U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE NEBRASKA SOIL SURVEY, G. E. CONDRA, DIRECTOR, UNIVERSITY OF NEBRASKA.

SOIL SURVEY OF POLK COUNTY, NEBRASKA.

BY

J. M. SNYDER, OF THE U. S. DEPARTMENT OF AGRICULTURE, IN CHARGE, AND THOMAS E. KOKJER, OF THE NEBRASKA SOIL SURVEY.

THOMAS D. RICE, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1915.]

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., October 4, 1916.

SIR: In the extension of the soil survey in the State of Nebraska work was undertaken and completed in Polk County in the field season of 1915. This survey was carried on in cooperation with the Nebraska Soil Survey, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1915, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF POLK COUNTY, NEBRASKA.

By J. M. SNYDER, of the U. S. Department of Agriculture, in Charge, and THOMAS E. KOKJER, of the Nebraska Soil Survey.—Area Inspected by THOMAS D. RICE.

DESCRIPTION OF THE AREA.

Polk County lies in the east-central part of Nebraska. The Platte River, which here flows in a northeasterly direction, forms the northern boundary line. The bordering counties are Merrick and Platte on the north, Butler on the east, York on the south, and Hamilton on the west. The western boundary line is 9 miles in length and the eastern and southern boundaries 24 miles each. The area of the county is 275,200 acres, or 430 square miles.

Polk County comprises two general topographic divisions, the more or less rolling uplands and the broad alluvial lands, including both river flood plains and the higher terraces.

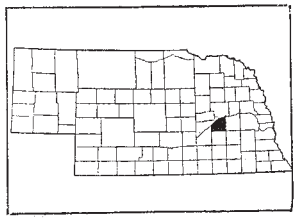

FIG. 1.—Sketch map showing location of the Polk County area, Nebraska.

The southern two-thirds of the county, roughly speaking, consists of a comparatively smooth, loess-covered upland plain sloping gently toward the east. The original surface has been encroached upon by the eroded drainage basins of streams.

The valley slopes lying between the remnants of the level upland plain and the flood plains of the main streams have been cut into by smaller drainage channels and a gently rolling topography has been developed. Between the stream valleys, however, considerable areas of the original plain have not been encroached upon by drainage channels and the surface here is almost level. In these areas the drainage is somewhat inadequate and the surface is dotted with numerous small depressions, which hold water a part of or all the year.

From the general level of the upland there is a rather abrupt drop of 125 to 150 feet to the alluvial flood plain of the Platte River. This descent is marked by a continuous strip of dissected lands made up of sharp spurs with steep slopes and intervening deep ravines. The alluvial land of the Platte Valley, as viewed from the upland, appears to stretch abruptly from the foot of these bluffs toward the river as a level plain, but in detail local surface inequalities, including a succession of terraces of varying elevation, alluvial fans,

shallow stream valleys, old stream channels, cut-off lakes, and ridges of sand and gravel, give some relief to the surface. On the western border of the county the Platte lowlands are scarcely a mile wide, but they broaden out toward the east to a width of more than 8 miles.

The elevation of the county is between 1,440 and 1,770 feet above sea level. The upland lies above the level of 1,630 feet. The elevations in the Platte Valley range between 1,440 and 1,620 feet. The lowest altitude in the county is in the northeastern corner.

The Platte River flows in a northeasterly direction along the northern boundary of the county, but it receives very little local drainage. It drains only its alluvial land and the narrow slope from the loess plain. Clear Creek, its only important tributary within the county, flows parallel to the Platte from a point 3 miles south of the town of Silver Creek, Platte County, to the eastern county line.

The larger part of Polk County, including nearly all the upland, is drained by the Big Blue River. This stream crosses the upland in a general easterly direction. Its principal tributaries are Prairie and Davis Creeks. From these upland streams small branches have cut back into the surface of the plains from 1 to 5 miles. All the streams except the Big Blue and Platte Rivers are intermittent.

Nearly all parts of the county have adequate drainage except the small basins on the upland loess plain, where drainage is not yet established. These depressions, because of their fine-textured surface soil and subsoil, hold water after heavy rains. This disappears in dry seasons, however, by evaporation and slow percolation. These depressions are indicated on the map by small areas of soils of the Scott series. Small areas of alluvial land are inundated during high-water stages of the streams. Such flooding is only temporary. The nearly level alluvial lands of the Platte Valley have porous subsoils and drain rapidly to the underflow.

