

SOIL SURVEY OF SARPY COUNTY, NEBRASKA.

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LOCATION AND BOUNDARIES OF THE AREA.

Sarpy County lies a few miles south of a line drawn east and west through the center of the State, and is in the eastern tier of counties bordering the Missouri River. It is included between 41° and $41^{\circ} 11' 35''$ north latitude and $95^{\circ} 50'$ and $96^{\circ} 20'$ west longitude. The Platte River elbows around the west and south sides of the county, while Douglas County bounds it on the north. The county is longest from east to west, with a slight dip in the southwestern corner. It has an area of 226.7 square miles or 145,088 acres, all of which was included in the present survey. The city limits of Omaha are but little more than $2\frac{1}{2}$ miles north of the area surveyed.

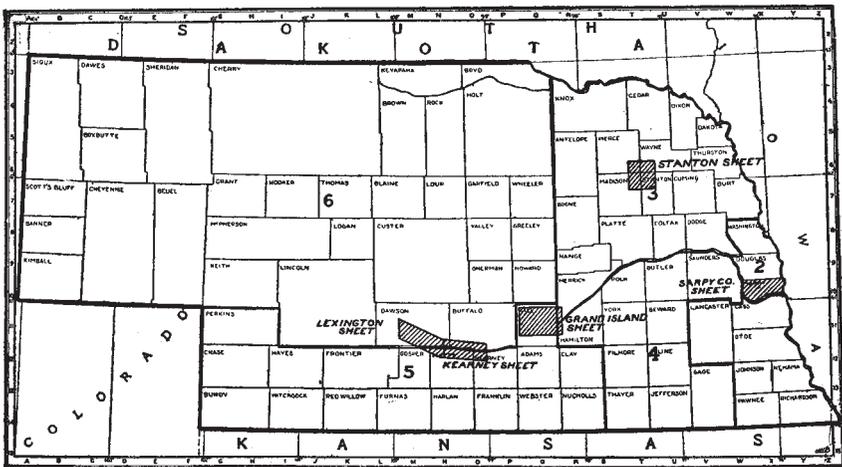


Fig. 38.—Sketch map showing location of the Sarpy County area, Nebraska.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

As early as 1810 fur traders of the American Fur Company established a post on the west bank of the Missouri River within the present limits of Sarpy County and for years carried on active trade with the Indians. In 1854 the town of Bellevue was founded and the surrounding country thrown open to settlement. Noticeable development did not take place, however, until 1857, when Sarpy County was organized under the Territorial government, with Bellevue as its county seat. Papillion, now a town of 600 inhabitants, was founded in 1869,

and six years later became the county seat. Other important towns are Springfield, Gretna, Richfield, Chalco, Fort Crook, and Laplatte.

From the beginning of agriculture in the county, whether practiced by the white man or the Indian, the dominant crop grown has been corn, and by good cultivation and careful selection of seed much improvement has been made both in yield and quality. From 1857 to 1867 considerable spring wheat was grown, but toward the end of this period the yields began to decrease, so the acreage was reduced and the crop no longer occupies a prominent place in the agriculture of the county. For a time considerable winter wheat was grown, but with the fall in price following the development of new wheat-growing sections in the north the crop was largely abandoned for corn. There has been a continued increase in the acreage of alfalfa, clover, and tame grasses, and, while their value in the rotation is not yet fully appreciated, they are a promising feature of the agriculture of the county. Since the extensive development of the packing industry at South Omaha the live-stock industry has assumed considerable importance, but is yet far short of its most profitable development. In the vicinity of Omaha trucking has been extensively developed, and on the Elkhorn River lowlands the production of melons and cucumbers for seed is proving profitable.

CLIMATE.

The climate of Sarpy County is marked by sudden changes of temperature, moderate winds, a favorable rainfall, and a high percentage of clear days. The winters are usually cold and changeable, with so small an amount of snow that winter grains are sometimes badly injured for lack of adequate protection. According to the Weather Bureau records, the annual precipitation at Omaha is 31.69 inches, and at Ashland it is 29.53 inches. Over 50 per cent of this falls during the four growing months—April to July, inclusive. The normal annual temperature at these two stations is 49.6° and 50.9°, respectively. At Omaha the average date of the last killing frost in spring is April 10 and the first in fall is October 20, giving an average growing season of one hundred and ninety-three days. At Ashland the average length of the growing season is one hundred and sixty-eight days, with the last killing frost in spring occurring on April 21 and the first in fall on October 6. According to the Weather Bureau records at these two stations the hottest months in the year are July and August, and the coldest months are December, January, and February. The greatest range of recorded temperature was in 1899, when a total range of 125° was registered.

