economic importance in Cape Girardeau County. Occasionally a small patch is sown to serve as pasture or a cover crop. Rye is admirably adapted for these two purposes, and its use could be extended with profit. Occasional small tracts of sorghum are grown for use in the manufacture of sirup. It is not produced on a commercial scale. The best quality of sirup is made from sorghum grown on the Pocahontas, Clarksville, and Hagers-town silt loams, though larger yields are obtained on some of the other upland types.

Red clover is one of the most important hay and forage crops in the county. With the decreasing fertility of the land the value of clover as a soil renovator is appreciated more and more and its acreage increased. The soil and climate are admirably adapted to

the crop, and a stand can be secured with little difficulty. On account of the mild winters the plants are seldom injured by "heaving." The seed is sown with wheat or oats in spring and cut for hay the second year. Sometimes the clover is plowed under in the fall of the year it is sown and used as a green manure. This is a good practice. The average yield of hay is about 1 ton per acre. After two years clover fields are usually badly infested with grass and weeds. Growing clover for seed is not practiced as extensively now as in former years, but with the prevailing high prices more attention should be given to this crop. About 2,200 bushels of seed were produced in 1910.

Japan clover was seen along some of the roads. No doubt many pastures could be improved by introducing this crop. It is probable that red clover will not grow on the lower or wetter areas of the lowland. Alsike clover is particularly adapted to lands that need drainage, such as old sloughs, swales, and lands subject to overflow where the water is moving and not stagnant. It is valuable as a mixture in hog pastures. It has this disadvantage, that it throws up but a small aftermath; hence it is not satisfactory if sown alone, and if possible should be mixed with red clover and timothy. When harvested for hay it should be cut when in full bloom like red clover.

Alfalfa in Cape Girardeau County is a crop of only minor importance. It is grown primarily on the lighter soils of the lowland and does exceedingly well here. Four cuttings are made each year, which yield 2 to 4 tons per acre. Alfalfa will thrive on the loess and the better residual soils of the upland. As yet the crop has not been given a fair trial. Failures in securing a stand have undoubtedly been due to improper preparation of the seed bed. A good way to secure a stand is to apply a heavy dressing of well-rotted manure on wheat or oat stubble immediately after harvest and plow under. Harrow the land occasionally to kill weeds and retain moisture. Sow seed in August or first part of September at the rate of 15 to 20 pounds per acre. It is essential that the seed bed be free from weeds and grass. On the upland residual soils inoculation will probably prove profitable. Cultivating an alfalfa field after the second or third cutting with a disk harrow, or better, with a spring-tooth harrow, will tend to keep down the grass.

Timothy meadows are not numerous in Cape Girardeau County. Although the soil is well adapted to it, the climatic conditions seemingly do not favor the highest development of this crop. As a rule, timothy meadows are taken by orchard, Bermuda, and foxtail grass within two years, and for this reason clover and timothy are generally sown together, so that when either one of these does not thrive the other can take its place. Yields of timothy hay average about 1 ton per acre. Bermuda and orchard grass are more or less indigenous to the county, and are therefore seldom sown. Bluegrass does fairly

well, but never "takes" the land as readily as it does on the glacial soils of north Missouri. The keeping of more live stock during recent years has caused more attention to be given to the cultivation of grasses, with satisfactory results. The growth of the dairy industry should also give an impetus to the cultivation of tame grasses.

One of the growing practices among the farmers of Cape Girardeau County, and one that is gratifying to those who are interested in a permanent agriculture, is the increased use of cowpeas. Although they are grown to a small extent in all parts of the county, rather large fields of the crop were found in the vicinity of New Wells and Jackson. The importance of cowpeas as a soil renovator has not as yet been appreciated as fully as it should be. Their use is strongly recommended, especially for areas where clover is a failure. They give the same benefit to the land as clover in about one-fourth the time and with just as great profit when once the method of handling is understood. Cowpeas improve the land, whether grazed, cut, or turned under. Occasionally a crop turned under green would be of benefit, particularly in case of the heavier types of soils. Besides improving the land physically and by adding fertility, cowpeas are a profitable crop if the vines are cut for hay, which makes a very palatable and nutritious feed for all kinds of stock.

Cowpeas can be broadcasted or drilled in the corn at the last cultivation. When planted alone a good method is to drill the seed with a grain drill, sowing from 4 to 5 pecks to the acre. Seeding should not be done until two or three weeks after corn-planting time and when the ground is thoroughly warmed. Whippoorwill, Clay, and New Era are the recommended varieties.

As has already been stated, tobacco was grown on a commercial scale in Cape Girardeau County before the Civil War. Agricultural and economic conditions at the present time would warrant the revival of this industry. The county is favorably located with respect to large tobacco factories. Moreover, the limestone soils of the upland are peculiarly well adapted to this crop. These conditions, together with the prevailing prices and the demand for greater diversity in the farm practices, should all combine to make the tobacco-growing industry a profitable one in this area.

Raising live stock is second in importance to the growing of crops, but as a source of revenue it holds first place. According to the 1910 census the total number of stock in the county is as follows: Horses, 5,764; mules, 2,500; cattle, 16,265; sheep, 9,450; hogs, 24,294; together representing a value of \$1,132,000. Cape Girardeau County can not be considered a live-stock country, yet the surplus products from this source in 1910 were valued at more than one-half million dollars.

Very few pure-bred cattle are kept, and the grades are of medium quality only. A rather inferior quality of grade Herefords and Shorthorns is predominant now (1910). The farmers should give more attention to the introduction of better breeds and the improvement of their live stock. During recent years more interest has been shown along this line as a result of the growth of the live-stock business.

Comparatively few cattle are fed for market. Only occasionally are feeders shipped in from St. Louis or other stock markets, although some feeders are brought in from Bollinger and other counties to the southwest. As a rule, the home supply of cattle is sufficient to consume all surplus grain. Stock feeding is not made a specialty by any of the farmers, but nearly all of them prepare from 1 to 15 head of cattle for the market each year. The decreasing fertility of the land makes it imperative that the live-stock industry be given more importance in the general system of farming. The natural conditions, including a most favorable climate, are ideal. The mild winters do not necessitate the building of shelters for the stock. There is every reason to believe that as the lowland country to the south of Cape Girardeau County is developed and becomes a great corn-producing country large quantities of this product will be shipped to Cape Girardeau County, to be there converted into beef and pork.

The sheep-raising industry has reached its greatest development in the western part of the county, around Burfordville, where nearly every farmer has a small flock of these animals. The industry is growing and should be extended, especially in the northeastern part of the county, where the rugged topography does not allow frequent cultivation. The pastures could be supplemented by growing forage crops on the narrow strips of bottom along the streams. This would probably be the most remunerative system of agriculture for this section. Shropshire and Southdown, or grades of these, are the predominating breeds.

Hogs are raised on every farm in conjunction with cattle or fed direct. At present there is no "stock law" for hogs. This no doubt tends to retard their improvement to a certain extent; nevertheless, there is no stock in the county that exhibits more improvement in breeding than the hogs. Poland China, Berkshire, and Duroc Jersey are the most popular breeds. A few Chester Whites were seen. The value of the hogs exported annually from Cape Girardeau County is estimated at over one-fourth million dollars and constitutes one of the chief sources of income.

A few goats are kept in parts of the timbered sections, but they are not an economic factor as a source of revenue. They are primarily used to browse down brushy and scrubby timbered areas.

The raising of horses and mules is quite an important industry, and although no single farm is devoted entirely to this branch the number of farmers who have a few head for sale each year is large. The animals are generally sold when 1 or 2 years old, and shipped to southern markets. This industry received an impetus when the southern farmer gave preference to large-sized animals instead of the small "cotton mules." Mules are raised more extensively than horses for export purposes. It is estimated that the revenue secured from this source amounts to about \$150,000 annually. The farm horses are grades of a good quality and average about 1,100 pounds in weight. As a result of the high prices for horses in the past the better animals have been sold and the poorer grade has been retained for breeding purposes. This, in addition to indifferent methods of breeding, probably explains why the horses of this region are not of better quality.

