

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS.

IN COOPERATION WITH THE UNIVERSITY OF MISSOURI AGRICULTURAL
EXPERIMENT STATION.

SOIL SURVEY OF LAFAYETTE COUNTY,
MISSOURI.

BY

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[Advance Sheets—Field Operations of the Bureau of Soils, 1920.]



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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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MAP.

Soil map, Lafayette County sheet, Missouri.

SOIL SURVEY OF LAFAYETTE COUNTY, MISSOURI.

By WILLIAM DE YOUNG, in Charge, and H. V. JORDAN, of the University of Missouri.

DESCRIPTION OF THE AREA.

Lafayette County is situated in the west-central part of Missouri. It lies south of the Missouri River, in the second tier of counties from the Kansas State line. The western border of the county is about 31 miles from Kansas City, which is the principal market for the products of the county. The land area is approximately 612 square miles, or 391,680 acres.

Lafayette County lies in the prairie region of the United States, which includes all of the treeless part of Missouri. The topography varies from almost level to moderately hilly; the greater part is gently rolling, with a general slope toward the east. On the whole, the northern half of the county is more rolling than the southern part.

Lafayette County consists of a plain with two kinds of interruptions of what would otherwise be a smooth, nearly level surface.

The first kind of interruption consists of stream valleys which have been eroded below the level of the plain. Sniabar, Tabo, and Davis Creeks are the three main creeks traversing the county. They occupy shallow, rather wide valleys, and the valley bluffs are low as a rule and rarely steep. The first two streams traverse the county from south to north, both flowing into the Missouri River, which forms the northern boundary of the county. Davis Creek flows eastward and into Blackwater Creek in Saline County. The country between these streams is dissected, but the valleys are less deep than those of the main streams, so that the result is the production of a surface relief that becomes rougher than gently rolling only in narrow strips bordering the larger creek valleys and the valley of the Missouri River.

The other kind of interruption consists of low ridges and isolated hills that stand on the plain and rise from less than 100 to about 150 feet above its surface. One of the lower hills is in the village of Mayview, one lies a few miles south of Wellington, and another about 10 miles south of Lexington. A prominent ridge begins 1 mile north of Odessa, runs eastward for 2 or 3 miles, then turns northward in a curve around the head of one of the tributaries of Sniabar Creek, and ends on the north side of that tributary. The top of the ridge is narrow and the slopes are gentle.



FIG. 24.—Sketch map showing location of the Lafayette County area, Missouri.

The bottom lands bordering the streams that rise within the area vary from about a rod to three-quarters of a mile in width. The Davis Creek bottoms are the most extensive. The slopes leading to these bottoms from the north are usually long and gentle, while those from the south are usually steeper and more eroded. The slopes to Sniabar and Tabo Creeks are steep in places, but generally not too steep to cultivate. The Salt Fork flood plain is relatively wide, and the lower part within Lafayette County is rather poorly drained.

Very little of the Missouri River bottom lies in Lafayette County. The river for the most part touches the bluff line on the south, having developed extensive bottoms along its northern bank in Ray and Carroll Counties. That part of the county lying north of the Missouri River was detached by a change in the course of the stream in 1915. At times of high water the river overflows into its former channel, and each time as it recedes it leaves behind some material, thus gradually filling this old river channel. This "made land" is being cultivated in places, but nowhere has it attained permanent soil characteristics.

The first settlement in Lafayette County was made near Lexington in 1815. In 1817 another settlement was made a half mile west of the present site of Dover. These early settlements were along the river, because at that time river traffic was important and provided the best method of transportation. The early settlers came mostly from Kentucky, Tennessee, and Virginia. In November, 1820, Lillard County was formed and included all of what is now Lafayette County and also territory south to the Osage River. In 1824 the name was changed to Lafayette in honor of the French general, and the present boundaries were established.

The population of Lafayette County, according to the 1920 census, is 30,006. Of this population, 24.7 per cent is urban and 75.3 per cent is rural. The negro population is given as 7.9 per cent, and is confined largely to Lexington and the mining regions.

Lexington, the county seat and largest town, has a population of 4,695. Higginsville, located near the center of the county, is the second largest town, with 2,724 inhabitants.

Coal mining is the only industry, other than agriculture, of importance in the county. Nearly all of the county is underlain with coal. The seams lie from 45 to 120 feet below the surface, and range from 18 to 40 inches in thickness. The chief mines are at Lexington, Wellington, Waverly, Higginsville, Waterloo, and Corder. In 1911 Lafayette County led the State in coal production, both in tonnage and value. In 1912 the output of coal amounted to 748,598 tons, valued at \$1,454,965, and the industry gave employment to 2,018 men.

Lafayette County is well supplied with railroads. The Chicago & Alton Railroad, a trunk line from Chicago and St. Louis to Kansas City, crosses the center of the county east and west. One branch of the Missouri Pacific follows the northern edge of the county and another extends southeast from Lexington to Sedalia. With the exception of the southwestern part, all of the county is within easy reach of a railroad. Kansas City is the nearest market, although both Chicago and St. Louis can be reached directly.

The public roads as a rule follow section lines and in general are fairly well kept. With the exception of the main roads in Lexington Township, all are dirt roads. Two cross-state highways traverse

the county in a general east-and-west direction; the Santa Fé Trail passes through the northern part and the Golden Belt Highway through the center of the county.

CLIMATE.

The climate of Lafayette County is about the average for the State and is favorable for the production of a wide variety of crops. Seasonal temperature variations have a wide range. The winters are generally moderately mild and short, periods of extremely cold weather being usually of short duration. The fall season is characterized by long periods of warm open weather which often continue to the middle of December.

According to the records of the Weather Bureau station at Lexington, the mean annual temperature is 53.8° F. The absolute maximum is given as 111° F. in July and the absolute minimum as -26° F. in February. These extremes show a wide range, but they are seldom reached, and then maintained only for short periods. Cold weather is rare before January, and zero weather is unusual.

The average date of the last killing frost in spring is April 15, and the average date for the first in the fall is October 17. This gives an average growing season of 185 days. The latest killing frost in spring is recorded as occurring on May 4, and the earliest in fall on September 26.

The average yearly rainfall is 37.66 inches. In the driest year it was 23.73 inches, which is considerably more than half the average precipitation. About one-half the total precipitation occurs during the growing season—May, June, July, and August—so that crops usually have plenty of moisture. May has the heaviest rainfall, averaging 5.06 inches, while the months of June and July average about 4.75 inches. Occasional periods of drought occur in late summer and early fall; however, the climatic conditions are, in the main, quite favorable for general farming.

The following table, compiled from the records of the Weather Bureau station, gives the normal monthly, seasonal, and annual temperature and precipitation at Lexington:

Normal monthly, seasonal, and annual temperature and precipitation at Lexington.

[Elevation, 688 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1886).	Total amount for the wettest year (1915).	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	31.5	71	-13	1.72	0.51	1.39	3.4
January.....	27.5	73	-21	1.57	1.79	2.58	4.2
February.....	29.4	75	-26	2.00	1.08	3.60	7.1
Winter.....	29.5	75	-26	5.29	3.38	7.57	14.7
March.....	42.9	94	1	2.37	1.15	1.34	3.8
April.....	54.1	98	14	3.36	2.74	1.74	.8
May.....	64.4	95	25	5.06	3.59	15.98	.0
Spring.....	53.8	95	1	10.79	7.48	19.06	4.6

Normal monthly, seasonal, and annual temperature and precipitation at Lexington—Continued.

[Elevation, 688 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1886).	Total amount for the wettest year (1915).	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
June.....	72.8	105	43	4.77	4.66	7.93	0.0
July.....	77.1	111	50	4.72	.31	10.92	.0
August.....	76.0	109	43	3.23	1.19	2.97	.0
Summer....	75.3	111	43	12.72	6.16	21.82	.0
September.....	68.5	107	28	4.44	3.36	8.58	.0
October.....	57.5	96	21	2.57	1.72	.69	.3
November.....	44.0	83	3	1.85	1.63	1.24	.8
Fall.....	56.7	107	3	8.86	6.71	10.51	1.1
Year.....	53.8	111	-26	37.66	23.73	58.96	20.4

AGRICULTURE.