The following table gives the normal monthly and annual temperature and precipitation at Omaha and Ashland. the two Weather

Bureau stations nearest to the area from which records could be secured:

Normal monthly and annual temperature and precipitation.

Month.	Omaha.		Ashland.		Month.	Omaha.		Ashland.	
	Temper-ature.	Pre-cipita-tion.	Temper-ature.	Pre-cipita-tion.		Temper-ature.	Pre-cipita-tion.	Temper-ature.	Pre-cipita-tion.
	°F.	In.	°F.	In.		°F.	In.	°F.	In.
January.....	19.2	0.69	23.8	0.59	August.....	73.7	3.34	74.6	4.11
February....	25.0	.79	23.3	.61	September...	64.8	2.91	66.8	2.57
March.....	35.5	1.50	37.4	1.19	October.....	52.9	2.47	55.5	2.27
April.....	51.0	3.13	52.8	2.67	November...	36.6	1.06	38.3	.70
May.....	61.7	4.37	63.3	4.47	December...	26.7	1.01	26.5	.69
June.....	71.5	5.67	71.9	4.62					
July.....	76.2	4.75	77.0	5.04	Year...	49.6	31.69	50.9	29.53

PHYSIOGRAPHY AND GEOLOGY.

Sarpy County, the smallest county in the State, occupies a position between the Platte and Missouri rivers, which bound the county on three sides. These streams have cut their channels from 100 to 300 feet below the former level of the glacial plain and have given rise to two distinct physiographic divisions—the highlands and the lowlands.

The topography of the highlands presents a variety of surface features consisting of high, level plateaus, gentle slopes, and steep precipitous bluffs. The highest altitudes in the county range from 1,200 to 1,300 feet above sea level and are found in the western part of the county from 2 to 3 miles east of the Platte, where a narrow tableland, extending north and south, forms the drainage divide between the Platte and the Missouri river systems. Thus it will be seen that the drainage of the county is chiefly toward the east and south.

Eastward from the tableland the drainage systems are again divided by a high, narrow ridge, which extends east and west through the county and constitutes all that remains of a former broad plateau. To the north of this ridge the drainage waters, entering Papillion Creek, find their way in a southeasterly direction to the Missouri River. Papillion Creek, the largest and most important stream lying within the area, is formed by the junction of Big and Little Papillion creeks and is notable as being the only one in the county whose waters flow direct to the Missouri River. Along its course are contributory streams, the most important of which, South Papillion Creek, has its source within 1½ miles of the Platte River bottoms.

The southern half of the county has a rough and broken surface, characterized by numerous deep-cutting streams, chief among which are Buffalo, Goose, and Weather creeks. As the laterals of these streams have branched and rebranched and pushed their V-shaped valleys back into the upland areas, the broad, high tableland of former

days has been gradually worn away until now it is little more than a narrow ridge.

In the southern part of the county the highlands extend nearly to the Platte and leave only narrow strips of lowland along the river. The largest areas of lowland soils are found in the eastern part of the county along the Missouri River and in the vicinity of Laplatte. These bottoms are little more than broad, low flood plains, over much of which the rivers still flow in time of exceptionally high water. The Missouri River is notable for the ease and frequency with which it shifts its channel, having moved within the last twenty years about $3\frac{1}{2}$ miles from its former course.

During times of high water the Platte is a swiftly flowing river from one-half to nearly 1 mile in width, but in the summer when the waters have gone down the shallow current divides and redivides, leaving wooded islands and low, barren sandbars in the river bed.

The Elkhorn, another important river of the State, enters the county from the north, about 4 miles from its confluence with the Platte, and by its overflows has formed a rich deposit of variously textured soils which are highly prized for their production of wild hay.

The geology of Sarpy County is comparatively simple, the entire area having been buried during the glacial period under from 100 to 300 feet of loess. Since that time this material has been entirely removed from three sides of the county by the action of the Platte and Missouri rivers, whose tributaries have carved out channels from 50 to 160 feet in depth and changed the landscape of the highlands from a moderately level plain to a surface of marked irregularity.

Along the bluffs in the western and southern parts of the county a few glacial boulders have been exposed by the wearing away of the silty clays in which they were embedded.

Underlying the glacial deposit is a thin bed of brown Dakota sandstone of Cretaceous age. This in turn is underlain by beds of valuable white carboniferous limestone, into which the Platte has cut a channel from 50 to 100 feet deep. The upper Carboniferous is said to be the oldest formation exposed in the State and is marked in this county not only by limestone beds but by valuable deposits of fire clay as well. The limestone outcrops from the bluffs which rise from 50 to 150 feet above the Platte River bottoms. Excellent railroad facilities have been provided along the base of the bluffs, and extensive quarries are being developed. Much of the rock quarried is used at the large smelters at Omaha or as foundations for buildings in or near the city. Quantities of the rock are also shipped to Lincoln, where it forms an important ingredient in the construction of street pavements.