Polk County was formed from Butler County in 1870. The total population, according to the 1910 census, is 10,521. Eighty-one per cent of the population consists of native white persons, and the remainder almost entirely of foreign-born white persons, mostly Swedish. The population is very evenly distributed throughout the county, and averages 24.5 persons to the square mile. About one-third of the people live in villages and towns. A large number of the residents of towns are retired farmers, many of whom still own farms.

Osceola, Stromsburg, Shelby, and Polk are the most important towns. The first have populations between 1,100 and 1,400. Osceola, the county seat, is in the central part of the county.

The railroad facilities of Polk County are fairly good. A line of the Union Pacific Railroad from Central City extends through the county to Valparaiso, where it connects with the Omaha to Lincoln branch. The Alma branch of the Chicago, Burlington & Quincy Railroad extends south from Stromsburg. A line of the Chicago & North Western Railway crosses the southeastern corner of the county. Much of the Platte Valley area is served by the main line of the Union Pacific Railroad, which roughly parallels the river.

The wagon roads of the county are kept in excellent condition throughout the greater part of the year. The highways most used are dragged after rains. Except for a few places in the bluffs and in the Platte Valley all the section lines are open to traffic. The Meridian Road from Minneapolis to Galveston traverses the eastern part of the county, and the transcontinental Lincoln Highway extends along the Platte River on the north, just outside the county.

Omaha is the principal market for the live-stock and dairy products. Grains, which constitute an important product, are marketed in the towns of the county. The fruits and truck crops grown supply home needs and the demands of the towns, and are largely consumed within the county.

The county is well supplied with telephone service, rural mail delivery routes, and rural schools and churches.

CLIMATE.

The climate of Polk County is favorable for the growing of hay crops, vegetables, fruit, and grain, and the raising of live stock. The more important climatic data are shown in the table below, compiled from the records of the Weather Bureau station at David City, in Butler County. David City lies only a few miles from the Polk County line, in the same latitude and practically the same general altitude, and the data from this station are believed to be representative of conditions in Polk County.

Normal monthly, seasonal, and annual temperature and precipitation at David City, Butler County.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	27.1	64	−17	0.70	1.00	0.25	4.4
Jaunary	21.8	60	−30	0.78	0.60	0.60	7.2
February	21.7	72	−30	0.88	0.50	0.25	6.2
Winter	23.5	72	−30	2.36	2.10	1.10	17.8

Normal monthly, seasonal, and annual temperature and precipitation at David City, Butler County—Continued.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
March	33.5	86	−11	1.51	0.30	2.70	6.7
April	49.5	89	10	3.52	1.85	10.25	0.6
May	58.8	100	24	4.58	1.20	7.60	0
Spring	47.3	100	−11	9.61	3.35	20.55	7.3
June	68.7	101	39	4.59	6.55	2.80	0
July	73.1	106	48	4.27	1.00	6.90	0
August	71.3	101	36	3.54	0.15	1.45	0
Summer	71.0	106	36	12.40	7.70	11.15	0
September	63.8	101	27	2.54	0.70	4.25	0
October	50.9	90	10	2.22	1.65	3.30	0.6
November	35.5	73	− 8	0.82	T.	2.60	2.2
Fall	50.1	101	− 8	5.58	2.35	10.15	2.8
Year	48.0	106	−30	29.95	15.50	42.95	27.6

The mean temperature is 48° F. The coldest months are January and February, with mean temperatures of about 22°, and the warmest month is July, with a mean temperature of 73.1°. The lowest temperature on record is −30°, in January and February, and the highest, registered in July, is 106°.

The average date of the last killing frost in the spring is April 21, and that of the first in the fall, October 6. This gives an average growing season of approximately 168 days. The latest killing frost in the spring on record occurred May 27, 1907, and the earliest in the fall on September 12, 1912.

The mean annual precipitation amounts to practically 30 inches. The rainfall is heaviest during May, June, and July, these three months having a total mean rainfall of 13.44 inches. The rainfall is lowest during November and the winter months, the total for the four months from November to February, inclusive, being only 3.18 inches. The winter precipitation occurs largely in the form of snow. Most of the summer rainfall comes as local showers, which are of short duration. The rainfall of the early summer is fairly well distributed, but during the latter part of July and in August and September periods of drought may occur. Hot winds in some years damage crops at this time.

AGRICULTURE.

The first settlement in Polk County was made about 1867. The earliest immigrants took up land in the eastern part of the Big Blue and Platte River Valleys. Agriculture in some form has always been the predominating industry of the county. Until 1875 cattle were grazed at large on public and railroad lands. The upland grass was used for pasturage and the grass on the bottom lands for hay. The first crops grown were corn and spring wheat.