Because of its fertile soils, Lafayette County is one of the leading agricultural counties in the State. Its crop production is representative of much of northwest Missouri. It is one of the best corn counties in the State, and it also ranks high in wheat production. The soils are fertile and well adapted to diversified cropping. In general, the land increases in productiveness from the south to the north, and this change is marked by a corresponding transition from general and livestock farming to a system of almost pure grain farming.

The early settlers, who located near the Missouri River because of the trading facilities it afforded, soon recognized the richness of the soil and began clearing land for the production of corn and vegetables for food. The prairies were the last to be settled because it was considered very difficult to break the prairie sod. They were largely used as cattle range. Corn soon became the principal crop, although wheat, hemp, and oats received attention, and some tobacco was grown. Thousands of bushels of apples were gathered as early as 1880, and wheat is said to have averaged from 25 to 40 bushels per acre. The development of the county was quite rapid until the Civil War, when agricultural progress was somewhat retarded. Following the completion of the Missouri Pacific Railroad from Lexington to Sedalia in 1871 and the Chicago & Alton Railroad in 1878, the agricultural development over the entire county was rapid. In 1880, 315,000 acres of land were already improved. Wheat, corn, hemp, tobacco, cattle, and hogs were shipped out. With the exception of hemp, all of the early crops continue to be grown, and, in addition, alfalfa, clover, and others have come in as crops of importance.

In a general way the Chicago & Alton Railroad divides the county into two rather distinct agricultural regions. The territory lying north of the railroad is generally considered as being better adapted to fruit and grain farming, while to the south of the railroad a more

mixed livestock and general-farming type of agriculture prevails. This division follows pretty closely the division between the loess soils and the heaviest prairie soils.

The soils of the gently rolling lands of the northern and eastern parts of the county have deep, porous subsoils, and are inherently productive. They are ideally adapted to grain farming, while the heavier soils to the south are not quite so well suited to the small grain crops. The soils are all good grass and corn lands, however, and thus well suited to mixed grain and livestock farming, and that is a type of agriculture that receives much attention. Fruit growing is of special interest on the "river hill lands" from Waverly to Napoleon.

Corn is the most important of the cultivated crops. According to the census of 1920, corn was grown for grain in 1919 on 84,097 acres, producing a total of 3,072,877 bushels. This represents an average yield of 35.5 bushels per acre, although yields of 60 and 70 bushels are common. In addition, over 8,000 acres of corn were cut for fodder and about 1,000 acres were grown to fill silos. Corn for grain is picked in the field, the stalks being left standing. Of the white varieties, Boone County White and Johnson County White have been found to do well in this region. Of the yellow varieties, Reid Yellow Dent is preferred.

Wheat ranks second in production and first in acreage and is the most important cash crop. In 1919, according to the 1920 census, 95,534 acres were in wheat, with a production of 1,643,804 bushels, an average of 17 bushels per acre. Yields of 20 and 25 bushels are common. In total production the county ranked third in the State in 1919. By far the greater part of the wheat crop is grown in the northern half of the county, principally on the dark-brown and black loess soils. In the rotation wheat usually follows oats or corn. Commercial fertilizer is used to some extent with wheat and is giving good results. Acid phosphate, or a complete fertilizer containing 2 per cent nitrogen, 8 to 12 per cent phosphoric acid, and 2 to 4 per cent potash, should give good returns.

The oat crop is relatively unimportant. It is grown on many farms, but generally in small fields. It is used for feed. In 1919, according to the census, 416,109 bushels were produced on 15,876 acres, with an average yield of 28 bushels per acre, although yields of 40 to 60 bushels are common in favorable seasons. The rust-resistant varieties give best results.

The acreage devoted to rye is very small. The crop may be grown to good advantage as a cover crop on the light-colored soils in the southern part of the county and then turned under in the spring for the organic matter. Rosen rye has been introduced and apparently does well in this locality. Barley could be grown, but is given very little attention. A few small fields along the Missouri River are used in growing tobacco.

Hay and forage crops are of considerable importance. In 1919, 44,516 tons of tame hay were produced on 30,156 acres. Of this acreage, 27,026 acres were devoted to clover and timothy, either alone or mixed, and 3,032 acres to alfalfa. Red clover does well in nearly all parts of the county. In seasons of normal rainfall clover seed is produced in quantities for sale. This important legume should be

given a prominent place in the crop rotations, especially over the southern half of the county, where alfalfa is less successful.

The growing of alfalfa is increasing, especially in the northern half of the county. It should also do well in the southern half on well-drained bottoms and on the more fertile upland soils with well-drained, porous subsoils. The limiting factors in growing alfalfa on the residual prairie soils are the heavy clay subsoils, the deficiency in lime, and in many cases low productiveness. The loess soils, on the other hand, are highly productive, have loose or porous subsoils, allowing deep root penetration, and almost perfect drainage, and therefore are well adapted to the growing of this crop.

Sweet clover will succeed on the soils well supplied with lime, but is not grown to any great extent. It is a good soil improver, producing a large quantity of organic matter.

Bluegrass grows luxuriantly in all parts of the county. Practically all land not well suited to cultivation because of a rolling surface is used as permanent pasture. On the better soils 1 acre will maintain a cow during the grazing season.

A few areas of native grasses still exist in the southern part of the county. Sudan grass, kafir, milo, and millet are grown to a small extent, principally in the southern part of the county, on the poorer soils. On account of their drought-resistant properties these crops can be sown late in spring and summer and still produce large quantities of coarse forage. The crops are grown principally to supplement pastures during late summer.

The production of apples is receiving particular attention on the loess soils, principally in the section between Lexington and Waverly, although other orchards, some of commercial size, are established in other parts of the county. In 1919 the production of apples amounted to 207,115 bushels from 93,659 trees of bearing age. The Knox silt loam, locally known as "brown loess" soil, along the Missouri River is the main fruit soil. Much of this land is steeply rolling and in places too badly dissected for general farming, but can be utilized for fruit growing. The richness of the soil and the porous structure of the subsoil allows very deep root penetration, which makes this soil particularly adapted to the growing of apples. The darker loess soil farther south of the river is also adapted to fruit growing, but because of its gently rolling topography it is used mainly for growing grain crops.

Many of the older apple orchards, especially those planted on the heavier soils, are dying out. Lack of care in pruning, spraying, and cultivation is responsible for the loss of many trees. Among the diseases, the blister canker seems to be doing the most damage.

There are good possibilities for grape growing on the Knox silt loam soil. Many steep slopes, with terracing, could be set in grapes.

Other fruits grown throughout the county are pears, peaches, plums, grapes, cherries, strawberries, and blackberries. With proper care most every farmer can grow small fruits as well as larger fruits for home consumption.

The raising of livestock is an important industry in Lafayette County. In January, 1920, the numbers of livestock were reported as follows: Beef cattle, 21,711; dairy cattle, 11,767; hogs, 75,605;

sheep, 14,445; horses, 11,485; mules, 6,169. In addition to the cattle raised within the county, feeders are brought in from Kansas City and fattened for the market. The number of cattle fed usually varies with grain and livestock prices. When grain prices are high, more grain is sold directly and less is fed to stock.

Dairying is carried on only in an incidental way on farms near enough to towns to have a convenient market. Hog raising is probably the most important branch of the livestock industry. Large numbers are raised and fattened for sale. Horses and mules are raised throughout the county, although not in large numbers. As there is comparatively little permanent pasture, not much attention is given to the raising of sheep, although western sheep are sometimes brought in and fed for market. The poultry and eggs produced in 1919 were valued at \$936,662.