In the vicinity of these quarries are frequently found small areas of sharp, coarse sand brought down and deposited here by the river. This material is also highly prized in the construction of concrete, and many carloads are annually removed.

In the eastern part of the county quantities of the subsoil of Miami silt loam are being used in the manufacture of brick. At Avery a plant is being operated with a daily capacity of 50,000 brick, and a high-grade product is being manufactured. Valuable beds of fire clay are also found along the bluffs of the Platte River, and the material is being worked up at the Avery plant.

SOILS.

Seven distinct soil types were recognized and mapped in the Sarpy County area. Of these the Marshall silt loam and the Miami silt loam are loessial in origin and occupy the highlands of the county, constituting 75 per cent of the total area mapped. The remaining five types are all alluvial in formation and occupy the creek and river bottoms. They range from heavy clays to loose, shifting sands which are continually changing in texture as the floods bring in new material or wash away deposits previously laid down.

The following table shows the total area embraced in each type:

Areas of different soils.

Soil.	Acres.	Percent.	Soil.	Acres.	Percent.
Miami silt loam.....	69,696	48.1	Laurel fine sand.....	5,440	3.8
Marshall silt loam.....	39,232	27.1	Wabash clay.....	3,648	2.6
Wabash silt loam.....	18,496	12.8	Sarpy clay loam.....	2,816	1.6
Laurel fine sandy loam.....	5,760	4.0	Total.....	145,088	.....

MIAMI SILT LOAM.

The soil of the Miami silt loam is a brown silt loam from 0 to 8 inches deep, with an average depth of 5 inches. The subsoil is a brownish-yellow silt loam or silty clay, which frequently extends with but little change to a depth of 100 feet or more. Scarcely a trace of sand is found, and when wet both soil and subsoil are plastic and sticky, which has given rise to the term "clay land," by which the type is locally known throughout the area.

The Miami silt loam is of general occurrence throughout the county, occupying nearly one-half of the total upland area. The type occurs normally as long irregular-shaped strips on the steep hillsides bordering the numerous deep-cut streams and valleys, but is also occasionally found on the higher level tracts in fields which have long been in cultivation.

The surface of the type is very rolling, yet only a small proportion is too steep to admit of cultivation. The altitude varies from 980 to 1,260 feet above sea level and from 20 to 300 feet above the normal level of the rivers.

The drainage of this soil is always good, and on the steeper slopes it is often excessive. The silty material, when once erosion has begun, wears away at a very rapid rate. In a few localities considerable damage has been done by the deep gulying of the hills. To correct this and prevent the future washing of the soil is a difficult and expensive task. In many fields where erosion has just begun much damage could be prevented by the construction of a few inexpensive terraces and by subsequent judicious plowing.

The Miami silt loam is composed of loessial material. Since the type has been brought under cultivation, erosion has been active and the depth of the original surface soil has steadily decreased, until now in many fields small areas occur from which the darker, organic-stained material has been completely removed. These areas, together with those on which the subsoil is exposed by plowing, give the fields the peculiar streaked appearance characteristic of the type.

For the first half-mile back from the Platte River bluffs the local color of the soil is distinctly lighter and the subsoil is frequently of a reddish-yellow hue.

The Miami silt loam is probably as well adapted to corn as to any other crop, but in many instances the type has suffered by continued cultivation to this crop. Clover, alfalfa, and grass do well and should be introduced more extensively into the system of rotation. With the introduction of these crops humus would be added to the soil, its productivity increased, and much ruinous erosion prevented. The average yield of corn is about 40 bushels to the acre. Wheat yields from 20 to 25 bushels and alfalfa from 3 to 5 tons per acre. The type is highly prized throughout the county and ranges in value from \$60 to \$100 an acre.

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

Mechanical analyses of Miami 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>
14050, 14052	Soil	0.1	0.4	0.1	0.6	13.6	69.1	16.0
14051, 14053	Subsoil .....	.1	.1	.1	.7	15.5	67.8	15.6

MARSHALL SILT LOAM.

The soil of the Marshall silt loam consists of a black heavy silt loam from 8 to 13 inches deep, with an average depth of about 10 inches. The content of organic material is high and the soil when dry is loose and friable. The subsoil, identical with that of the Miami silt loam, is a brownish-yellow silt loam or silty clay extending to a depth of many feet.