Dairying is practically an unknown industry in Cape Girardeau County. Hardly enough butter and cream are produced to supply the local demand. The warm climate and the lack of good pastures may be partly responsible for this condition. Silos are found on two or three small dairy farms near Cape Girardeau. There is no reason why this industry should not be developed, since it is remunerative and is also a good means of building up the fertility of the land. It would, however, necessitate the building of silos, the use of separators, the growing of forage crops, and above all the introduction of dairy breeds. Proximity to good markets and good shipping facilities are already provided.

More or less poultry is kept on every farm, and is an important source of revenue. The climate and soil are peculiarly well suited to this industry. The surplus farmyard products, primarily in the form of eggs and live poultry, represented a value of \$549,112 in 1910.

On the better kept farms there are usually a few apple trees, and enough fruit is grown to supply the local demand. A few peach, cherry, and pear trees were seen. After the trees are planted no further attention is given them, spraying being unknown. It is therefore natural that fungus and insect diseases have infested the orchards everywhere, making this industry unprofitable until more scientific methods of handling are adopted.

There is no doubt that in time Cape Girardeau County will be one of the greatest fruit regions in Missouri and even in the Mississippi Valley. Few have as yet realized the excellence of the soil for fruit growing in this area. The loess soil found in the eastern and southern part of the county is preeminently a fruit soil. Its great depth and comparatively loose subsoil permit trees to thrive remarkably. Moreover, the topography of much of the eastern part of the county is such that it can not be used for cultivated crops, but can be utilized for orchards. Climatic and drainage conditions are excellent, and

this with the good markets and shipping facilities should bring about a great development of the fruit-growing business.

Small fruits such as blackberries, raspberries, and strawberries are grown for local market only. Most farmers have a small vineyard and use the product for making wine. Grapes, berry fruits, and truck crops all do remarkably well. The growing of watermelons for market will probably become of importance in the lowland when more intensive farming is practiced. A canning factory at Oak Ridge uses tomatoes, corn, and apples.

Although practically all the timber has been removed from the greater part of the county, no attempt has been made to replace it by the planting of woodlots. At the present rate of consumption the supply of timber will be exhausted in a few years. A small woodlot on every farm, especially in the rougher sections, would undoubtedly be profitable as a source of fuel, fence posts, and rough lumber.

The cultural methods practiced in Cape Girardeau County are, as a rule, good. When wheat follows corn the seed bed is prepared by disking and harrowing the land several times. When meadows and pastures are broken up, plowing is usually done in the fall. Careful preparation of the seed bed, together with deep fall plowing, always proves profitable. The latter practice is especially recommended, since it permits the air to penetrate the soil, and the alternate freezing and thawing of the soil has a tendency to loosen up the subsoil, thus putting it in better tilth and insuring a better seed bed for the next crop. Another desirable effect of deep, careful fall plowing is that it enables the soil to absorb and store up winter rains, thus placing at the disposal of the plant roots for the next year a larger quantity of moisture, mitigating the effect of droughty conditions which occasionally prevail in late summer.

One of the objectionable features that the farmers, especially those on the loess soil, have to contend with is excessive erosion. The relatively warm climate causes the rapid decay of the organic matter and soils low in humus tend to wash more than those containing large amounts of humus, and one method of checking erosion is to keep the soil well supplied with organic matter. Slopes should not be put in cultivated crops, such as corn, for two years in succession. Seeding the land to grass is the most effective method to check erosion. If care is not taken fall-plowed land will wash badly during the winter months. In order to avoid this loss the growing of winter cover crops is recommended. In addition to this the cover crops furnish excellent pasture for stock. Rye is admirably adapted to this purpose, though wheat and oats are sometimes used and can be harvested if not grazed too close and late in the spring.

Commercial fertilizers are not used. Although their general use is not recommended, it is probable that phosphatic fertilizers would prove profitable. These can be supplied most cheaply in this section in the form of ground-rock phosphate. It should always be applied either with stable or a green manure.

Stable manures are carefully saved and used, but the supply does not equal the demand. The continuous grain farming necessitates the use of large quantities of manure or fertilizers if the land is to be kept in productive condition. Much straw is obtained from the wheat fields, and more attention should be given to converting this material into manure and putting it on the land. Animal manures could be made more effective by the use of a spreader, for by this means they would be scattered over larger areas. So far as practicable, they should be spread as soon as made. The necessity of applying organic matter is obvious when we consider that it is upon the humus supply more than upon any other one factor that the productiveness of a soil depends. The live-stock farmer can build this humus most rapidly, since he can feed all his crops back on the land. The grain farmer will have to depend more upon the growing of special crops, such as cowpeas and clover, for turning under if the organic content of his soils is to be increased or even maintained.

Although parts of Cape Girardeau have been cultivated for more than a century, these areas are as productive now as they were in early times. This condition is due to the fact that more or less attention was given to proper crop rotation. The fact that wheat and corn have given such good returns has led to the excessive culture of these crops without proper systems of crop rotation, resulting in many cases in a greatly decreased humus supply and a consequent decrease in productiveness. In the sections where wheat has been the most important money crop its continued culture without the use of manure or fertilizers has caused a much greater depletion of humus than would otherwise be found.

Each farmer should adopt a crop-rotation system which answers the requirements of his farm and the soils found thereon. At present a rotation consisting of corn two years, wheat two years, and clover one or two years seems to be the most popular. It is a fairly good one, but should include another legume. Rotations suggested for the various soil types will be given later. In general, a four-year rotation containing legumes two years will maintain the humus supply.

As a rule the most improved farm machinery is used. Only a few manure spreaders were seen. The double cultivator should be more generally substituted for the one-horse implement, for with the present scarcity of labor the use of the latter is not economical. Proper housing of the farm implements should also be provided. The annual loss sustained from this source probably amounts to many thousand dollars.

The soils in no part of Missouri respond more readily to good treatment than do the upland soils in Cape Girardeau County. A wornout field can be rejuvenated in one to three years by the judicious use of manures, fertilizers, and crop rotation. However, on account of their porous, loamy structure they are readily depleted of their content of organic matter if grain crops are grown continually. The physical condition of the soil is normally nearly ideal. The content of clay is sufficient to insure the retention of moisture and fertilizers. Under this system of farming large quantities of manure can be made, and the use of this on such a soil is highly profitable. The lowland soils have a high fertility, and when once they are provided with good drainage and the humus supply maintained they will produce maximum crops.

The average size of the 2,576 farms is 135.5 acres. This average will probably be reduced within a few years when some of the larger farms, and notably the Alt estate, containing thousands of acres, will be divided into smaller farms. In the vicinity of Cape Girardeau the majority of farms contain considerably less than 100 acres. Land rent varies from \$2 to \$5 an acre, depending on location and kind of land. Where crop rent is given it is usually one-third or one-half of the crop.

Practically all the farms are operated by the owners. During recent years these conditions have been changing somewhat, since many of the farmers remove to the towns and rent their land. The usual labor difficulties are encountered, but do not reach such serious proportions as in the northern part of the State. Farmers have solved the labor problem to a certain extent by greater use of labor-saving machinery and by putting larger areas of their land in mowings. Monthly wages for farm labor vary from \$20 to \$30, with board and lodging in addition. Day laborers can generally be had for \$1.50 to \$2 a day.

Comparatively few farms are mortgaged, and these obligations are being paid off rapidly. Land values vary considerably. The River Hills sell for \$15 to \$40 an acre; land in the western part of the county is held at \$20 to \$50, while in the central part of the county land values range from \$35 to \$100 and \$150 an acre. In the lowland prices range from \$20 to \$125 an acre. Land values have never been higher in the history of the county, and the tendency is to still higher prices.

#### SOILS.

On account of the two natural physiographic divisions the soils of Cape Girardeau County have been grouped as upland and bottomland soils. The upland is by far the more extensive and comprises about three-fourths of the entire area. Whatever is said of these soils and the agriculture practiced thereon is also applicable for all

practical purposes to the soils of those geological regions of which Cape Girardeau County forms a part.