A number of tests made during the progress of the soil survey indicate that most of the soils of the area are somewhat deficient in lime. The soils are not too acid to grow clover, but where lime is used the beneficial effects on alfalfa and clover are clearly indicated in the increased growth and vigor of the plants. The loess soils are generally less acid than the residual prairie soils of the southern half of the county. Exception may be made of the rolling land north and southwest of Odessa, where the soils are derived in part from limestone and are not very acid.

Erosion is not very serious, except along the Missouri River bluffs and the slopes of Davis Creek. However, all slopes are subject to surface wash, and more or less material is carried away with every rain. Soils that are porous and contain much organic matter tend to absorb and retain large quantities of water, and thus to prevent rapid run-off. Steep slopes should be protected almost constantly by grass sod. Cover crops will help protect the land from washing during the fall, winter, and early spring. The use of the Mangum terrace is advisable in many cases. The terracing of slopes is a means by which erosion can be greatly minimized.

Because of high average productiveness of the soils of Lafayette County, little use of commercial fertilizers has been made up to the present time. Under the prevailing system of grain growing under which crop after crop is taken off and little return made to the soil, a steady decline in yields may be expected unless soil-improving crops are introduced into the rotations. The use of commercial fertilizers on wheat is increasing. Much of the wheat straw is allowed to stand in piles or is burned. This is a wasteful practice, since some benefit from this material could be obtained by spreading it as manure and plowing under, or by scattering with a straw spreader. The amount of manure produced is never sufficient to maintain the supply of organic matter in the soil. The growing of legumes, such as clover, alfalfa, or cowpeas, with occasional green manuring, should supplement the use of farm manures and phosphatic fertilizers.

According to the 1920 census, 91.2 per cent of the land area is in farms, and of the land in farms, 90.7 per cent is classed as improved. The total number of farms is reported to be 2,807, with an average of 127.2 acres per farm. About 66 per cent of all the farms are operated by owners and about 34 per cent by tenants.

The farmers are generally prosperous, as indicated by the appearance of farm buildings, other improvements, and stock.

In general, the types of farming now established in the various parts of the county appear to be fairly well suited to the soils and existing conditions, although changes in agricultural practices must necessarily be made as economic conditions change, and as the necessity of giving more attention to the maintenance of soil fertility becomes more imperative.

SOILS.¹

Lafayette County is mainly a region of dark-colored prairie soils. The soils of the southern half of the county are similar to those of western Missouri in general, while the soils of the northern half of the county are loessial and are similar to the soils of northwestern Missouri. The brown soils occur principally in the forested areas bordering the Missouri River and the smaller streams. Probably less than 10 per cent of the land is still in its virgin condition.

The soils may be divided into four general groups, the loessial soils found principally in the northern half of the county, the residual soils in the southern half, the old-alluvial soils of the terraces or second bottoms, and the recent-alluvial soils of the first bottoms or flood plains bordering the streams.

The soils are grouped into soil series on the basis of similarity in origin, color, topography, and structural characteristics. The soil series is composed of soil types which differ from each other in texture, or the relative content of coarser and finer particles in the surface soil. The soil type is the unit of soil mapping.

The loess soils are derived from material that is generally believed to have been deposited by the winds. Loess rarely contains gravel or coarse sand, and although it is fine textured it does not contain a very large proportion of clay. It is almost ideal in texture, since it frees itself from excess water to its full depth and yet retains moisture well for growing crops. The brown loess was originally forested and is prevailingly lighter in color than the prairie soils, which are dark brown to black. The prairies were originally covered with a heavy growth of grasses, and the large accumulations of organic matter from decaying roots give the soils a darker color. No evidences of glaciation are found in Lafayette County, the loess having been superimposed directly upon the underlying rock formations or upon material derived from these rocks.

In the northern part of the county, in the loess area, the soil is light brown to yellowish brown and has a rolling and, in places, badly dissected topography. This soil is mapped as the Knox silt loam. Farther back from the river the soil becomes darker in color and the topography becomes less rolling. In the southern half of the loess area the soil has a dark-brown to black color and a gently

¹The soils on the Lafayette County side of the Jackson-Lafayette boundary appear to differ from those on the Jackson County side, as shown on the soil maps of the two counties. Jackson County was surveyed about 10 years ago, before the soils of the Middle West had been as well worked out and as sharply defined as now. The several soils of the Summit series, which cover a considerable range of soil conditions in Jackson County, are now placed, because of clearer definition of the soils, in the Mandeville, Summit, Pettis, and Marshall series, according to the features of the soil profile. The Jackson County map represents the status of soil surveying of more than 10 years ago, while the Lafayette County map is up to date.

rolling topography, and is classed as the Marshall silt loam. The change from the typical Knox silt loam to the typical Marshall silt loam in this county is very gradual, and the region occupied by the gradation from one type to the other is rather extensive. For this reason this intermediate soil or gradation from the Knox silt loam to the typical Marshall silt loam is considered as distinct from both of these types and is mapped as the brown phase of the Marshall silt loam. The Muscatine silt loam is a black soil developed in poorly drained depressions within areas of Marshall soils.

The typical loess soils are easily recognized by the somewhat rounded topography of the country in which they occur, by their yellowish-brown to dark-brown color, and by the uniformity of the color and texture of the soil. Over the greater part of the loess area the material forms a uniform sheet covering the ridges, slopes, and valleys. The deposit is thickest, however, near the Missouri River, and thins out gradually as it approaches its southern limit, where it is found mainly on the higher lying areas. Consequently the edge of the loess deposit is not easily determined.

The loess soils are among the most productive soils of this region. Their high fertility is due in part to their comparatively recent formation and lack of weathering and leaching. The uniformity of their texture throughout the soil section permits of free movement and absorption of water, aids in maintaining the soils in good physical condition, and tends to make an early and warm soil especially adapted to deep-rooted crops.

The basal rocks of the county consist of alternating strata of shale, limestone, and sandstone of the Coal Measures or Pennsylvanian period. Of these rocks the sandstone which occurs in thin beds is not present in sufficient quantities to give a loamy character to any of the residual soils. The other rocks give rise to important soil types.

The soils of the Boone series are probably in part of the same origin as the Summit soils. They occupy slopes and a few narrow ridges of the same region. These soils, which were originally forested, have been eroded and are low in organic matter, and therefore have a lighter color at the surface than the prairie soils.

The soils of the Pettis series have been derived partly from the interbedded limestone and shale. The surface soils are a little lighter than the Summit, the subsoil is browner in color and lighter in texture, and the topography is generally more rolling.

The Mandeville silt loam, which occurs most extensively in the southwestern part of the county and on the ridges or hills north of Odessa, has been derived from higher beds of the Coal Measures. These beds contain more limestone, which occurs at or near the tops of the ridges. The latter weathers slower than the softer shale, thus leaving a more broken surface. The consequent rolling soils are more eroded, contain less organic matter, and are lighter in color than either the Summit or Pettis soils.

The soils occupying river terraces have been included in the Waukesha and Bremer series. These terraces or second bottoms are considered to be the floors of ancient flood plains which are now above normal overflow, the stream which formed them having eroded its channel deeper. Thus, their origin is essentially the same as that of the recent-alluvial soils, although their physical characteristics may

have been considerably changed by weathering subsequent to their deposition. The Waukesha silt loam, in profile, color, and texture, closely resembles the Marshall silt loam. Its subsoil probably averages heavier than that of the Marshall. The Bremer soils are darker, very closely resembling the corresponding first-bottom soils of the Wabash series.

The alluvial soils along the Missouri River are of two general classes. The dark-colored, relatively heavy soils have been included in the Wabash series, represented by the silt loam, silty clay loam, and clay types. Their dark color is due to a high content of organic matter. The lighter colored bottom lands, characterized by having lighter textured and more porous subsoils, have been included in the Sarpy series, and mapped as very fine sandy loam, silt loam, and silty clay loam.