Like the Miami silt loam the Marshall silt loam is found in all parts of the upland portion of the county in irregular-shaped areas which are always contiguous with bodies of the former type. The two types are very similar, the only differences being the deeper, blacker soil with a higher organic-matter content and the more level topography which the Marshall silt loam usually possesses.

As a rule the type occupies the high, level plateaus and the gentle slopes, although it is sometimes found in small areas on steep hillsides which are still forested or which have not been long in cultivation. The localities around the heads of the streams are usually covered by this type. In the upper part of the small stream courses a phase of the type is found consisting of a black silt loam from 3 to 20 feet or more in depth, which lies in long, narrow areas seldom more than 40 rods in width and nearly always divided into two parts by a narrow vertical-walled ditch, which has been eroded to a depth of from 10 to 40 feet.

The sloping surface of the Marshall silt loam affords excellent drainage. More attention should be given to the methods of cultivation in order that erosion may be checked and the removal of the rich surface soil prevented.

The Marshall silt loam is derived from loess, the immediate surface of which contains a high percentage of organic matter. On the higher areas this covering is being gradually worn away and the type converted into the Miami silt loam, while the washed material collecting on the lower slopes is constantly adding to the area of the Marshall silt loam.

This soil is well adapted to all of the crops commonly grown in the county. Corn is the chief crop, but the area devoted to alfalfa is annually increasing. Owing to the eroded condition of the narrow areas of the deep valley phase, they are usually devoted to pasture. Along the lower slopes potatoes are extensively grown and yield from 150 to 250 bushels per acre. Wheat yields from 20 to 30 bushels and oats from 35 to 45 bushels per acre. Alfalfa returns from 3 to 5 tons per acre and corn from 40 to 60 bushels, and higher yields are frequently secured. In the vicinity of Omaha extensive areas of the type are devoted to market gardening, and the industry is proving very profitable.

Along the stream courses where sufficient water can be had for irrigation the soil is well adapted to the growing of celery, and it would seem that the cultivation of this crop could be profitably introduced.

Because of its position the Marshall silt loam is considered one of the most desirable soils in the county and has a value of from \$70 to \$100 an acre.

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

Mechanical analyses of Marshall silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
14046, 14048.....	Soil.....	<i>Per cent.</i> 0.1	<i>Per cent.</i> 0.3	<i>Per cent.</i> 0.1	<i>Per cent.</i> 0.4	<i>Per cent.</i> 10.3	<i>Per cent.</i> 69.6	<i>Per cent.</i> 19.1
14047, 14049.....	Subsoil.....	.1	.2	.1	.3	9.7	72.5	16.9

LAUREL FINE SANDY LOAM.

The Laurel fine sandy loam, owing to its origin as river sediment, has a wide variation of structure and texture. The larger proportion of this type consists of a yellowish-brown or gray fine sand or fine sandy loam 16 to 24 inches in depth, with an average depth of 20 inches, underlain by a gray or light-brown silty loam containing much very fine sand. The silt content increases with depth, and at from 30 to 36 inches the subsoil may contain some clay. A phase of this type, found chiefly in the vicinity of the Platte and Elkhorn rivers, consists of a thin layer of yellowish-brown clay or silt loam underlain by yellow or brown fine sand.

In all eleven bodies of this type were mapped, varying in extent from a few acres to 2 or more square miles. One of these bodies lies north of Bellevue and another just east of Laplatte. These and two smaller bodies include all of this type mapped in the Missouri River Valley. The remaining bodies are found along the course of the Platte River, chiefly in the western part of the area. The type is found exclusively in the valleys, and usually occupies flat benches along the present stream courses or where these streams formerly had their channels. The type has an elevation of from 2 to 12 feet above the normal level of the streams, and descends abruptly to the stream courses when found in proximity to them. Where the elevation is 5 feet or more above the stream level, adequate drainage is afforded for most of the crops grown. Like the other soils of the valleys, this type is generally subject to overflow. The floods usually come during the growing season and frequently destroy the entire crop.

This type is alluvial in origin, having been formed by the deposition of materials carried in suspension by the rivers. This sediment was derived from the weathering of sandstone and other materials farther up the stream courses and was brought down chiefly during times of floods.

The chief crops grown upon this type are corn and potatoes. Occasionally, when the seasons are favorable, wheat and oats are included in the system of crop rotation. When properly drained the soil is well adapted to the growing of muskmelons, watermelons, cucumbers,

and cabbage. Small fruits also give good yields. The average yields of the principal crops are: Corn, 40 bushels; oats, 30 bushels; wheat, 20 bushels, and potatoes, 100 bushels per acre.