The geology of the upland region of the county consists of stratified layers of limestone, sandstone, and shales formed from sediment laid down in an ancient ocean. The disintegration and decomposition of these several rock formations has resulted in the production of a distinct soil type for each layer. With the exception of the alluvial, colluvial, and æolian areas, which represent a mixture of material from different formations, the soils bear a direct relation to the underlying rocks, and in most places their boundaries are as easily outlined as those between the rocks themselves. These rocks are disintegrated to a depth of from 1 to 40 and even 60 feet, the greatest depth of the soil mantle occurring where the softer shales and chert-free limestones are exposed. None of the soil types as found in the area can be said to be derived from any one of the formations exclusively, as all the formations above have contributed more or less material to the soil below.

The rocks of this county are wholly sedimentary, consisting of Paleozoic and Recent deposits. The Paleozoic formations comprise the indurated rocks of the region, and the Recent the alluvial deposits. The geological formations belong to the Cambrian, Ordovician, Silurian, and Devonian systems, and consist of beds of limestone, sandstone, and shale of varying thickness. The beds dip east and northeast at an angle from 6° to 9° in conformity with the general slant of the eastern slope of the Ozark region. Outcrops at the surface are in zones, having a northwestward and southeastward trend.

The lowest and oldest geological formation in Cape Girardeau County is the Jefferson City limestone, occurring in the western part of the county. It consists of massive, crystalline layers, usually gray in color, and contains a comparatively small amount of chert. The next layer above is the Crystal City sandstone. It is thin bedded and is composed of a white to yellowish siliceous sand, which disintegrates readily when exposed to the weather. The Trenton limestone is the next formation in the ascending series. This is a bluish, massive, fine-grained, chert-free limestone, which weathers comparatively fast. Above this is the Hannibal shale. It is a thin belt composed of shale and fine-grained argillaceous sandstone. The highest formation is the Mississippian limestone, a fairly hard limestone containing a large percentage of chert.

Of these rocks the Trenton limestone and the Crystal City sandstone are the most important from an economic standpoint. The sandstone is well suited for the manufacture of glass. The limestone is extensively used in the manufacture of lime and cement, and when crushed is used as a road material. It is also used for building purposes.

All the residual soils are derived almost entirely from the breaking down of limestone rock, the sandstones and shales contributing in an almost negligible proportion. Each formation originally extended farther west, and has been worn back to its present position, leaving some of its decomposition products scattered over the surface. The subsoils in going westward across the belts depart more and more from the typical of each type and partake more and more of the nature of the next belt of soil to the west. Because derived from similar material and acted upon by the same conditions all these soils show a well-marked relationship to each other, and any division made between them must be indicated by a more or less arbitrary line.

A striking characteristic of the soils is their high silt content, all of the surface soil being a silt loam. Through the soil mass the more resistant, cherty part of the rock is scattered in proportion as it occurred in the original rocks, though generally most abundant on the surface. The effects of weathering extend down 20 and even 40 feet below the surface, as is indicated by the brownish color, and is due to a high degree of oxidation of the iron content. This color in a subsoil invariably indicates that condition of mineral and organic constituents, which may be considered the normal state of a good productive soil in this region. Such thoroughly aerated and oxidized soils have very few if any undesirable chemical or physical properties, and are well suited to general farming. They are easily made productive, in general are well drained topographically and texturally, and if properly managed they maintain a favorable supply of moisture for growing crops.

The only upland soil not residual in origin has been named the Knox silt loam, the name given to the same kind of soil in other areas. It is derived from a silty material commonly known as loess. Loess is widely distributed over the Mississippi Basin, as well as over the Rhine Valley in Europe and large districts in China. The vast extent of the deposit, its uniformity, and lack of well-marked stratification lines have involved its origin in doubt, and the probable manner of its deposition is still a matter of contention among geologists. It is certain that the loess was assorted by either wind or water, or both, during the Glacial period, from the mass of material left over regions to the north of this area at the time of retreat of the ice sheet. Whether the silty loam of this area is derived from original deposits or from some of the material that was transported and re-deposited is immaterial, but it is evident that the loess mantle was originally continuous and probably of about uniform thickness over considerable areas. As a rule it thins westward in this region.

As has already been stated, it is supposed that the Mississippi River at one time occupied that region now known as the lowland. After the river changed its course to the position it now holds the

old stream bed gradually filled up with material brought down by the river from the north and also with material washed in from the adjoining uplands. As the land was built up higher it was overflowed during periods of high water only, and consequently there was considerable difference in the current at different places and a difference in the size of the particles deposited. To the assorting power of water may be attributed, to a large degree at least, the variation in the size of the soil grains in different parts of the lowland. In swift currents only the heavy, coarse material is deposited; in more slowly moving streams finer particles settle to the bottom, while the finest particles forming silt and clay will not settle until the water is almost or quite still. It will be noted from the map that the heavy soils of this region are confined chiefly to the southern part of the county, which is still occasionally inundated by backset water from the Mississippi River. Along the upland, where large quantities of material were washed in by the creeks and draws, the soil shows considerable variation, but the remainder of the lowland is characterized by large areas of uniform soil. The region between the upland and Hickory Ridge is composed primarily of material washed from the adjacent high ground and therefore possesses a greater variation in its soil than the main body of the lowland.

The soils of the area have been classified according as they differ in origin, mechanical composition, topographic position, agricultural value, and depth of soil and subsoil. Thus, those soils that are alluvial and colluvial in origin have been mapped as the Huntington silt loam, Huntington loam, Lintonia silt loam, and Judson silt loam. The other bottom soils are probably entirely alluvial, but they vary so widely in origin, color, texture, and agricultural value that they could not be included in a soil series, and to each of them has been given either a local name or the name that has been given to the same kind of soil mapped in some other area.

The following table gives the name and extent of the various soils mapped in Cape Girardeau County:

*Areas of different soils.*

Soil.	Acres.	Percent.	Soil.	Acres.	Percent.
Hagerstown silt loam <sup>1</sup> .....	111,424	30.3	Judson silt loam.....	7,616	2.1
Knox silt loam.....	60,864	16.6	Lintonia silt loam.....	7,552	2.1
Tilsit silt loam.....	39,168	10.7	Huntington loam.....	4,864	1.3
Clarksville silt loam.....	36,096	9.8	Sharkey clay.....	2,752	.7
Waverly silt loam.....	32,320	8.8	Elk silt loam.....	1,984	.5
Pocahontas silt loam.....	23,616	6.4	Yazoo loam.....	1,344	.4
Huntington silt loam.....	17,280	4.7			
Holly silt loam.....	11,776	3.2	Total.....	367,360	.....
Wabash clay.....	8,704	2.4			

<sup>1</sup> Western belt includes some areas of Hagerstown stony loam.

HAGERSTOWN SILT LOAM.<sup>1</sup>

The soil of the Hagerstown silt loam is a light-brown, faint reddish-brown, brownish-gray or yellowish-gray silt loam, with a depth of 9 or 10 inches. The subsoil from 10 to 36 inches is a brown, slightly reddish-brown, brownish-gray or yellowish-gray loam, or silty clay, silt loam, or silty clay, usually becoming heavier with depth to 30 inches. Below 30 inches it is sometimes mottled and more silty in texture. Scattered throughout the subsoil are small black and brown iron stains and gray streaks. The soil type is distinctly uniform in color and texture and is noticeably silty, especially in the surface 24 inches. The depth of the soil is therefore determined by the depth to which organic matter has been incorporated. The soil contains some chert fragments, the quantity being greater in the western belt, but is loose, friable, and easily handled. Its physical properties are such that it is readily made productive and if properly managed will maintain a favorable supply of moisture for growing crops.

As already stated, the Hagerstown silt loam is derived from limestone—in the eastern belt the Trenton and in the western the Jefferson City formation. The former occupies the central part of the county as a belt varying in width from 2 to 9 miles and terminates about 3 miles south of Jackson. South of that it is covered with loess.