The bottom lands along the smaller streams, where the material has been derived from the uplands of loessial origin, have been included in the Wabash and Vicksburg series. The Vicksburg silt loam was mapped only along a few small streams in the northern part of the county where the alluvial material is of lighter color, having been derived chiefly from the lighter colored loess. The Wabash soils here, as in the Missouri River bottoms, are characterized by the dark-brown to black color of the surface soil. Where the material has been washed principally from uplands of residual origin, the soil is classified in the Osage series, represented by the silt loam and clay types. The chief difference between the soils of the Wabash series and the soils of the Osage series is in the source from which the alluvium is derived. In general the Osage soils average somewhat lighter in color, especially in the subsoil, than those of the Wabash series.

In the following pages of this report the several types of soil mapped are described in detail, and their relation to agriculture is brought out. The distribution of the soils is shown on the accompanying soil map.

The following table gives the names of the soil types mapped in Lafayette County and their actual and relative extent:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Marshall silt loam.....	50, 176	26. 1	Sarpy silty clay loam.....	2, 304	0. 6
Brown phase.....	52, 096		Bremer silt loam.....	1, 664	
Boone silt loam.....	39, 168	15. 6	Heavy phase.....	256	. 5
Brown phase.....	21, 888		Summit stony clay.....	1, 856	
Summit silt loam.....	46, 208	14. 6	Muscatine silt loam.....	1, 280	. 3
Colluvial phase.....	9, 408		Wabash silty clay loam.....	1, 280	. 3
Bench phase.....	1, 664		Wabash clay.....	1, 088	. 3
Pettis silt loam.....	40, 256	10. 3	Waukesha silt loam.....	1, 024	. 3
Osage silt loam.....	36, 736	9. 4	Riverwash.....	960	. 2
Knox silt loam.....	30, 528	7. 8	Sarpy silt loam.....	806	. 2
Mandeville silt loam.....	22, 912	5. 8	Osage clay.....	448	. 1
Wabash silt loam.....	20, 672	5. 3			
Sarpy very fine sandy loam....	4, 544	1. 2			
Vicksburg silt loam.....	2, 368	. 6	Total.....	391, 680

MARSHALL SILT LOAM.

The surface soil of the Marshall silt loam is a very dark brown to black mellow silt loam, which averages about 12 to 15 inches in

depth, but may vary from 10 to 18 inches. Below this the soil passes within a few inches into a dark-brown to brown friable silty clay loam, which at 20 to 24 inches grades into brownish-yellow or light-brown friable silty clay.

In places the lower subsoil contains less clay and more silt than the upper part, but in all cases the soil is readily pervious to water. In some areas, on the contrary, the lower subsoil is a little stiffer than the upper subsoil. In general the color of the soil is lighter near the northern edge of its occurrence than along the southern; and the soil, and especially the subsoil, is heavier near the southern edge than near the river. A little gray or pale-yellow mottling appears locally in the lower subsoil on flat areas south and west of Higginsville. The soil averages lighter in color and shallower in depth on the slopes of rolling areas, while on the smooth areas it is darker in color and deeper. Boundaries between the Marshall silt loam and the Pettis silt loam are somewhat arbitrarily drawn, as the two soils blend into each other almost imperceptibly. The principal difference is in the color and character of the subsoil, the Pettis subsoil being more dense and more mottled and, on the whole, yellower than the Marshall.

The Marshall silt loam occupies level and undulating to gently rolling areas through the central and north-central parts of the county. Most of this soil was originally in prairie, with some tree growth along the small drainage ways. Owing to the character of the soil and subsoil, the natural drainage is fairly good. Some of the depressions or shallow draws and long gentle slopes are somewhat seepy, but a single line of tile along these areas generally will provide good drainage.

Erosion has been fairly well controlled, but heavy rains always wash more or less soil down the slopes, especially on the more rolling land. The growing of winter cover crops, seeding to grass, and the incorporation of organic matter are measures that help to hold the soil in place. Cultivation with the contours or the use of the Mangum terrace is advisable for long slopes.

The Marshall silt loam is a strong agricultural soil adapted to a wide range of crops. It is regarded as a typical corn soil, and produces higher average yields than other upland types. Corn yields average about 45 bushels per acre, but yields of 60 to 70 bushels are common. Wheat, oats, clover, alfalfa, and fruit are other important crops. Wheat averages 15 to 20 bushels per acre and oats 30 to 35 bushels. Clover and timothy both do well and occupy an important place in the crop rotation, which generally consists of corn two years, followed by wheat or oats, and then by mixed clover and timothy. Considerable alfalfa is also grown.

This soil is somewhat acid and, though productiveness tends to offset this condition, liming will prove profitable, especially in growing alfalfa and clover. The return of all manure and the scattering of old straw stacks on the land would aid in maintaining the supply of organic matter. Phosphatic fertilizers applied to the wheat crop have given good results, especially on the more eroded and worn areas.

Marshall silt loam, brown phase.—The brown phase of the Marshall silt loam is intermediate between the typical Marshall silt

loam on the south and the Knox silt loam on the north. The principal difference from the typical Marshall is the lighter brown color of the soil. The surface soil is prevailingly a brown to dark-brown, very mellow silt loam, ranging in places to yellowish brown in color. At 10 to 15 inches the soil grades into brown or light-brown, friable, heavier silt loam or silty clay loam, which passes downward into a lighter brown or yellowish-brown friable silty clay. The lower subsoil in places ranges to yellow in color, and adjacent to areas of the Knox silt loam it is generally not heavier than a silty clay loam. Throughout the soil section there is less clay and more coarse material than in the typical Marshall silt loam. Where it borders the Knox silt loam, lying on the north, the phase approaches that type in color and texture; and it becomes darker in color and slightly heavier as it approaches the typical Marshall silt loam, lying on the south. Boundaries between this and the adjacent loessial soils are necessarily somewhat arbitrary, as the soils blend into each other almost imperceptibly.

This phase probably averages a little more rolling than the typical soil. In the western part of the county south of Napoleon the areas are small, but south and east of Lexington to the Saline County line the phase occupies a continuous but irregular belt from 4 to 5 miles wide.

A large part of this land was originally forested, and some of it is locally known as "black walnut land." White oak, elm, maple, and honey locust trees were included in the forest growth.

At present this land is nearly all under cultivation and is considered some of the best in the county. It produces high yields of all the crops grown and has a wide range of adaptability. Because of its mellow surface soil and open subsoil it is particularly well adapted to alfalfa, clover, small fruits, apples, and vegetables. Some farmers state that the soil does not readily form a sufficiently firm seed bed for best results with wheat, but wheat is extensively grown and good yields are obtained. Corn also does very well.

With careful return of all manures and waste straw, supplemented with applications of phosphate fertilizers on the wheat crop, the fertility of the soil can be maintained. Acid phosphate may be used at the rate of 125 to 175 pounds per acre.

KNOX SILT LOAM.

The surface soil of the typical Knox silt loam, locally known as "river hill land," consists of a light-brown or brown mellow silt loam that is velvety to the touch and is almost uniform in color and texture throughout. At about 8 to 15 inches a subsurface layer is reached which consists of yellowish-brown heavy silt loam or silty clay loam; this, in turn, passes at about 20 to 24 inches into yellowish-brown or brownish-yellow silty clay. On smooth areas the lower silty clay subsoil is somewhat dense, but loosened fragments are easily crumbled. In other places, generally along the bluff, the lower subsoil is more silty and friable than the upper, and is a yellow, friable, heavy silt loam to silty clay loam. Just west of Wellington a small included area approaches a very fine sandy loam in texture. In many places, especially near the river bluffs, the lower substratum effervesces with hydrochloric acid, indicating the presence of car-

bonate of lime. In the deep substratum at Lexington there occur considerable numbers of lime concretions, varying up to 1 inch or more in diameter. Limestone outcrops occur along a few of the lower slopes about 3 miles south of Lexington.