In 1880, according to the census, corn occupied 27,671 acres, oats 4,864 acres, and spring wheat 41,815 acres. No winter wheat was grown at this time. Hay was cut from 2,880 acres, mainly in the Platte Valley. Other products included barley, rye, buckwheat, potatoes, broom corn, and sorghum.

During the following decade the acreage of corn more than tripled and that of oats increased by over 800 per cent, while the area devoted to wheat fell to only 1,459 acres. The acreage mowed for hay in 1889 was about seven times that in 1879. Flax had become an important crop, occupying 10,482 acres. Irish potatoes were planted on 1,276 acres, and broom corn on 1,103 acres. There were 21,803 apple trees in the county in 1889. Rye, barley, and buckwheat were less important than at the preceding census period.

During the decade 1889 to 1899 there was a marked change in the number of crops grown. The acreage of oats and corn increased considerably. Winter wheat had become an important crop by 1899, while flax had been practically abandoned. The acreage of potatoes, broom corn, and sorghum remained about the same as at the previous census period. The number of fruit trees was greatly increased, apples and peaches leading. A small acreage was devoted to strawberries and brambleberries. Previously to 1899 almost all the hay cut was harvested from wild grass in the Platte Valley. Clover, millet, and alfalfa were sown in the early nineties and in 1899 there were 3,768 acres in tame-hay crops. Stock raising was carried on quite extensively, especially on the valley farms.

The agriculture of Polk County has been diversified to some extent in recent years. It now consists mainly in the growing of corn, oats, wheat, hay, and fruit, and the raising of horses, cattle, and hogs.

Corn occupies a greater acreage than any other crop. According to the report of the Nebraska State Board of Agriculture, 77,705 acres were planted to this crop in 1914, and the production was 2,781,839 bushels, or an average of 35.8 bushels per acre. The corn grown is used mostly on the farm or by local feeders in feeding work stock and beef and dairy cattle and in fattening hogs. The surplus production is marketed in near-by towns.

Wheat is the money crop of the county. This grain occupied 69,466 acres in 1914, with a production of 1,250,388 bushels, or an average of 18 bushels per acre. Part of the crop is used by local flour mills, but it is largely shipped to Omaha. A very small acreage is devoted to spring wheat.

Oats were reported grown on 21,129 acres in 1914, yielding an average of 44 bushels per acre. The greater part of the production is fed on farms, the surplus being marketed in the towns.

Hay is one of the most important crops. According to the report of the Nebraska State Board of Agriculture, 29,957 acres were devoted to hay or forage crops in 1914. About one-fourth of the hay acreage consists of wild-grass land, mainly in the Platte Valley. Tame grasses occupy a large acreage, mainly on the uplands, but on a number of the upland farms the hay production is not sufficient to feed the stock, so that it is necessary to buy hay from the farmers in the valley or from outside markets. Very little hay is shipped out of the county.

Practically every farm has an orchard and garden, but neither fruit nor vegetable production is carried on commercially.

Dairying is not carried on very extensively. There are a few herds of dairy cattle in the county, and all the farmers keep a few cows to supply dairy products for home consumption, the surplus milk and cream being hauled to receiving stations. Some of the farmers make their surplus cream into butter, which is marketed in the towns. Farms on which the production of milk is specialized send cream to Omaha and Lincoln, mainly during the summer months, the skim milk being fed to hogs and calves.

There are a number of important animal industries. The 1914 report of the Nebraska State Board of Agriculture gives the value of live stock in the county as: Horses, $979,098; sheep, $8,142; beef cattle, $564,980; dairy cattle, $319,592; hogs, $284,675. The raising of cattle is carried on quite extensively. Most of the feeders are grown on the farms, and few cattle are shipped in for feeding. Hog raising is carried on in connection with general farming. Most farmers keep from 10 to 50 hogs. The animals not slaughtered for home consumption are shipped to the Omaha market. The census reports 27,699 hogs sold or slaughtered in 1909. There are only a few herds of sheep in the county. The census reports the sale or slaughter of 2,904 sheep in 1909. The annual poultry and egg production of the county is valued at approximately $150,000. Chickens, ducks, geese, and turkeys are raised in a small way on most farms for home consumption or for sale on the local markets.

The adaptation of the soils to different crops is recognized to some extent by most farmers. They realize that the Grundy, Waukesha, and Plainfield silt loams are well suited to general farm crops,

and that the Knox silt loam, Cass fine sandy loam, Cass sandy loam, and the Wabash silt loam, unless well drained, are best suited to use as pasture. Farmers also recognize that the light-textured soils give good results with vegetables.