The topography of the type varies from gently rolling to rolling, but most of the area has a surface favorable to cultivation. Along the western border of the eastern belt of the type there are many sink holes, the result of leaching of the underlying limestone. Occasionally they are numerous enough to unfit areas from 1 to 10 acres in extent for agricultural use. Wherever they occur the soil mantle is usually not more than 1 to 10 feet thick. The nature of the surface and the open structure of the soil insure thorough natural drainage.

The Hagerstown silt loam was originally covered with a heavy growth of timber, consisting of black oak, white oak, poplar, elm, gum, walnut, and hickory, but at present only a few 10 to 40 acre tracts used for woodlots remain. About 90 per cent of the eastern belt of the type is in a high state of cultivation; of the more rolling western belt 70 per cent is under the plow. The forested areas consist of the steeper, more cherty slopes. Wheat, corn, grass, and oats are the principal crops in the order named, and are well adapted to the soil. As a wheat soil it is unexcelled by any in the area. In many places wheat has been grown continually for 25 to 50 years on the same land, and still large yields are secured. The southern part

<sup>1</sup> The western belt includes some areas of Hagerstown stony loam. The largest areas of excessively cherty soil are west of Gravelhill.

of the type was among the first land to be taken up and cultivated by the early settlers, and, although it has been producing crops for almost a century, it is considered as productive now as when first put to the plow.

Corn yields on this type range from 25 to 75 bushels per acre, with 35 bushels an average. Wheat yields average from 10 to 25 bushels, and oats 30 to 40 bushels per acre. The Hagerstown silt loam is a natural clover soil, and rarely is there any difficulty in securing a stand. It is not a typical grass soil, yet bluegrass and timothy thrive on it. Yields of hay average about 1½ tons per acre. As a grass and pasture soil the soil in the western belt is one of the best in the county.

In general, the Hagerstown silt loam may be considered the best soil of the upland types, though the type in the western belt is not so productive as that of the eastern belt. It is somewhat deficient in humus, but this can easily be supplied by growing legumes and applying barnyard manure. Of prime importance, therefore, in the management of this soil is the maintenance of the humus supply through the growing of such crops as clover and cowpeas and either pasturing them, feeding them and returning the manure, or turning them under. A high content of organic matter is also the most effective preventative against soil erosion. To this end the acreage of corn should be reduced and a greater acreage devoted to the grasses.

Land of this type in the eastern belt sells for \$40 to \$125 and in the western belt for \$25 to \$65 an acre, depending on location and convenience to market.

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

*Mechanical analyses of Hagerstown silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24925, 24933.....	Soil.....	0.0	0.1	0.3	0.5	1.1	84.2	13.7
24926, 24934.....	Subsoil.....	.0	.2	.2	.4	1.1	68.6	29.3

TILSIT SILT LOAM.

The surface soil of the Tilsit silt loam, to an average depth of 9 inches, is a light yellowish-brown silt loam. On the steep slopes and wherever the underlying sandstone comes near the surface the soil usually contains more or less fine sand, but these areas are small in extent and of no economic importance. The subsoil from 10 to 24 inches is slightly heavier in texture, probably a silty clay loam, and

has a lighter color than the soil. The subsoil below 24 inches is a mottled yellow, brown, and gray silty clay loam.

The surface 2 feet of soil resembles a limestone soil more than a sandstone soil, and it is more than probable that much of this material has been derived from the higher Trenton limestone. The lower subsoil has all the indications of being derived from the underlying sandstone.

The Tilsit silt loam is mellow and easily cultivated. It forms a soil belt varying in width from 1 to 5 miles, and extends from the northwest part of the county to the north side of the lowlands, but like the Hagerstown silt loam has its southern portion covered with loess. Its topography is gently rolling. The surface drainage is thorough everywhere, and this in addition to the rather loose-structured subsoil often permits of excessive erosion.

The type was originally timbered, but practically all of it is now under cultivation. Wheat, corn, grass, and oats are the principal crops. Yields are not as large as on the Hagerstown silt loam, for it is not as productive a soil as the latter, and is inferior as a grass soil on account of its porous subsoil.

The matter of chief concern in the management of this soil type is the maintenance of the organic matter supply, for it is humus that the soil lacks most. Such a system of farming should therefore be adopted which will supply this material in the greatest quantities. The present system of farm practice does not produce enough manure, and the necessity of growing legumes is therefore obvious. In other words, a system of farming should be adopted in which grain crops, such as corn, wheat, and oats, should alternate with crops that tend to leave more organic matter in the soil. The live-stock farmer can maintain the organic supply more readily, since he can feed all his crops and return to the land all the by-products. The grain farmer must depend more upon the growing of special crops, such as cowpeas and clover, and turning them under. If these conditions are provided there is no soil in Cape Girardeau County that responds more readily and with greater returns than does the Tilsit silt loam.

A rotation suggested for this type, and one that is also applicable to the Hagerstown silt loam, is the following: Corn one year, wheat or oats one year, and clover and timothy two years. If oats follow corn, cowpeas should be seeded in the corn at the last cultivation.

In general, the improvements, such as houses, barns, etc., on this type do not indicate the farmers to be as prosperous as those on the Hagerstown silt loam. However, it can easily, with intelligent cultivation, be made as productive as any other of the upland soils.

Land of this type sells for \$20 to \$70 an acre, depending on the topography and distance from market.

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

*Mechanical analyses of Tilsit silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24945.....	Soil.....	0.0	0.2	0.4	1.1	2.4	77.3	18.3
24946.....	Subsoil.....	.0	.1	.3	.7	2.3	69.0	27.4

POCAHONTAS SILT LOAM.

The Pocahontas silt loam consists of a yellowish-gray to light-brown silt loam, underlain at about 9 to 12 inches by yellowish silty clay or silty clay loam. On account of its silty character the soil is easily worked. The type is free of chert fragments, with the exception of small included areas which really represent areas of the Clarksville silt loam too small to map.

The soil is derived from shales with some limestone. The topography is much smoother than that of the Clarksville silt loam and the agricultural value much higher. However, the two types grade into each other, making it difficult in places to draw a sharp boundary.

The Pocahontas silt loam is developed in a strip from about 1 to 4 miles in width bordering the Clarksville silt loam to the west. The topography is prevailingly rolling.

This is an excellent agricultural soil, being well suited to corn, wheat, clover, and grass. Cowpeas are grown quite extensively, giving excellent yields. The smoother areas are not excelled for corn by any of the residual types. With proper management alfalfa could be successfully grown.

The type sells for \$30 to \$70 an acre. Some of the most highly improved farms of the county are included in this type.

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

*Mechanical analyses of Pocahontas silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24939.....	Soil.....	0.0	0.2	0.2	0.5	1.4	83.3	14.4
24940.....	Subsoil.....	.0	.0	.1	.2	.6	71.6	27.4

CLARKSVILLE SILT LOAM.

The surface soil of the Clarksville silt loam is a dark-gray to yellowish or brownish gray silt loam, varying in depth from 9 to 12 inches. The subsoil from 12 to 30 inches is a yellowish-gray silty

clay, which has a tendency to be sticky when wet. The lower subsoil is a mottled yellow and brown silt loam. There is no distinct line between soil and subsoil. On account of its silty nature this soil is easily handled.

The type has its greatest development in the northeastern part of the county. It represents the decomposition product of the Mississippian limestone, and constitutes the roughest land in the county, being locally known as the "River Hills." Dissection is complete everywhere. The valleys have been cut down to great depths, and their slope to the north is usually steep. The narrow ridges or divides have a general east and west trend. Receding from the river and also along the southern border of the type the topography becomes less hilly and the slopes are more gradual.

In general, the south slopes of this soil are always extremely cherty, while the tops of the hills and the north slopes are chert free. On the latter evaporation is less, oxidation and decomposition are more active, and the chert and limestone are more thoroughly decomposed. On the southward-facing slopes moisture is soon evaporated and decomposition is retarded. However, the rapid changes in temperature cause the compact flint to be broken up into small pieces. Characteristics of the flint stones are their uniform size, about 3 inches in diameter, and their sharp angular edges.