This belt of brown soil varies from one-half mile to 4 miles in width and forms the northern edge of the upland in the county. The belt is widest southwest of Lexington along Little Sniabar Creek. Most of the Knox silt loam is used for agriculture, but a few areas are still in forest. This soil is very productive and suited to a wide range of crops, but owing to its rolling topography it is less desirable for general farming than the more nearly level Marshall silt loam. Where the surface is not too rolling, corn and wheat are grown. Clover and alfalfa do well, and the area devoted to the production of these crops, especially alfalfa, is steadily increasing. Alfalfa should be grown more to prevent erosion.

As a fruit soil the Knox silt loam is probably superior to any in the county. Because of its rolling surface, much of it is better suited to fruit than to general farm crops. A number of commercial apple orchards are established on this soil, but there are possibilities of a much greater extension of the fruit industry. The soil is also well adapted to the growing of vegetables, but the trucking industry has not been developed in this region.

The problem of soil management consists principally of maintaining the supply of organic matter and nitrogen through systems of rotation, the use of manure, the prevention of soil erosion, and the use of phosphates in seeding wheat. The range in crop adaptation allows wide choice of crop rotations as well as the growing of special crops, such as fruits, vegetables, and tobacco. In many places the control of erosion is a serious problem, and deep gullies with vertical walls traverse these areas. Because of these gullies the fields are smaller and more irregular on the Knox silt loam than on most other types.

Land values vary with improvements and proportion of tillable land.

MUSCATINE SILT LOAM.

The Muscatine silt loam occupies depressions or poorly drained flats, usually at the head of drainage ways, within areas of the Marshall silt loam. It is typically a black silt loam, rich in organic matter, grading at about 10 inches into black silty clay loam and this at about 15 inches into a black or nearly black plastic silty clay with some faint yellowish-brown or drab mottlings in the lower part of the 3-foot section. In places some small black concretions occur.

This type occurs only in small areas and its aggregate area is not large. Because of its flat surface and its slightly impervious subsoil, it remains moist and cold longer than the Marshall silt loam.

This soil is generally farmed with surrounding types, and produces good crops of corn, oats, and grass. It is too poorly drained to be well adapted to the growing of alfalfa, although clover does well as a rule. Drainage, the maintenance of the supply of organic matter through good cropping systems, including legumes, and the return of crop refuse are the essential features of soil management on this type.

SUMMIT STONY CLAY.

The Summit stony clay occurs in rather narrow belts along steep slopes and escarpments of the hills in the western part of the county. Most of the areas lie near the top of the slope. The soil here consists of dark-brown to black clay which quickly passes into a brown or drab stiff clay. Some included patches of Crawford stony clay have a red or pinkish subsoil. Bedrock appears at depths ranging from a few inches to 12 inches or more. Fragments of limestone and chert and limestone ledges are abundant. Shale generally outcrops immediately below the limestone. The limestone outcrops are thickest north of Chapel Hill and present possibilities for local quarrying for agricultural lime or road material. The type is forested with walnut, black locust, oak, hickory, and redbud. It is valuable for what pasturage it affords. Bluegrass does well.

SUMMIT SILT LOAM.

The Summit silt loam represents the dark-colored, level or undulating prairie land in the southern part of the county. The typical soil is a black, nearly black, or very dark brown, mellow silt loam which grades at about 12 to 18 inches into very dark brown or nearly black silty clay loam, which, in turn, quickly passes into brown or yellowish-brown silty clay, and this into rather tough or plastic drab clay usually with gray mottling in the lower subsoil, the gray increasing with depth. Some small variations occur within the type. On narrow ridges bordering the Boone silt loam the surface soil is dark grayish brown and is underlain at about 10 to 12 inches by heavy silty clay or clay mottled with yellow and gray, below which a more friable yellow and gray mottled clay occurs, the gray increasing with depth. Flat areas within the type have a dark-gray surface soil, which is underlain at about 8 to 10 inches by a gray subsurface layer. In the low flat country east and northeast of Chapel Hill white lime concretions are abundant in the substratum and some iron concretions are present.

In general, the Summit silt loam occupies the smoother areas of the county. It occurs on the tops of divides and on lower level stretches. The chief areas of this soil are located south of Davis Creek and south of Odessa. The land is generally rolling enough to have sufficient surface drainage, but the rather heavy and plastic character of the subsoil does not permit a rapid downward passage of water.

All the type is under cultivation. It was originally prairie and was very rich in organic matter when first cultivated. The raising of livestock in conjunction with grain growing is the common agricultural practice. The livestock industry is more important here than on the loess soils. The type is an excellent grass soil, and bluegrass and timothy thrive on it. It is also a good grain soil, but will not permit the continuous grain cropping that is practiced on the Marshall silt loam. The marked adaptation to grass and the good results obtained with corn make the type a desirable soil for livestock farming. Corn, wheat, oats, clover, and grasses are the

principal crops. Yields of 40 to 50 bushels of corn per acre are common, although higher yields are obtained on the better farms.

Because of the rather heavy subsoil, poorly drained areas are cold and wet in spring, thus delaying the seeding of crops. Poor tilth may result from failure to maintain the organic content. The principal needs of this soil are improved drainage (on many areas), the maintenance of the supply of organic matter by rotation of crops, and the addition of manure and phosphates. Since much of the soil is somewhat acid, applications of limestone would also prove beneficial, especially in growing leguminous crops. Usually $1\frac{1}{2}$ to 2 tons of ground limestone are required to sweeten it.

Summit silt loam, colluvial phase.—The Summit silt loam, colluvial phase, represents small irregular areas of soil about the heads of drainage ways or on slopes within the large bodies of Summit silt loam and Pettis silt loam. These areas are locally called "gumbo" land. The soil is usually darker in color than the typical Summit soil and in texture approaches a clay loam. The subsoil is dark colored, with drab or yellow and gray mottlings, and is plastic. This soil represents accumulations of wash from the adjacent slopes. In places limestone and shale occur within the 3-foot section.

This phase, when farmed, is cultivated with the surrounding types. Much of it, however, is used for pasture because it usually remains moist longer than the adjoining soil, and bluegrass and timothy thrive on it, while drainage ditches usually cross these areas and interfere with cultivation. The more poorly drained land would be benefited by tiling.

Several small areas of Bates silt loam lying just east and north of Bates City, southeast of Odessa, and north of Higginsville, were included with the colluvial phase of the Summit silt loam because of their small extent. In these areas the soil is a brown or very dark brown silt loam underlain at 6 inches by a brown silty clay loam, which passes into a yellowish-brown stiff silty clay mottled with red. The lower subsoil is a yellow and gray rather friable silty clay, the gray increasing with depth. Agriculturally this soil compares favorably with the colluvial phase of the Summit silt loam, although it is not as dark in color nor as heavy in texture. Most of it remains in grass.

Summit silt loam, bench phase.—The bench phase of the Summit silt loam occurs on benchlike flats adjacent to the Davis Creek bottoms. The soil profile is essentially the same as that of the typical Summit silt loam. The surface is smooth and slopes gently toward the bottoms. This land is generally less than 20 feet higher than the adjacent bottom lands and as a rule it merges gradually with the uplands. Just east of Aullville the soil is a dark-gray silt loam with a thin gray subsurface layer, which is underlain by a stiff, plastic yellow and gray mottled clay subsoil. Because of its flat surface and impervious subsoil water often stands in low spots, and in these places a grayish subsurface layer has developed. The soil is generally acid and can be improved by liming and draining. The yields of corn and grass are practically as good as on the main upland type. The phase has marked agricultural possibilities, providing drainage is established.

PETTIS SILT LOAM.