In growing corn on the upland, where the Grundy silt loam is the predominating soil type, the land is usually plowed in the spring to a depth of 6 to 8 inches. The ground is harrowed before planting. Occasionally the land is plowed in the fall or winter and left bare unless seeded to rye. Practically all the corn is planted in check rows. The Platte Valley soils are mainly much lighter in texture and where used for corn, listing is commonly practiced. This does not require previous preparation of the seed bed. Corn on the upland is cultivated three or four times with either shovel or disk cultivators. Listed corn is cultivated two or three times with single or two row cultivators. The last cultivation is performed with shovel cultivators.

Ground to be sown to winter wheat is plowed to a depth of 4 to 7 inches. Plowing is done as soon as possible after the removal of the previous small-grain crop, as early and deep stirring tends to check the spread of the Hessian fly. The seed bed is harrowed at least twice and in a few instances is packed with a roller. Wheat is sowed with the drill.

The farm buildings are generally substantial. Most of them are of frame construction with concrete foundations. The barns are large, having storage capacity for grain and hay and room to accommodate work animals and other live stock. Barbed wire and woven wire are in general use for fences. The work stock consists of medium to heavy draft horses and mules. Generally the farm machinery includes turning plows, harrows, corn planters or listers, grain drills, manure spreaders, binders, cultivators, mowing machines, rakes, hay bucks, and hay stackers. A few farmers have power tractors for plowing. Gas engines are in common use for light stationary work. Many farmers own thrashing machines, and thrashing outfits travel from farm to farm during the harvest season.

No system of crop rotation is in common use, but many farmers rotate crops to suit individual farm needs.

The use of commercial fertilizers or lime is practically negligible. The census of 1910 reports only one farm using commercial preparations. All the barnyard manure obtainable is used. This is usually applied to the corn land and as a top-dressing on the pastures.

Farm labor is scarce throughout the greater part of the year and is especially difficult to obtain during the harvest season. Some farmers hire hands by the month, but most of the help is hired by the day during the harvest season. The supply consists mainly of laborers who come in at harvest time and of young men from schools,

who seek work in the summer. The farm laborer is paid about $35 a month, with board. Day laborers are, as a rule, paid from $2.50 to $3 a day during harvest.

The size of farms varies considerably. Most of the farms range between 50 and 500 acres in size. The 160-acre farm is common where general farming is practiced. Where more than this acreage is in one holding much of the land is used for pasture. The 1910 census reports the average size of farms as 173.5 acres. The average size seems to be increasing.

The 1910 census reports 48.6 per cent of the farms as operated by owners, a decrease of almost 40 per cent since 1880. The majority of the farm leases call for a rent of two-fifths of the grain, delivered at the market. These contracts run for one to five years. Very few farms are rented for cash.

The 1910 census reports 97.6 per cent of the total area of the county as being in farms and 88.6 per cent of the farm land as improved. The value of farm land varies considerably with differences in soil, improvements, nearness to towns and roads, and other factors. Upland farms range in price from $150 to $225 an acre, while land in the Platte Valley is cheaper, ranging from $40 to $175 an acre.

SOILS.

The upland soils of Polk County have been derived through weathering from the loess, which is a widely distributed deposit over the general region. The loess in its unweathered condition is an even-grained material composed largely of silt and loosely cemented with carbonate of lime. The color ranges from light brown to yellowish brown. The material has a rather coherent structure where undisturbed, but breaks down readily into a loose, floury mass. Under erosion it has a tendency to maintain vertical banks and often shows a columnar structure.

Beneath the loess is a fairly well defined deposit of sand and gravel. This material is of no importance as far as soil formation is concerned, but it is of value on account of its water supplies. The exact age of this sand and the yet lower mantle-rock deposit is not known. Certain layers of silt, clay, and sand were without much doubt deposited when the counties farther east were covered by the Kansan glacier. No drift bowlders have been found in Polk County, but they may occur deeply buried by later deposits. The bedrock also has not been of importance in the formation of the soils. There are no outcrops of these rocks. Evidence as to the age of the bedrock is afforded by outcrops in the bordering counties and by a few deep well borings. It is probable that shales and limestones of the Benton formation of the Cretaceous underlie the greater part of the county. The base of these lies on the impor-

tant Dakota formation, which outcrops in Saunders County. The Niobrara chalk rock, covering the Carlisle or uppermost member of the Benton, outcrops in Nance County and probably extends under part of western Polk County.[1]

The deposit of loess was originally highly calcareous and, after the leaching that has taken place, the subsoil still has a sufficient content of lime to effervesce with acid. There is also an accumulation of lime in the lower subsoil in the form of small lime concretions. In this area the loess deposit has a thickness of 50 to 90 feet.