The drainage is everywhere excessive. As yet the greater part of the type is covered with timber, and it is only the more gradual slopes along the larger streams that are cultivated. The timber growth consists of black, white, and pin oak, elm, hickory, and gum.

Scattered throughout the northern half of the county are chert hills and ridges, varying in extent from 10 to 400 acres, and usually rising from 10 to 50 feet above the general level of the surrounding country. These hills consist of almost pure chert and are remnants of the Mississippian limestone that have not as yet been removed by erosion and weathering. They are covered with timber and are worthless agriculturally. Whenever the chert material is weathered sufficiently it furnishes excellent road material.

The change from this type to the Pocahontas silt loam is an abrupt one, the latter having a lower level topographically as well as geologically. The change in many places is indicated by a distinct escarpment which varies from 10 to 50 feet in height, but in some places the division between the two types is a more or less arbitrary one.

Corn, wheat, and grass are the principal crops on the Clarksville silt loam and are about equally distributed. Yields of wheat range from 10 to 20 bushels. Corn yields range from 30 to 40 bushels per acre. It is a natural clover soil, and grass thrives on it everywhere. Cowpeas are extensively grown and do exceedingly well.

The excessively cherty and hilly areas are adapted only to the production of timber. Taking the eastern phase of the type as a whole, it should be used primarily as a grass and live-stock country. The topography will not permit the extensive growing of grain, but the soil is well suited for pasture land. The pastures can be supplemented by growing forage crops on the creek bottoms. Supplying the soil with organic matter and preventing soil washing are the two matters with which the farmer on this type should be most concerned. This can be done most easily by the use of legumes and the growing of grass.

It is generally recognized that the hills nearest the river are more productive than those farther west. This is undoubtedly due to the thin coating of loess that covers much of this area.

The Clarksville silt loam offers excellent opportunities for fruit growing. The soil, drainage, and shipping facilities are well suited for this industry, and areas that are not too steep could be utilized for orchards.

The type sells for \$15 to \$40 an acre, depending on location, timber, roughness of surface, and amount of chert in the soil.

#### KNOX SILT LOAM.

Beginning at Neelys Landing, in the northeastern part of the county, extending in an ever-widening belt southward to the end of the upland, and following the latter westward to the county line, is a belt of territory covered with a mantle of fine material called loess. This belt attains its greatest width and most perfect development at Cape Girardeau and west from there to a width of 8 miles. There are many reasons to believe that the loess formerly covered a much larger area, probably more than one-third of the entire county; but, owing to the action of erosion, its distribution has been limited to the area as indicated on the accompanying map. Small patches of the loess are found scattered over the county 2 to 4 miles west and north of the main area, but these patches are too small to be indicated or the loess is so mixed with material of residual origin that it could not be classed as the Knox silt loam. It is only where the loess is 3 feet or more in depth that it gives rise to a distinct type of soil. Nevertheless, the beneficial effect over the entire area in which traces of this material are found is readily noticed.

The typical profile of the Knox silt loam consists of a brown or brownish-gray silt loam to a depth of 12 inches, underlain with a brown silt loam slightly heavier in texture. The soil and subsoil, not only to a depth of 36 inches 6 to 8 miles away from the river, but to a depth of 60 feet or more along the bluffs, are practically of the same texture and material throughout. The determination of the depth of the surface soil, then, is a question as to the depth to

which organic matter has been incorporated, which is shown by the characteristic dark color. There is a perceptible gradation of particles composing the type in going away from the bluffs, for there is distinctly more of the clay and less of the coarse silt toward the western border of the type. The soil is mellow and easily cultivated.

Occasionally the deep subsoil has a few small yellow and gray mottlings or streaks, but the characteristic lime and iron concretions and shells are not present. The Knox silt loam in Cape Girardeau County is practically identical with the loess of northwest Missouri, but differs from the latter in having a somewhat lighter color and a slightly heavier texture. The first difference is probably due to the warmer climate and greater rainfall, which causes a more rapid decay of the organic matter and more leaching of the soil. The difference in texture may probably be explained by the fact that the loess material in Cape Girardeau County was carried a much greater distance by water and that, owing to the deposition of the coarser particles first, only the finer particles were brought this far south.

The topography of the Knox silt loam varies from hilly to gently rolling, the hilly portion being confined to the eastern part of the county. West of Cape Girardeau the type is gently rolling and includes some of the best farming land in the county. In the hilly areas the loess has in many places been washed from the slopes and accumulated at the foot of the hills in great quantities, often attaining a depth of 50 feet. All terraces found along the Mississippi River are composed of this material.

The surface drainage of the Knox silt loam is everywhere perfect and frequently excessive. Few soils have better capillary action, for the uniform size of the silt particles permits the water to pass up or down readily, thus insuring at all times the most favorable moisture condition for plant growth.

Originally all of this type was timbered, but at present it is only the hilly areas that are still covered with tree growth.

Corn, wheat, grass, and oats in the order named are the principal crops grown on this type and are all admirably adapted to it. It is especially well suited to corn, and yields range from 30 to 50 bushels per acre, though 85 bushels are occasionally secured. Wheat yields range from 10 to 25 bushels, with 18 bushels a good average. Thirty to thirty-five bushels is considered a good oat yield. Grass and clover produce about  $1\frac{1}{2}$  tons per acre.

In natural fertility and the ease with which the mineral plant-food elements are made available this soil is excelled by none of the upland type. What it needs most is organic matter. Manure and legumes should therefore be used liberally. Soil washing can be checked to a great extent by not putting corn on the same land two years in succession. Whenever practical, the rows should parallel the

slope rather than run diagonally to it. Clover does exceedingly well on this type. Of all the upland soils it is best suited to alfalfa. The latter will grow readily and without any special treatment, but better stands are secured if the land is first given a good coating of manure. A rotation that is well suited to the rolling land of the Knox silt loam is the following: Corn and cowpeas one year, corn one year, wheat or oats one year, clover and timothy two years.

The Knox silt loam is preeminently the fruit soil of Cape Girardeau County. Apples, peaches, and all berry fruits thrive remarkably well on it. The loose, deep subsoil permits the trees to send their roots down to a great depth. Strawberries and the various truck crops also thrive. When once its value as a fruit soil is recognized fruit growing will become an important industry.

The rougher land of this type, such as is found to the south of Neelys, sells for \$20 to \$40 an acre. In the vicinity of Cape Girardeau and west around Gordonville land of this type is held at \$50 to \$100, and occasionally a sale at \$125 an acre is made.

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

*Mechanical analyses of Knox silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24937.....	Soil.....	0.0	0.1	0.1	0.3	1.1	82.4	16.0
24938.....	Subsoil.....	.0	.0	.1	.1	1.5	71.4	27.0

HUNTINGTON SILT LOAM.

The Huntington silt loam is a dark-gray or brown to almost black, rich, mellow silt loam, 15 to 20 inches in depth, underlain with somewhat lighter colored and slightly heavier, probably silty clay loam, subsoil down to 40 inches. Occasionally the subsoil is a dark-gray silt with yellow and brown mottlings. Frequently the entire soil section of 3 feet shows no appreciable change in color or texture. The characteristic features of the type are its mellowness, due to the high content of organic matter and the ease with which it can be cultivated.

The Huntington silt loam is a bottom soil, and is found along the streams and draws of the upland. It is both alluvial and colluvial in origin, and consists of material washed from the adjoining limestone hills and deposited by streams during periods of high water. Much of it receives a fresh coating of silt and organic matter each winter and spring. It occupies a level position 5 to 10 feet above the normal level of the stream, but much of it is subject to overflows during

periods of high water. The mellow character of the soil admits free movement of soil water, and the proximity to streams insures rapid removal of surface water, so that natural drainage is good.

The type was originally covered with a heavy forest growth, consisting of elm, sycamore, cottonwood, hickory, and gum, but practically all of it is now in a high state of cultivation. Corn is the principal crop, and yields range from 40 to 80 bushels per acre. The mellow character of the soil and its high content of organic matter make it an excellent corn soil. Wheat is likely to be injured by winter flooding and is not generally grown. Although grass thrives on this soil, it is considered more profitable when used for grain crops. When not flooded too frequently it is a good alfalfa soil. It is also well suited to trucking and fruit growing. The occasional coating of sediment takes the place of manure, and fertilizers are never used.