The Pettis silt loam represents the gently rolling prairie land of the southern and western parts of the county. It is sometimes called "mulatto land." The surface soil is a dark-brown or nearly black mellow silt loam, 12 to 18 inches deep. This grades into a brown, dark-brown, or grayish-brown friable silty clay loam, which passes at about 20 to 24 inches into brown friable silty clay. The lower subsoil becomes lighter in color with increase of depth, and in places contains a few yellow mottlings. A few areas of soil with a lower subsoil of rather stiff yellowish clay, which in some places is slightly mottled with gray and is more friable in the lower part, are mapped with the Pettis silt loam.

The Pettis silt loam is most extensive south and east of Mayview and north and west of Odessa, where it occupies the higher land on both sides of the Sniabar Valley. Other areas are scattered throughout the southern and western parts of the county. It grades into the Summit and Boone soils on the one hand and the Marshall and Mandeville soils on the other. The Pettis silt loam averages lighter in color and has a more friable subsoil than the Summit silt loam. The principal difference between the Marshall and Pettis soils is that the subsoil of the Pettis is slightly heavier and yellower. The surface soil of the Pettis type is lighter in color where it blends with the Boone soils.

The Pettis silt loam has an undulating to gently rolling topography, averaging more rolling than the Summit silt loam, and is therefore a little better drained.

The tendency on this type is toward a diversified system of grain farming in conjunction with the raising of livestock. Corn, wheat, oats, clover, and grasses are grown extensively and do well. The type appears to be better for clover and grain than the Summit silt loam, but not as good as the Marshall silt loam. Alfalfa will grow on the better variations of this soil, although in places lime may be necessary to correct soil acidity.

Rotations, including clover, with frequent use of barnyard manures or plowing under of green-manure crops are essential to the proper management of this soil. Little commercial fertilizer has been used except on wheat. Phosphatic fertilizers, such as acid phosphate, bonemeal, or a complete fertilizer containing 10 to 12 per cent of phosphoric acid and only small proportions of nitrogen and potash, give best results. Lime is needed on some areas.

The table below gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the type:

Mechanical analyses of Pettis silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
345318.....	Soil.....	0.0	0.0	0.5	0.8	13.4	57.4	26.0
345319.....	Subsurface..	.0	.0	1.1	1.4	16.2	53.6	27.8
345320.....	Subsoil.....	.0	.8	.4	3.5	13.8	54.6	24.8

BOONE SILT LOAM.

The Boone silt loam represents the rolling forest land in the southern part of the county. The typical soil is a grayish-brown to light-brown or dark-gray silt loam, passing at about 5 to 8 inches into pale-yellow to yellow silt loam, and this at about 8 to 10 inches into yellow silty clay loam, which, in turn, passes abruptly into a yellow silty clay of moderately plastic to stiff structure. Gray and yellowish-brown mottlings appear at about 12 to 15 inches and increase with depth, the lower subsoil generally being a stiff silty clay mottled yellow and gray and locally containing rusty-brown and dark-colored concretionary material. At about 24 to 30 inches fragments of the subsoil of some areas are more friable, but the structure of the clay in places is stiff, and when dry it is difficult to bore through this dense material. In places on level, terracelike areas and lower slopes, the lower subsoil and the substratum are essentially a hardpan or claypan, consisting of compact and very stiff, heavy clay containing an abundance of dark-colored concretions and concretionary material. Virgin areas have a more brownish soil and less compaction in the subsoil.

An area of Cherokee silt loam about 6 miles southeast of Odessa, lying along the South Fork of Davis Creek, but too small to set apart as a distinct type, has been included with the Boone silt loam. It is a light-gray silt loam, underlain at 6 to 8 inches by a distinct gray layer, which in turn is underlain by a stiff yellow or brownish clay mottled with gray.

Strata of sandstone and occasional limestone beds outcrop locally on slopes or in the stream beds. Small fragments of chert are present in the substratum of some areas and shale also is encountered in the subsoil here and there. Most of the soil material appears to be derived from the shale which underlies the type.

This type occupies rolling land, chiefly in the southern part of the county bordering the larger streams. It occurs mainly on slopes, but extends over narrow and rounded ridges.

Most of this type was originally forested, and many of the steeper slopes are still in forest, in which oak and hickory are the principal trees. Corn, kafir, wheat, and some clover are grown. The land is best suited for grass because of its broken surface and relatively low fertility. Yields are considerably lower than on the darker prairie soils.

The Boone silt loam is lacking in organic matter, and careful management is necessary to maintain or increase productiveness. A more extended use of clover is recommended. When clover fails, cowpeas or soy beans will usually make a good growth. Erosion is a serious factor to contend with in handling this soil. The growing of rye as a cover crop would tend to keep the soil from eroding during the winter months and also afford some pasturage. Grain sorghums may be grown in place of corn on the worn areas. The use of phosphatic fertilizers for wheat and for starting clover and grass is recommended. Lime is sometimes needed for successful clover growing.

Boone silt loam, brown phase.—The brown phase of the Boone silt loam consists of a light-brown to brown silt loam, grading at about

5 to 7 inches into yellowish-brown silt loam, which passes into yellow silty clay loam at about 10 or 12 inches. At depths of 15 to 18 inches the subsoil shows gray mottling, which increases with depth. The lower subsoil is generally dense and stiff, and locally contains dark concretionary material. In places, as $1\frac{1}{2}$ miles east of Higginsville, the soil consists of light-brown to brown silt loam grading at about 6 inches into yellowish-brown to pale-yellow silt loam, grading, in turn, into yellow silty clay loam, with a little gray mottling, and underlain at about 16 to 20 inches by yellow silty clay with dark concretionary material and some mottling in the lower part.

Most of the material appears to be derived from shale and some interbedded sandstone. This soil blends with the Marshall silt loam at its northern margin, and no doubt parts of it have been affected by loessial material.

The phase occupies slopes along the streams on the southern edge of the loess region. Some of the steeper slopes remain forested with oak, hickory, walnut, elm, and redbud. It is a better soil than the typical Boone silt loam, but not as good as the Pettis or Marshall. Grasses, corn, and wheat are the common crops. Clover generally does well.

Much of this soil is too rolling for easy cultivation and should be kept in grass and used for pasture. As with the typical Boone silt loam, prevention of erosion and maintenance of the supply of organic matter are the main problems on this soil.

The results of mechanical analyses of samples of the soil, subsurface, and subsoil of the typical Boone silt loam are given in the following table:

Mechanical analyses of Boone silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
345325.....	Soil.....	0.1	0.1	0.1	0.9	8.0	71.9	18.9
345326.....	Subsurface..	.0	.2	.1	3.0	11.8	61.6	23.3
345327.....	Subsoil.....	.0	.4	.2	1.5	10.3	68.3	19.3

MANDEVILLE SILT LOAM.

The Mandeville silt loam is a light-brown to brown silt loam underlain at about 8 to 10 inches by yellowish-brown silty clay loam, which passes quickly into a buff-colored (reddish to yellowish-brown) silty clay that becomes stiff to moderately plastic with increase in depth. In places the lower subsoil is yellowish brown or nearly yellow, but the typical soil shows a distinct reddish cast, at least in the upper subsoil. Limestone underlies most of this type at various depths. There are some included patches which have a straight yellow subsoil, and on slopes some patches of Crawford silt loam have been included.

Two to three miles north of Odessa the type is rather variable in character of the subsoil. Here the upper subsoil is mottled yellow and gray in places, with greenish-yellow plastic clay below, or mottled greenish-yellow and gray plastic clay, containing dark-colored concretionary material. In other places the upper subsoil

has a distinct buff color. These variations are due to differences in the shale rocks and to differences in the stage of weathering, as much of the type is not sufficiently weathered to have acquired uniform characteristics.

The Mandeville silt loam occupies ridges and slopes in the southwest corner of the county and north of Odessa. It has a rolling topography and is subject to severe erosion, consequently the cultivated areas are irregular in outline and many clay spots occur on the steeper slopes.

The type differs from the Pettis silt loam in its lighter colored and shallower soil and more rolling surface. Corn, wheat, and some clover are produced on the smoother areas. Bluegrass and timothy do well, and these are the most important crops. Oak, walnut, hickory, redbud, and elm are the principal trees in the remaining forest areas.