The value of the Laurel fine sandy loam varies with its availability for cultivation. Some of it is held as high as \$100 an acre, but most of it is worth less than \$50. The value has declined considerably in the last few years owing to a succession of floods.

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

Mechanical analyses of Laurel fine sandy 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>
13628, 14056	Soil	Tr.	0.2	0.3	13.8	47.1	33.4	4.9
13629, 14057	Subsoil .....	.0	.1	.2	6.8	41.1	47.4	4.3

The following samples contained more than one-half of 1 per cent calcium carbonate (CaCO₃): No. 14056, 4.5 per cent; No. 14057, 4.6 per cent.

LAUREL FINE SAND.

The soil of the Laurel fine sand is a loose, medium to fine sand of a grayish-yellow color, with an average depth of 24 inches. Below this the material is very similar to the soil, both in color and texture, but the structure is considerably more compact.

The Laurel fine sand is confined to the river bottoms and is found as long, narrow ridges adjacent to the rivers or as more extensive bodies farther inland. In St. Mary's bend, where a number of such inland areas are found, the river has shifted to the east from 1 to 3½ miles within the last twenty years. In these old channels and on the flood plains adjoining, where the current of the river was comparatively swift, the bodies of Laurel fine sand were deposited. The soil is also found as low, barren islands in the shallow channels of the Platte and Missouri rivers. These areas are constantly shifting their position as the current adds fresh material or carries away the fine sand previously deposited. Thus within a year the areas mapped may double their present size, or, on the other hand, may be removed entirely. The wind is also active in the formation of this type, carrying large quantities of the dry material across the channel and depositing it as dunes or ridges along the river bank. These ridges vary from 5 to 20 feet in height and in places are rapidly encroaching on the heavier soils farther inland.

A phase of the Laurel fine sand containing a small percentage of silt is found in two small areas along the river bluffs in the southwestern part of the county. The soil in these areas is formed by the weathering of the sandstone beds which come to the surface at these points.

Owing to the loose structure and the shifting nature of the soil the most of the areas mapped as Laurel fine sand are of little agricultural

value. Where a turf of wild grasses has become established the type is of some value as a range for stock.

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

Mechanical analyses of Laurel fine sand.

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>
13677, 14054.....	Soil.....	0.1	0.6	3.6	65.4	24.9	3.0	2.3
13678, 14055.....	Subsoil.....	.1	1.5	4.2	74.5	16.7	1.4	1.4

WABASH CLAY.

The Wabash clay consists of a heavy, sticky clay, ranging in depth from 0 to 24 inches. The color of the soil varies from drab to jet black, depending on the period of its formation and the amount of organic matter present. The subsoil is also a heavy, tenacious clay, varying in color from gray to black, with occasional faint markings of brownish-yellow.

This type is of limited extent in the county, being found only in a few narrow strips on the bottoms of the Platte and Missouri rivers and in two small areas along Papillion Creek. The largest and by far the most important body of the type is found in the Platte River bottoms, beginning near the mouth of the Elkhorn River and extending 6½ miles to the south in a strip from one-fourth to 1 mile in width. Here the surface foot of the stiff waxy soil is very rich in organic matter, and the jet black color extends to a depth of 40 inches or more.

The Wabash clay is one of the lowest lying soils in the county, and in consequence its drainage is often quite inadequate. In the vicinity of the Platte the type occupies a channel-like depression which winds down through the bottoms between the hills and the foregrounds of lighter-textured soils along the river front. This soil body probably marks one of the former courses of the Elkhorn River, and is still used as a long flood plain by that stream in times of high water. With each successive overflow and its accompanying deposit the elevation of the type is slightly raised, and with each increase in elevation the current, flowing more slowly, deposits a larger proportion of the finely divided materials carried in suspension. These different velocities of the current, corresponding to the different levels of the land, account for the formation of the sand which is frequently found below the fourth foot, and the occurrence of the heavier clays above.

In the Missouri River bottoms the type occurs as low, isolated areas, and may be found near the river or as narrow strips lying near the hills. As a rule, the soil here has been formed by the river backing up and depositing the fine material in its old abandoned channels.

The formation of both soil and subsoil in this vicinity is of quite recent date, areas being found on which the surface foot had been deposited during the present season. Here neither the soil nor subsoil contains an appreciable amount of organic matter, and the stiff, impervious clay maintains its drab color to a depth of 4 feet or more. In such areas the absence of organic material allows the surface to bake and crack badly, making it a very difficult soil to till.

Owing to its low, poorly drained condition a few spots are found throughout the type which are somewhat affected with alkali, but the extent of such areas is so small that their occurrence is of little moment.