#### HUNTINGTON LOAM.

The Huntington loam, like the Huntington silt loam, is a bottom-land soil found along the streams and draws, but its distribution is limited to the territory occupied by the Tilsit silt loam. It is the most variable type in the area and frequently more nearly resembles a fine sandy loam than a loam. In its typical development the surface soil is a dark or brownish gray loam to a depth of 15 inches. The sand content is fine grained. The subsoil is lighter in color, and as a rule contains less sand than the soil and occasionally is a pure silt.

The type occurs chiefly along the courses of Whitewater River and Cane Fork at irregular intervals as narrow marginal strips, and along the small tributaries of these streams. It is of heterogeneous nature and consists of alluvial or colluvial material. From the steep slopes flanking the narrow valley on each side material has been washed to lower lying land, where it has become mixed with silt, sand, and clay deposited by the stream.

One phase of this type is found along the Mississippi River in the southeast corner of the county and consists of a dark-gray fine sandy loam formed during periods of overflow by the river. An entire soil section of 3 feet shows no appreciable change either in color or texture.

The Huntington loam is an excellent corn soil and is used for this crop almost exclusively. Wheat, oats, and grass do well, but are rarely grown. As an alfalfa and trucking soil it is one of the best in the area, being mellow and easily cultivated. Like the Huntington silt loam, it is subject to overflows, which greatly depreciates its value.

On account of its variable composition no samples were taken for mechanical analyses.

## LINTONIA SILT LOAM.

The soil of the Lintonia silt loam to a depth of 15 inches is a dark or yellowish gray to dark brown coarse silt loam. The subsoil down to 36 inches is a yellowish gray silt, slightly lighter in color than the soil and contains brown and yellow iron stains. Occasionally the lower subsoil below 30 inches is a light ashy gray silt, containing many iron concretions. On account of the high percentage of organic matter and the coarse texture of the silt particles, this soil is very mellow and easy to cultivate.

The type is found along the streams in the region occupied by the Knox silt loam. The largest areas are along Juden, Big Flora, and Cape La Croix Creeks. The soil is mainly colluvial in origin, representing reworked material of the Knox silt loam. It is subject to inundation, although it occupies relatively higher bottoms than the Huntington or Holly silt loams.

Practically all of the type is in a high state of cultivation and is used almost exclusively for the production of corn. Yields of this crop range from 50 to 85 bushels per acre. It is also well adapted to wheat, grass, and clover, and as an alfalfa soil it is one of the best in the area. The mellow character of the soil and its high fertility make this an ideal trucking and fruit soil.

No special price can be given to land of this type, since it is always included within some of the upland soils.

## JUDSON SILT LOAM.

The Judson silt loam consists of 18 inches of a dark or yellowish-gray coarse silt loam, underlain to 36 inches by a somewhat lighter colored yellowish-gray material of practically the same texture as the soil. The difference between the soil and subsoil is determined primarily by the difference in the content of organic matter. The soil is very mellow and easily worked, because of the high content of organic matter and the relative coarseness of the silt particles.

The Judson silt loam occurs as a belt of varying width in the lowland along the foot of the bluffs. The largest areas are found south of Dutchtown and extending to the east and west from this point. The Judson silt loam is both alluvial and colluvial in origin, and consists of sediment deposited by streams during floods and of material washed from the adjacent hills. It is undoubtedly derived from the loess, as a soil profile closely resembles the Knox silt loam, though the material is coarser in texture and the organic matter incorporated in much larger quantities and to a greater depth.

Near the debouche of the streams the outwash material is distributed over a much larger area than is indicated on the map, for it is only where the material has been deposited to a depth of 2

feet or more that it has been mapped Judson silt loam. Thus, at the foot of the bluffs it has in places been built up to a depth of 12 feet, but receding from these places it gradually thins until it can hardly be recognized. The boundary of the type is therefore in many places a more or less arbitrary one. During floods the loess wash is carried out as much as 5 miles from the upland, and the area of this type is therefore gradually being extended. Owing to the assorting power of water there is a distinct gradation in the soil particles in receding from the stream banks.

The surface of the Judson silt loam is characterized by a long, very gentle slope toward the lower bottoms, though it does not in any respect resemble a terrace or second bottom and rarely overflows. The natural drainage of the type is good.

The Judson silt loam is used for all general farm crops, but by far the greater part of it is given to corn. As a corn soil it is unexcelled, and yields ranging from 40 to 90 bushels are secured. It produces large yields of wheat and oats, though these crops are apt to lodge because of the rank growth. Clover and alfalfa thrive on this type, and as a trucking and fruit soil it is one of the best in the area.

Practically all of the type is in a high state of cultivation, and it is probably the most productive soil in the county. No special price can be given to the land, since it is always included within other types.

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

*Mechanical analyses of Judson silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24935.....	Soil.....	0.1	0.1	0.0	0.5	11.4	73.9	13.6
24936.....	Subsoil.....	.0	.0	.1	.4	9.0	79.9	10.3

WABASH CLAY.

The soil of the Wabash clay is a black clay loam to clay, with a depth of 10 inches. The subsoil to 36 inches in depth is a dark-gray to drab heavy tenacious clay, becoming heavier with depth. In the low places the subsoil contains characteristic yellow and brown iron stains.

The type occurs only in the Mississippi River bottoms in the southeastern part of the county. The largest body of this type extends from the river south of Cape Girardeau west to Hubble Creek. It constitutes the northern part of a large area of this soil which has its

greatest development in Scott County. The second largest area is found at the bend of the river 3 miles northeast of Cape Girardeau. This area originally was much larger, but it is steadily being reduced by the encroachment of the river.

The Wabash clay has been developed by accumulations of clay and silt in areas where water has stood for a considerable length of time, allowing the finer particles of silt and clay carried in suspension to be precipitated. The surface soil has been modified by the accumulation of much organic matter, the remains of luxuriant vegetation. Most of the type probably represents an old Mississippi River channel, and when the river suddenly changed its course these low areas were left as large lakes. These have held the water emptied into them by each succeeding flood, gradually becoming filled with fine soil particles.

The northern area has good surface drainage, although it is occasionally inundated by the Mississippi River. Its subsoil below 5 to 6 feet is a fine sand, which gives good underground drainage. All of this portion of the type is in a high state of cultivation and produces large yields of corn and wheat. The lowland portion is as yet covered with timber, and much of it is covered with water during the winter and spring months. When ditches are constructed which have sufficient depth to carry the water of the laterals and tile systems much benefit will accrue to the land.

Although corn does well on this soil, it is better adapted to wheat, oats, or grass. On the heavy portions corn is an uncertain crop. Alfalfa, on account of the heavy subsoil, will not do so well on this soil as on the silt types. Clover will grow on the well-drained areas.

The Wabash clay is not too heavy to permit easy cultivation, but it should not be cultivated when wet, as clods form that are extremely hard to break up. When once reclaimed this will be a lasting and very productive soil.

Cleared land of this type sells for \$40 an acre, while the unimproved areas can be bought for \$25 to \$40. This low price is probably due to the fact that most of the land is unprotected by the levee and is therefore subject to overflow.

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

*Mechanical analyses of Wabash clay.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24947.....	Soil.....	0.0	0.0	0.1	0.3	0.2	62.8	36.5
24948.....	Subsoil.....	.0	.0	.0	.6	.8	44.3	54.3

## WAVERLY SILT LOAM.

The soil of the Waverly silt loam to a depth of 9 to 10 inches consists of a gray or dark-gray silt loam. When wet it has a dark-gray to yellowish-gray color, but when dry is a light ashy gray. The subsoil from 9 to 36 inches is a gray silt loam slightly heavier in texture and lighter in color than the soil. It is mottled brown and yellow, becomes lighter in color with depth, and contains iron pipes and concretions. The latter are most abundant below 30 inches and in the lower or poorly drained places. In general, it may be said that where the drainage is poorest the gray color predominates and the texture is heavier.