In order to prevent destructive erosion, fields should not be allowed to remain uncovered during the winter months. Winter cover crops, the use of available farm manure, and rotations including a legume, such as red or alsike clover, are recommended in farming this soil. Control of erosion is one of the most important problems, and most of the type should be kept in grass.

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

Mechanical analyses of Mandeville silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
345328.....	Soil.....	0.0	0.2	0.2	4.0	10.0	57.3	28.4
345329.....	Subsurface..	.0	.2	.3	3.9	8.7	62.1	24.7
345330.....	Subsoil.....	.0	.1	.2	4.2	9.6	22.4	63.5

BREMER SILT LOAM.

The Bremer silt loam is a black or a very dark-brown silt loam, passing at about 8 to 12 inches into black silty clay or clay loam, which grades into black, rather tough silty clay to clay, with some yellowish-brown or light-brown mottlings. A few flat areas have a lighter colored subsurface layer and faint gray mottlings in the subsoil, resulting from inadequate drainage.

The Bremer silt loam is similar to the Wabash silt loam in color and structure, but differs from the latter type in occupying stream terraces or benches not subject to ordinary overflow. The Bremer silt loam is developed principally along Tabo and Little Tabo Creeks.

Most of this type is under cultivation, corn being the principal crop, although wheat and oats do well. Part of this soil is kept in permanent pasture. Clover should be grown more extensively. In some places drainage has not been well established and should be improved either by ditching or tiling. The Bremer silt loam is generally farmed in conjunction with some adjoining upland soil. The soil-management problems are mainly those of drainage and of maintenance of the supply of organic matter through rotations, legume growing, and the return of crop residues.

Bremer silt loam, heavy phase.—Several areas of Bremer clay, on account of their small extent, are shown on the map as a heavy phase of the Bremer silt loam. This soil occupies well-developed second bottoms on the lower Sniabar and Little Sniabar Creeks. The soil is a black plastic silty clay to clay, underlain at 6 to 8 inches by a tough black or dark-gray clay. The lower subsoil in places is mottled brown and dark gray. It differs from the Bremer silt loam only in texture.

Because of its plasticity and the tough character of the subsoil, this soil is hard to handle and is used mainly for grassland. Timothy and bluegrass grow luxuriantly. The soil is very fertile and large crops of corn are obtained when the conditions are favorable. Alfalfa will thrive where the land is well drained. The management should be the same as in case of the Bremer silt loam, but its heavy character makes care in cultivation somewhat more important.

WAUKESHA SILT LOAM.

The Waukesha silt loam is a brown to dark-brown mellow silt loam, passing at about 10 or 12 inches into brown, friable silty clay loam to silty clay. It is characterized by its mellowness and uniformity in color throughout the 3-foot section, the subsoil being slightly, if any, lighter in color and finer in texture than the surface soil.

The type occupies stream terraces above normal overflow. The principal areas are south of Wellington on Sniabar Creek and 6 miles east of Lexington on Tabo Creek.

The Waukesha silt loam is lighter in color and has a more friable subsoil and better drainage than the Bremer silt loam, with which it is associated. In agricultural value and productiveness this is one of the best soils of the area, comparing favorably with the upland Marshall silt loam, which it closely resembles in color and texture.

All this type is under cultivation and is well adapted to the growing of corn, wheat, clover, and alfalfa. Its productiveness can be maintained by the use of stable manure, crop rotations, including legumes, and, on the more worn areas, phosphate fertilizers.

WABASH SILT LOAM.

The Wabash silt loam is a black or nearly black silt loam, with a depth of about 8 inches, grading into a firmer black silt loam and at 10 to 15 inches into black silty clay loam, which passes into black silty clay, in places mottled with brown at depths of 20 to 25 inches. The surface soil sometimes takes on a dark-gray color when dry. As mapped this type includes small areas of colluvial material along the heads of draws. Recent wash material in places shows a lighter color than the typical soil.

The Wabash silt loam occupies first bottoms along streams that receive their wash principally or entirely from the loessial soils. It is mapped mainly along the smaller streams in the northern half of the county, in areas ranging in width from a rod to a half mile.

The surface is nearly flat, with a gentle slope toward the stream. Much of the land is subject to overflow, generally during the spring of the year, and consequently can not always be plowed in time for planting, so that a considerable part is kept as permanent pasture.

The need of adequate drainage is one of the chief factors in handling the type. The soil has a high content of organic matter and is naturally fertile, and where adequate drainage is established it is adapted to the staple crops of the region.

Corn is the principal crop grown, with yields ranging as high as 60 to 80 bushels per acre. Wheat does well on areas not subject to prolonged overflow. Good crops of clover and alfalfa can be grown on the better drained areas, but alsike clover is better adapted to the more poorly drained areas. Much of the type supports a luxuriant growth of bluegrass and is used for pasture. With the provision of adequate drainage by means of tile, or by ditching and straightening the channels of streams, the loss caused by overflow would be lessened and a greater area could be used safely for crops.

WABASH SILTY CLAY LOAM.

The Wabash silty clay loam is a dark-gray to black silty clay loam, with a depth of 8 to 10 inches, overlying black silty clay, which continues through the 3-foot section. Some patches of silt loam are included in this type, the soil next to the stream channel being lighter in texture than that bordering the upland. The principal area of this type is found along Salt Fork in the northeastern part of the county.

The topography is flat and the natural drainage is poor; water stands on the land for some time after overflows or heavy rains. The soil is inherently very productive, but its use for agriculture is restricted by insufficient drainage, which could be improved to some extent by straightening the stream channels. This type is used largely for pasture. Bluegrass does well where the land is not too wet, and corn and wheat are grown on the better drained areas. When properly drained this soil is very productive, although too fine in texture for ease of handling.

WABASH CLAY.

The Wabash clay is commonly known as "gumbo land." The soil is a dark-gray to black silty clay, which passes at about 10 to 15 inches into black or nearly black plastic silty clay, containing brown mottlings in places. Where the surface is dark gray in color, ashy-gray material occurs locally in the subsoil. In places the surface soil of included areas consists of silty clay loam. The topography is flat.

The principal areas of this type occur in the Missouri River bottoms north of White Siding in the northeastern corner of the county, and in the Hickland bottoms, 4 miles east of Lexington. Smaller areas are mapped along Sniabar Creek.

The area at White Siding is protected from overflow by a levee. The other areas are subject to overflow and remain wet far into the summer. The soil puddles badly if worked when wet, and bakes and cracks badly when dry, so that in order to be tilled successfully it must be plowed when it has the proper moisture content.

The type is very productive. The better drained land is cultivated to corn and wheat. Part of the type is kept in grass. Protection from overflow and provision for adequate drainage by ditching or tiling are the principal needs of the type.

OSAGE SILT LOAM.

The surface soil of the Osage silt loam is a dark-brown to black silt loam, 15 to 18 inches deep. The subsoil is a black to dark-brown or dark-gray silty clay loam to silty clay. The lower subsoil is usually a silty clay, and in places is mottled grayish and brownish. Along the upper parts of Davis and Tabo Creeks the surface soil locally is dark gray and the subsoil somewhat grayish. In cove areas bordering the uplands along the lower part of Davis Creek the soil is black and the subsoil black, with brown or dark-gray mottlings. The color of the soil in the small draws averages darker than in the larger bottoms.

The Osage silt loam occupies first bottoms along streams of the southern part of the county. It has been derived entirely or principally from the upland soils of residual origin, whereas the Wabash soils of the northern part of the county have been derived from loessial soils. In general the Osage soils average a little lighter in color than the Wabash soils.

The surface is nearly flat, usually with a slight slope toward the stream. Some areas bordering uplands are lower than the areas near the stream.