The areas of Wabash clay have been so wet during the last few years that only a small percentage of the type is now under cultivation. When well drained, or in dry seasons, the soil is well adapted to the growing of corn and hay, large quantities of the latter crop being produced. The type commands a price of from \$20 to \$100 an acre.

The following table gives the average results of mechanical analyses of samples 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>
13630, 13681	Soil.....	0.2	0.4	0.4	1.9	3.5	54.5	39.1
13631, 13682	Subsoil.....	.1	.2	.2	1.9	5.8	60.1	31.2

WABASH SILT LOAM.

The soil of the Wabash silt loam has an average depth of 24 inches and consists of gray, dark-brown, or black silt loam. Owing to the presence of a large quantity of organic matter, the soil when dry is friable and mellow under cultivation, but in the presence of even small quantities of moisture it becomes sticky and plastic, assuming some of the properties of a clay. The subsoil varies from gray to black in color and from a friable silty loam to a heavy clay loam in texture.

The largest and most typical bodies of this soil are found in the bottoms of Papillion Creek and along the courses of its largest tributaries. Other important areas of the type are found in the lowlands along the Platte, the Elkhorn, and the Missouri rivers, being usually separated from the river by some one of the coarser-textured soils.

The topography of this soil is uniformly level, and as its elevation is only a few feet above the river bed much damage is sometimes done by midsummer inundations. In seasons of normal rainfall good drainage can be secured by the use of tile drains, and even in seasons of general overflow much benefit would be derived from such drainage after the rivers had returned within their banks. In the low, flat bottoms of Papillion Creek, through which the stream has cut its channel

from 10 to 20 feet below the general level of the surface, destructive overflows are occasionally experienced. Much damage is also done by the water from the hills, which pours into these lowlands after every heavy rain. Here tile drains would be especially beneficial in hastening the removal of the water into the channel of the stream. As yet, however, little has been done toward the drainage of this soil.

The origin of the Wabash silt loam is alluvial. Along the rivers it has been formed by the deposition of the fine material carried in suspension by the slowly moving waters in times of overflow, while along the courses of the smaller streams the type has been built up partly by successive overflows and partly by the wash from the higher lying soils.

The structure of this soil is in many places materially influenced by the large accumulation of organic matter which, in the vicinity of the Elkhorn and Platte rivers and along the bottoms of the inland streams, is largely responsible for its deep black color. Along the Missouri, where the formation of the type is of more recent date, the influence of organic material is less pronounced, and in consequence the color is somewhat lighter.

The Wabash silt loam, if properly drained, is one of the best alfalfa soils in the county, though as yet only a few small fields are devoted to this crop. On the drier parts of the type potatoes are extensively grown and do remarkably well, yielding from 150 to 250 bushels per acre. The soil is well adapted to celery, but little attention is given to its cultivation as yet. The chief crop grown is corn, which yields from 45 to 65 bushels per acre, with yields of 80 bushels per acre frequently recorded.

Owing to the successive overflows of the rivers during the last three years probably not more than 40 per cent of the type is now under cultivation, the remainder being used as hay meadow or as a range for stock. The value of the type runs from \$70 to \$125 an acre, depending on its position and liability to overflow.

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

Mechanical analyses of Wabash 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>
13679, 14058	Soil.....	0.1	0.3	0.2	0.9	13.4	72.9	12.0
13680, 14059	Subsoil.....	.1	.2	.3	1.3	11.5	72.2	14.2

SARPY CLAY LOAM.

The soil of the Sarpy clay loam is a stiff waxy clay from 12 to 24 inches deep, with an average depth of about 20 inches. The color

varies from gray to black, depending largely on the quantity of humus in the soil. The subsoil consists of gray or yellow fine silty sand.

The Sarpy clay loam is found only in a few small areas in the bottoms of the Missouri River, and as long, narrow strips near the bank of the Platte. These soil bodies occupy depressed areas in the flood plains of the rivers, and frequently lie so low that artificial drainage must be resorted to if profitable cultivation is to be continued. On account of the close, impervious texture of the first 20 inches of the soil, the use of tile drains would probably not be satisfactory, but the construction of a few open ditches through the type would be of much benefit in furnishing avenues for the escape of water which otherwise must be removed by the slow process of evaporation.

The subsoil of the type is composed of sand and silt deposited by the flood waters of the rivers at a time when the current through these low places was comparatively strong. As the elevation became higher, and the river shifted somewhat from its former course, the conditions became more favorable for the deposition of fine material. All of the type is of comparatively recent formation, and along the Missouri River are found areas whose surface foot of soil was deposited by the flood of July, 1905. In the Platte River bottoms, where the type has not been so changed by recent overflows, considerable organic matter has accumulated and has given the soil a much darker color.