The Waverly silt loam is the most extensive of the bottom-land soils. The largest body of the type is found to the south and east of Allenville, where it occupies an area several square miles in extent. The Waverly silt loam as here mapped is probably the same as the large areas of gray silt soil found west of Crowleys Ridge, in Stoddard County. That part of it in Cape Girardeau County is probably more productive than the land to the south, since the former has been modified and enriched to a greater extent by large quantities of sedimentary material spread over it by the numerous streams from the uplands.

The Waverly silt loam is a loose, friable soil of excellent tilth. It does not bake, for, like the Judson silt loam, it is composed of uniform-sized silt particles which prevent the soil from running together, and at the same time insure the best capillary action of the soil water. On some of the lower areas of the type where drainage is poor there is sometimes found a very thin, compact layer of dry silt, light in color, just overlying an impervious subsoil. This lower silty clay subsoil is locally termed "hardpan," but it is not a true hardpan, as there is no cementation of the soil particles. This peculiar impervious condition of the lower subsoil is probably due to the presence of a larger amount of clay and the peculiar arrangement of the silt and clay particles.

The topography of the Waverly silt loam is very nearly level, though occasionally small mounds and ridges, from 1 to 2 feet high and 10 to several hundred feet in extent, occur. These mounds probably owe their origin to wind action or, what is more probable, are due to an obstruction in the current which caused a greater deposition of its sediment.

The Waverly silt loam, on account of its geographic location and level surface, has rather poor drainage. In the lowland, that portion from one-fourth to one-half mile wide which lies adjacent to higher ground is generally drained well enough to permit cultivation. The swampy areas are found along Hubble Creek Overflow, and in Big

Field Bog, south of Arbor. Although there are numerous bayous and shallow depressions, locally termed "slashes," from several feet to several hundred feet wide, which act as drainage ways for large quantities of surface waters and may hold considerable standing water for a long time during wet seasons, they have a sluggish flow and do not have a proper outlet to the south.

Although most of the type is poorly drained in its natural state, the Waverly silt loam is so situated that it can be easily drained artificially. To secure this condition for the land in Cape Girardeau County, as well as that in the counties to the south, an extensive system of drainage has been proposed (see fig. 33), which, when completed, will undoubtedly reclaim all land of this type. The land will also become drier, owing to increased evaporation, when once it is cleared and cultivated. Moreover, the open nature of the subsoil

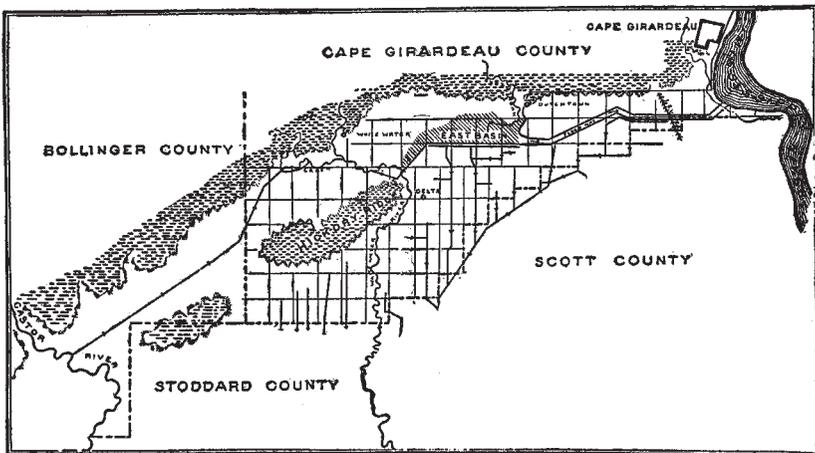


FIG. 33.—Plan of proposed drainage of the lowlands of Cape Girardeau County.

would make underground drainage by means of tile extremely successful.

The Waverly silt loam was originally covered with a heavy growth of timber, and only the higher portions are cleared and cultivated. Gum, elm, hickory, maple, persimmon, ash, and cypress in wet portions are the varieties of trees found on this type. The cleared portion is rapidly being extended, and the only thing that retards this area from being converted into a flourishing farming region is lack of good drainage. As soon as the latter is provided this will become one of the best farming sections in the country.

The crops grown on the Waverly silt loam are wheat, corn, oats, and grass. Although its physical properties would indicate it to be an excellent corn soil, this crop does only fairly well. Yields range from 20 to 50 bushels per acre, although 70-bushel yields are reported. According to acreage wheat is the most important crop on this type; in fact, the Waverly silt loam seems to be peculiarly well

adapted to the various small grains and to grass. Wheat yields in ordinary seasons from 15 to 25 bushels. From 1 to 2 tons of hay are usually secured per acre. Clover does only fairly well. Alfalfa will probably not grow except on the higher ground, but when good drainage is provided this should be an excellent alfalfa soil, as it is of great depth and has a porous subsoil. Cowpeas are extensively grown on this type and do remarkably well. They are grown primarily for pea-vine hay and yield 2 to 4 tons per acre.

Next to providing good drainage the chief concern in the management of this soil type is to incorporate a large amount of organic matter in the soil. It is naturally deficient in humus, but when this is supplied it is one of the most productive soils in the area. It is drought resistant, easily tilled, and when once improved will undoubtedly become the most highly prized land in the area.

Indications are that this soil is sour, and it is more than probable that liming would prove beneficial in counteracting the acid condition, especially of the poorer drained areas. The use of ground limestone, 2,000 pounds per acre, would probably prove highly profitable.

A rotation well suited to this soil type is the following: Corn and cowpeas one year, corn one year, wheat or oats one year, and clover and timothy one or two years.

South of Arbor, on the south side of Hickory Ridge and west of Whitewater River, is a swampy area known as Big Field Bog. This morass consists of very light floating soil or mud, from a few inches to 5 feet deep. Along the outer edge of this bog, and where the mud is not more than 2 feet deep, it is covered with a dense growth of cypress, ash, and gum. The central part of it is either open water or is covered with flags and water-loving grasses. The construction of ditches to the south of the area has lowered the water level of the bog during recent years, and as a result trees are encroaching and occupying all the open part. The swamp receives its water from springs and from Whitewater River during floods. The bottom of the swamp is silt and clay. When once this area is drained its soil will be the same as the surrounding Waverly silt loam, but will contain a much higher percentage of organic matter on account of the muck now covering it. The absence of vegetation in parts of the bog is due to the depth of the water and the absence of a firm foothold in which the roots could anchor themselves.

That portion of the Waverly silt loam in the lowland which is adjacent to and subject to frequent overflows by the creeks is continually being modified by the material that is being deposited on it. This condition is especially marked in the area along Hubble Creek, southwest of Dutchtown, and along Whitewater River between Whitewater and Allenville. During each inundation a coating of sediment is spread over the flooded areas, which tends gradually to

build up the surface of the land. Most of the sediment is the loess of the upland.

The origin of the Waverly silt loam is mainly a recent coating of silt carried into the lowlands by Whitewater River and other streams draining the adjacent uplands and laid on top of the old Mississippi River alluvium. The silt is reworked loess and other silt material of the upland lying to the north.

Land of this type ranges in price from \$22 for the unimproved to \$100 an acre for improved land.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Waverly silt loam:

*Mechanical analyses of Waverly silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24929.....	Soil.....	0.1	0.4	0.5	0.7	0.9	80.3	16.9
24930.....	Subsoil.....	.0	.9	.7	.8	3.1	74.1	20.2

#### HOLLY SILT LOAM.

The soil of the Holly silt loam consists of a light ash gray silt to a depth of 10 inches, grading into a light yellowish-gray silt slightly heavier than the soil. This material extends to a depth of 3 feet or more, but gradually becomes lighter in color with depth. Yellow mottlings and iron concretions are found in the subsoil and are most abundant in the poorly drained areas. Although the soil contains very little organic matter, it is rather mellow and easy to cultivate.

The Holly silt loam is an alluvial soil found along the streams in nearly all parts of the county. The largest areas of the type are along Whitewater River and Hubble Creek.