The type is rich in organic matter and productive. A considerable proportion is maintained in permanent pasture of bluegrass and timothy. Of the cultivated crops, corn is grown most extensively, with yields ranging from 40 to 60 bushels per acre. Wheat is grown only on areas not subject to frequent overflow. With protection from overflow and improved drainage this soil has a high agricultural value for a wide variety of crops.

About 17 miles of drainage ditch have been constructed along the lower part of Davis Creek in straightening its course. Tile drains leading to this ditch would in many cases prove beneficial.

OSAGE CLAY.

The Osage clay consists of a black, heavy, plastic clay, grading at about 12 inches into dark-gray or bluish-black plastic clay, which continues to a depth of 3 feet or more.

This soil is usually darker in color than the silt loam type and is normally developed at the foot of the upland slopes and away from the stream channel. The Osage clay is mapped in a few small areas in the large bottoms of Davis and Sniabar Creeks. Generally it has a lower position than the silt loam, and is therefore poorly drained. In color and soil profile it is similar to the Wabash clay, but it differs from the latter in origin, having been derived from residual uplands, while the Wabash consists of material washed from the loessial uplands. It has the same characteristics and is handled in the same manner as the Wabash clay.

VICKSBURG SILT LOAM.

The Vicksburg silt loam consists of a light-brown to brown mellow silt loam, with a depth of 10 to 15 inches, passing into light-brown or yellowish-brown friable silty clay loam to silty clay.

The type occupies high first-bottom positions along small drainage ways and outwash areas in the Missouri River bottom in the northern part of the county. Most of the material represents wash from the brown loess uplands.

The soil is very mellow, fertile, and generally well drained, but erodes rather easily. Very few of the areas in small valleys are cultivated, because they are too narrow and too much cut up by deep drainage ways. The larger areas are all cultivated, mainly to corn and alfalfa, for which this soil is unexcelled. The type is also suited to the growing of small grains, clover, and various truck crops.

A small remnant of a terrace south of White Siding is included with the Vicksburg silt loam. The soil here is lighter in color and heavier than the typical Vicksburg silt loam.

SARPY VERY FINE SANDY LOAM.

The Sarpy very fine sandy loam consists of a light-brown loamy very fine sand to very fine sandy loam, underlain at 6 to 8 inches by a yellowish-brown or brownish-yellow loamy very fine sand, or a loose, more grayish fine or very fine sand. In places layers of silt loam or silty clay loam occur in the subsoil. Except for these occasional heavy layers, the subsoil is uniform in texture throughout its depth. Small areas of fine sandy loam are included with the type on the river cut-off north of Wellington.

The Sarpy very fine sandy loam occurs in the Missouri River bottoms. It is composed of comparatively recent deposits of fine sediment over sandy material. Part of this land is still overflowed during high water, but the porous nature of the subsoil insures particularly good drainage.

This soil is well supplied with plant food and is adapted to all the staple crops. Corn yields may reach 60 or 80 bushels per acre. Because of its porous nature, this soil is well suited to clover and alfalfa, both of which are extensively grown. Potatoes and watermelons also do well. Where overflow can be controlled the soil is very productive of a wide variety of crops.

Very little livestock is kept on the bottom-land farms and consequently little plant food taken from the soil by cropping is returned. The proper use of rotations, including legumes, is about the only step necessary to maintain the soil in a state of high productivity.

SARPY SILT LOAM.

The soil of the Sarpy silt loam consists of a brown to dark-brown silt loam, underlain at about 8 to 15 inches by brownish-gray very fine sandy loam, and below this by grayish sandy loam or fine sand. Layers of silt loam, silty clay loam, and fine sandy loam alternate in many places through the 3-foot section. In small depressions the soil is heavier and darker in color.

This soil consists of recent alluvium, and the subsoil probably represents former sand bars. The largest area of the Sarpy silt loam occurs on the river cut-off south of Camden (Ray County). It is associated with the very fine sandy loam and generally occupies slightly lower positions than the latter type. All of it is fairly well drained, as its porous subsoil allows excess water to penetrate it quickly.

All the grain crops common to the region are grown and good yields are obtained. Corn is grown extensively and yields from 40 to 75 bushels per acre. Clover and alfalfa do well and yield heavily. Not much livestock is fed; consequently most of the crops are sold from the farm. Crop rotations, including legumes, are important to the maintenance of the type in the most productive condition.

SARPY SILTY CLAY LOAM.

The Sarpy silty clay loam consists of a brown to dark-brown silty clay loam, passing beneath into light-brown or grayish-brown silt loam to silty clay loam, underlain at depths ranging anywhere from 5 to 24 inches by yellowish-brown or yellow very fine sandy loam to loamy very fine sand. As mapped, the Sarpy silty clay loam includes small patches of Sarpy very fine sandy loam occurring on slight elevations or ridges, Sarpy silt loam on some flat parts, and Sarpy clay in some of the deeper depressions. These areas are too small to indicate on the soil map. The area of Sarpy silty clay loam lying farthest northwest in the Missouri River cut-off is a dark-brown silty clay loam generally passing at 4 or 5 inches into a loamy very fine sand.

The type has been formed by deposition of fine material from standing or slowly moving water over sand bars or flats. Owing to its porous subsoil, it has fairly good drainage. It is fairly well supplied with organic matter and is very fertile. Much of this land has not been farmed and is covered with a dense growth of willows. It would be a very productive soil, with wide crop adaptations, if cleared and drained.

The type is used for the production of corn, wheat, and some clover and alfalfa. A large proportion of the area on the eastern part of the cut-off is low and subject to prolonged inundation. Each overflow brings a fresh deposit of material, so that this soil is still in the process of formation.

RIVERWASH.

Riverwash occupies low bars of the Missouri River composed of recently deposited brownish-colored fine sand, very fine sand, silt, and clay. This material lies too low and is too frequently overflowed to have any important agricultural value in its present stage of development. It supports some vegetation in places.

SUMMARY.

Lafayette County is situated in the west-central part of Missouri, south of the Missouri River. It contains 612 square miles, or 391,680 acres, of which about 90 per cent is improved land.

The county has a smooth to rolling topography, the greater part of it being gently rolling.

The Chicago & Alton Railroad and Missouri Pacific Railroad provide good transportation facilities.

A population of 30,006 is reported in the 1920 census. Most of the inhabitants are engaged in agriculture.

The average annual temperature is 53.8° F., and the average annual precipitation is 37.66 inches.

The agriculture of the county is based on general farming, combined with stock raising and stock feeding. Corn and wheat are the principal cultivated crops. The acreage devoted to clover, alfalfa, and fruit could be profitably extended. Markets and shipping facilities are favorable to the development of the dairy industry as well as to the raising of purebred cattle.

Improvements in farm practice should be along the line of systematic crop rotations, extensive use of legumes (clover and alfalfa), and the application to the soil of all farm manures supplemented with commercial fertilizers, the latter especially on the poorer soils.

The loessial soils are included in the Knox, Marshall, and Muscatine series. They form the soils in the best upland areas of the county, are very productive, and suited to a wide variety of crops, of which corn, wheat, clover, alfalfa, and apples are the most important.

The residual prairie soils include the types of the Summit and Pettis series, which are characterized by their dark color and heavy subsoils. They are fertile and well suited to the production of corn, grass, wheat, oats, and clover. The Boone and Mandeville soils constitute the rolling forested land of the southern and western parts of the county. They have lighter colored surface soils and are somewhat inferior agriculturally to the black prairie types.

The second-bottom soils are included in the Waukesha and Bremer series. They are above normal overflow. They are very fertile and produce high yields of corn and wheat.

The recent-alluvial soils include the types of the Wabash, Osage, Sarpy, and Vicksburg series. They are generally subject to overflow, but when well drained form some of the most productive land in the county. They are used largely for corn and grass.

In general, Lafayette County is one of the most productive areas of western Missouri. It is suited to a great variety of crops. A generally prosperous condition exists throughout the county.





Areas surveyed in Missouri, shown by shading.

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