The Sarpy clay loam, if properly drained and protected from the ruinous overflows of the river, would be an excellent soil for all of the crops commonly grown in the county. In its present wet condition only a small percentage is under cultivation, the remainder being devoted to pasture or to the production of wild hay. Corn is the only cultivated crop now being grown, the average yield being about 50 bushels per acre. Alfalfa is grown to some extent, and where the fields are not overflowed excellent yields are secured.

Along the Platte River south of Springfield areas of this type are found where the subsoil is a sharp, coarse sand. From some of these the clay surface has been dredged away, and quantities of the sand are being removed for use in the construction of concrete.

The value of the Sarpy clay loam ranges from \$25 to \$75 an acre.

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

Mechanical analyses of Sarpy clay 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>
13632, 14060	Soil.....	Tr.	0.1	0.4	2.6	8.7	51.5	36.4
13633, 14061	Subsoil.....	0.1	.4	.3	9.7	40.3	42.3	6.5

Sample No. 14061 contain 4.7 per cent of calcium carbonate (CaCO₃).

AGRICULTURAL METHODS.

Considerable money has been expended throughout the county in the purchase of farm machinery, and the most improved modern machinery is being used in the cultivation of all crops. Corn is the leading crop grown, and the high degree of success which has always attended its cultivation has not lent encouragement to the introduction of new crops.

At the present time the rotation most commonly practiced in the county is a two-years rotation, consisting of corn one year, followed by wheat or oats the next year. The usual method is to plow the grain stubble in the fall for the succeeding corn crop. When the corn has ripened the ears are gathered from the field, while the stalks are left standing and used for pasturage during the late fall and winter months. The following spring the corn land is broken for wheat or oats and in the fall is again plowed for corn. Many farmers are found who plant corn on the same field two years in succession, following it the third year with wheat or oats. A few have introduced a rotation in which clover and grass play an important part. In such cases three or four crops of hay are secured before the land is again used for cultivated crops. This is a commendable practice, and should be more generally followed, especially on those fields which are in danger of washing and on the lighter-textured soils in the river bottoms.

Nearly all of the wheat grown is of the spring varieties, as the severe winters have taught the farmers that the winter wheats are too uncertain to be profitable. Threshing is done from stacks in the field, and the straw is mostly used for bedding stock.

In the past considerable attention has been given to the production of different varieties of millet, there being in 1900, according to the census of that year, nearly 2,000 acres devoted to these crops. Within the last few years, however, the number of fields sown to clover and alfalfa has reduced to some extent the acreage of these crops.

Only a small amount of commercial fertilizer is used within the county, but the fertilizing value of barnyard manure is quite generally recognized, and the supply is carefully husbanded. It is generally conceded that the most prosperous farmers are those who devote a part of their farms to the raising of live stock, and thus return to the soil, in the form of manure, a large proportion of the material removed from it. With the excellent facilities for marketing stock at South Omaha this could be made a very profitable industry, and should be much further developed.

Along the river flats, in the western part of the county, considerable areas of the poorly-drained soils are given over to the production of wild hay. This, as well as the clover and alfalfa grown on the uplands, is stacked in the field and in the winter is hauled away and used on the farm or is marketed in the loose condition.

AGRICULTURAL CONDITIONS.

The productive soil and the effective methods of its cultivation, together with the close proximity of the active markets of Omaha, have given the people of Sarpy County a degree of prosperity far above that of the average farming class. This prosperous condition is in evidence on every hand throughout the county. As a rule the houses are large, pretentious structures set in well-kept yards. Good, substantial barns are found on nearly every farm, and these, together with the sheds provided, are usually sufficient to house all stock and farm machinery. The roads throughout the county are carefully built and are usually maintained in good repair.

The present prosperous condition of the farming class is strikingly shown in the rapid rise in the value of farm lands within the last decade. In 1895 farm property could be bought for from \$10 to \$30 an acre. Since then the values have increased until now they range from \$50 to \$125 an acre. A large number of the farms are still occupied by the original settlers, many of whom secured their homes by preemption before the homestead law was enacted, and considerable care is usually exhibited in their management.

In 1900, according to the census of that year, 39.6 per cent of the farms were being operated by their owners. Since that date the number of farms thus occupied is said to have materially increased, and the more careful methods of cultivation resulting therefrom have contributed not a little to the increased prosperity of the county. The greater proportion of the rented land is cultivated for a share of the crop, from two-fifths to one-half of the crop being retained by the owner. When cash rent is paid, the usual amount is from \$3.50 to \$5 an acre.