The material is derived principally from the upland limestone soils. The natural drainage of this type is generally poor; overflows are frequent on the lower lands, and the soil in such places is apt to clod when cultivated. Along the smaller streams, where the type occurs in narrow belts, it frequently contains an overwash of colluvial material to a depth of several inches, which tends to make it a more productive soil.

Originally this soil type was covered with timber, but all of this has been removed with the exception of a few areas along Whitewater River.

Corn, grass, and oats are the principal crops grown, and fair yields are obtained. It is, however, best adapted to grass, and will give the biggest returns if used for this crop.

In addition to providing good surface drainage by means of open ditches, it is essential to incorporate a large amount of organic mat-

ter in the soil in order to obtain maximum yields. Organic matter can most easily be supplied by turning under a green crop of clover.

## ELK SILT LOAM.

The typical surface soil of the Elk silt loam is a brown or dark-brown silt loam, 18 inches in depth. In all essentials this is loess, and is the same as the soil of the Knox silt loam. The subsoil, from 18 to 36 inches, is a dark-gray, mottled brown and yellow silty clay, becoming heavier with depth. In a general way the subsoil resembles the subsoil of the Waverly silt loam, but contains a somewhat higher percentage of clay. The point of contact between soil and subsoil is quite distinct. The depth of the soil depends on the depth of the loess covering. However, where the loess is more than 18 inches thick its lower part is quite low in organic matter and should, therefore, more properly be classed as subsurface in distinction from the soil and clayey subsoil.

The Elk silt loam occurs in the high bottom or bench land between Hickory Ridge and the upland. As a rule, it is found along old bayous and low grounds and slopes gradually away from these. The largest area of the type, containing about 700 acres, is located  $1\frac{1}{4}$  miles south of Whitewater.

The nature of the topography and the deeper covering of loess adjacent to the low ground would indicate that this is an alluvial soil. During early times, when the streams were still on a much higher level and when the bench lands were bottoms, the silt or loess carried down by creeks from the upland was deposited on these bottoms during periods of overflow. No doubt the loess covering was formerly much thicker than now, but erosion has removed most of it so that only a thin coating remains. Throughout the type are found shallow depressions from 10 to 150 feet in extent that have a distinctly gray or ashy color. These areas are due to the removal of the loess covering and the exposure of the gray subsoil.

All of this type is in a high state of cultivation and produces large yields of corn and wheat for which it is exclusively used. The occasional turning under of a green crop, preferably a legume, to maintain the supply of organic matter, is all that is necessary to insure maximum crops. Land of this type sells for \$60 to \$100 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Elk silt loam:

*Mechanical analyses of Elk silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24927.....	Soil.....	0.1	0.6	0.4	1.1	1.2	79.7	17.1
24928.....	Subsoil.....	.0	.4	.7	1.3	3.3	69.1	25.1

## SHARKEY CLAY.

The soil of the Sharkey clay is a dark gray silty clay to a depth of 7 inches. It is rather friable and easy to cultivate, as it contains a high per cent of organic matter. The subsoil from 7 to 36 inches is a gray or yellowish gray, heavy, tenacious clay, becoming heavier with depth. Occasionally it is stained brown and yellow. When dry the subsoil is hard and cracks, and in order to obtain a good seed bed cultivation must be done when the moisture conditions are just right, for if plowed when too wet large clods form.

The Sharkey clay occurs in two topographic positions. The higher phase occupies the high bottom and lies at the same level as the Elk silt loam. The largest area of this phase constitutes the greater part of the high bottom at Allenville and extending north from there to the upland. The low bottom phase occurs as narrow belts, usually adjacent to the higher Elk silt loam. The largest area of this phase is to the northwest of Hickory Ridge. It generally occupies basin-shaped areas or old stream beds, which have no well-defined stream channel, but carry a slight flow during rainy seasons. It is usually covered with water during winter and spring.

The Sharkey clay is an alluvial soil and was formed by deposition of suspended material from overflow and backset waters. The higher phase may have been at one time a lake bed and probably was formed at the same time as the Elk silt loam. On the low bottom phase this deposition of clay material is still going on from backset water during periods of overflow of Crooked Creek.

The high bottom is cultivated and is used for the production of wheat, oats, and grass. It is not a good corn soil. The low bottom is still covered with cypress, ash, and other water-loving trees. When once reclaimed it will be equally as productive as the high bottom, as large quantities of organic matter are being incorporated in it.

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

*Mechanical analyses of Sharkey clay.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24943.....	Soil.....	0.3	2.2	1.6	2.4	3.0	51.7	38.7
24944.....	Subsoil.....	.0	.2	.2	.4	.2	24.0	75.2

## YAZOO LOAM.

The surface soil of the Yazoo loam is a brown loam relatively high in the finer grades of sand with a depth of 18 inches. Although it is fairly compact, it is easy to cultivate. The subsoil down to 36 inches

is slightly lighter in color than the soil, but heavier and more compact in texture and structure. Occasionally the subsoil below 36 inches is a brown or gray sandy loam.

The Yazoo loam is unimportant in extent. The largest areas are located northeast of Allenville and southwest of Hickory Ridge. Like the Elk silt loam, this type occupies the high bottoms and is always adjacent to an old bayou or stream bed, which would indicate that it is alluvial in origin.

All of the Yazoo loam is in cultivation, and it is an excellent corn and wheat soil, for which it is used exclusively. It is also well adapted to clover and alfalfa. On account of its good surface and underdrainage, high fertility, and good physical properties, this is one of the most highly prized of the lowland soils. No special price can be given to it, since it is always included within other types.

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

*Mechanical analyses of Yazoo loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24941.....	Soil.....	0.0	1.6	3.5	12.3	16.4	52.3	13.3
24942.....	Subsoil.....	.0	.5	3.8	22.6	11.7	38.8	22.4

SUMMARY.

Cape Girardeau County forms a part of the Ozark border and the Mississippi embayment in southeast Missouri. The former comprises the upland and constitutes about six-sevenths of the 574 square miles in the county. With the exception of a narrow belt of hills along the Mississippi River, the topography is gently rolling. The lowland is a smooth plain, with poor drainage, and in general is as yet unimproved.

The settlement of this county dates back to 1794, and it is one of the oldest settled regions west of the Mississippi River. The first settlers were French and Americans, but beginning with 1834 many Germans came to this area and now constitute about 70 per cent of the 27,621 population.

The climate is mild, the average annual temperature being 56° F., and humid; the average annual precipitation is 45 inches. The growing season is about six months long.

The agriculture of the county is based primarily on grain growing, with stock raising of secondary importance. Wheat is exported extensively, all other grain and hay crops being consumed locally.

The live-stock industry is becoming more important, and there is consequently an increase in the acreage of corn and grass, with a decrease in wheat acreage. Cattle feeding for market will probably become an important industry when the lowland to the south of the county is improved and will have large quantities of surplus corn.

Fifteen soil types were mapped. The upland soils are all silt loams and, with the exception of the Knox silt loam, are all residual, derived primarily from limestone. They are all productive soils and are well adapted to general farm crops. The lowland soils are clays, silts, and loams. They are to a large extent made up of material washed down from the adjoining uplands. Only the high bottoms are cultivated, the remainder being covered with timber. When reclaimed by drainage, all of the lowland types will be highly productive and well adapted to the general farm crops.

Of chief concern in the management of the soils of Cape Girardeau County is the maintenance of the supply of organic matter, which can be done most easily by a more extensive use of clover and cowpeas. More attention should also be given to crop rotation and the conservation and use of barnyard manure. On the uplands erosion should be guarded against by proper cultural methods. In the lowland drainage must be provided before the rich soils can be utilized for farm crops.

In general, the soil, physical features, and climate of Cape Girardeau County are not excelled in any part of southeast Missouri, and the agricultural practices are of the most improved kind. The farming class is universally prosperous.

Land values range from \$20 for the unimproved lowland and hilly areas to \$125 an acre for the improved land, and the yields obtained warrant such valuation.

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