No large tracts of land in Sarpy County are held by corporations or by individuals. According to the census of 1900 the county contained in farms 140,190 acres, of which 123,682 acres, or 87.6 per cent, was improved. Since then considerable improvements have been made and it is reasonable to suppose that a higher percentage of the total area has been brought under cultivation.

The average size of farms in 1900, according to the same authority, was 131.3 acres, a figure which probably closely represents the conditions of to-day.

Until recent years little difficulty was experienced with the labor problem, but since the development of the large packing houses in South Omaha, where 12,000 people are daily employed, the supply of farm labor has steadily decreased until now it is frequently a serious problem to secure sufficient labor to carry on the ordinary operations of the farm. Nearly all of the labor used is white, and the general efficiency has always been relatively high. Few farmers find it

necessary to retain the services of a man throughout the year, but when this is done the usual wage paid is from \$20 to \$22 a month and board. Those who contract by the month for shorter periods receive on an average about \$23 a month, although as high as \$30 a month has frequently been paid.

Sarpy County, lying in the midst of the corn belt, is well adapted to the growing of this crop, and both the yield and quality of the product are excellent. Potatoes return good yields of tubers of fair size and quality and good profits are being made in their production. Along the wet bottoms of the Elkhorn River large quantities of wild hay are annually produced, but the tall, rank grass is considered inferior to alfalfa or tame grasses, and its price is relatively low.

Corn has always been the staple crop of the county, occupying, according to the census of 1900, nearly 49 per cent of the total area under cultivation. It is doubtless true that the marked adaptability of the soils to this crop has done much to place the county in its present condition of prosperity, but the fact should be recognized that this condition can not be maintained indefinitely by continued dependence on this one crop. The practice of alternating wheat or oats with corn should give place to a rotation in which the clovers, alfalfa, and tame grasses form a prominent part. Already alfalfa is beginning to occupy a considerable acreage on the silt loams of the county and the crop is recognized as being of especial value on the Miami silt loam in preventing erosion and in restoring to the soil needed organic matter, which the past methods have caused to be depleted.

More attention should be given to the stock-raising industry, and the feed produced, instead of being sold as such, should be converted into beef and pork before it leaves the farm. By this practice not only would increased profits be derived from the products grown, but the crop-producing power of the soil would be continually increased. The prevailing idea that the Miami silt loam requires more care and attention to maintain its productive power than does the Marshall silt loam is doubtless correct, yet the original crop-producing power of the Miami silt loam was such that with careful treatment its productivity might be indefinitely maintained. Fields of this type were observed which were said to have yielded crops continuously for more than fifty years, yet the average yield of corn in 1904 was over 50 bushels per acre. Such crops are secured by giving live stock a place on the farm and by practicing a rotation of corn, small grain, and grasses.

Dairying is followed to a small extent by a few farmers near South Omaha, the milk being delivered by wagon to consumers in the city. At Springfield a creamery has been established, and the revenue which the farmers are securing from this source is encouraging the development of this industry.

In the northeastern part of the county considerable attention has been given of late to the cultivation of truck crops, of which the most

important are potatoes, sweet corn, cabbage, onions, and celery. These are grown on the deep Marshall silt loam soil of the lower slopes and in the narrow valleys of small streams and are usually in great demand in the markets of South Omaha.

On well-drained areas of Wabash silt loam along the Elkhorn River a few farmers have found the growing of melons and cucumbers for seed to be very profitable. The soil is well adapted to these crops and it would seem the industry could well be extended. The seeds are shipped to seed houses in Waterloo, a few miles to the north.

Sarpy County is provided with excellent facilities for transportation, six railroads radiating from Omaha having been so constructed that no point in the county is more than 5 miles distant from a railroad station. The main line of the Burlington and Missouri River Railroad, entering the area from the west, extends across the county in a northeasterly direction to Omaha. Along the Missouri River bluffs in the eastern part of the county another line of the Burlington passes north and south, paralleling a line of the Missouri Pacific Railway, while in the central part of the county excellent service is provided by the Union Pacific, the Chicago, Rock Island and Pacific, and the Missouri Pacific railroads.

The county is fortunate in being located so near the growing markets of Omaha and South Omaha. In the former city all orchard, field, and truck crops find a ready sale, while cattle, sheep, and hogs are disposed of at the large packing houses in South Omaha. A considerable proportion of the eastern part of the county is so located with respect to South Omaha as to enable the farmers to deliver large quantities of truck to this market by team. Gretna, Springfield, and Papillion, towns of from 400 to 600 inhabitants, form important local markets at certain seasons of the year.

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