Over the upland of Polk County the weathering of this loess has gone on without great interruption by erosion. The most noticeable changes that have taken place are the accumulation of organic matter in the surface material, as indicated by its black color, the concentration of clay in the subsoil to the extent of forming in places a hardpan, and the leaching and partial removal of the lime from the weathered upper zone. On the more nearly level upland weathering and leaching in their most advanced stage have resulted in the formation of a dark-colored surface soil, only moderately calcareous, with a heavy compact subsoil. This type of soil is correlated as belonging in the Grundy series.

The types of the Grundy series are characterized by dark-brown surface soils underlain by a light-brown very compact subsoil. The surface of the area occupied by the Grundy soils shows little relief, except over comparatively small tracts where there has been erosion by streams. This series has a high agricultural value. It is represented in Polk County by the silt loam type.

Where the upland breaks away to the Platte Valley the loess has been weathered under conditions of better drainage and has given rise to a lighter colored surface soil underlain by a subsoil of a yellowish-brown color and light, friable structure. The material here closely resembles the original loess. The soil is classed in the Knox series.

The Knox soils differ from the Grundy in having lighter colored surface soils and less compact subsoils. Usually lime concretions occur in the subsoil. The topography is very rolling, and the soils are well drained, eroding very easily. The silt loam is the only type of the Knox series encountered in this county.

The Scott series is represented by the silt loam type, occurring in small depressions or basinlike areas in the upland loess plain. The soil is derived from loessial material deposited in shallow temporary pools by sheet water and intermittent streams. The soils of this series are very poorly drained and of low agricultural value. They are characterized by dark-gray to black surface soils and light-gray subsoils.

[1] Geological data supplied by Dr. G. E. Condra.

At the foot of bluffs or rather steep slopes between the upland and the bottoms a dark-colored soil is developed, consisting largely of colluvial material derived mainly from loess. This soil is classed in the Judson series.

The soils of the Judson series range in color from brown to dark brown or almost black. They are not overflowed and are not subject to much erosion. Considerable organic matter has been incorporated with these soils in the process of their formation and they are valuable general-farming types. In Polk County only the fine sandy loam type of the series is developed.

Alluvial terraces are developed in well-defined areas in the valley of the Big Blue River, where they occupy the greater part of the valley floor. These terraces range from 15 to 40 feet above the river. The soil consists of a silt loam underlain by gray sand. The terrace sediments were deposited by the river and its tributaries in a valley that had been eroded in the original loess plain. The silt of these terraces resembles that of the upland, and is termed valley loess by the Nebraska Soil Survey. A large terrace formerly occupied the Platte Valley, but much of its surface has been eroded away, and in other places it has been obscured by the formation of overlying alluvial fans. Farther east, in Butler County, this terrace is well defined.

The soils of the terraces now lying above overflow are correlated in two series, the Waukesha and the Plainfield series.

The Waukesha series is characterized by surface soils ranging in color from dark brown to black and by yellow to dark-brown subsoils. The topography of these soils is flat to slightly undulating, but drainage is good. Only the silt loam of this series is encountered in Polk County.

The Plainfield series differs from the Waukesha in its lighter colored soil material and the lighter texture of the subsoil. The surface soils are brown to dark brown, and grade into light-brown subsoil. The topography ranges from level to gently rolling and dunelike. The soils are derived from alluvium brought down by the Platte River. The surface of the lighter types has been reworked to some extent by wind. This series of soils occurs in slightly elevated areas on the Platte Valley floor. The drainage is good to excessive. In Polk County the Plainfield sand, fine sand, and silt loam types are mapped, the sand and fine sand each including a rolling phase.

First bottoms occur along the Platte and Big Blue Rivers and their tributaries. The soils here consist of recent deposits of sand, silt, and clay. The first bottom of the Big Blue River is very narrow. In many places it is not sufficiently wide to justify mapping. The extensive Platte Valley floor, though nearly level, is modified in places by old stream channels, narrow ridges, and small dunelike elevations built up by the wind. Drainage in the first bottoms is in general imperfect, and the soils are subject to overflows. The black

first-bottom soils with a heavy subsoil are classed in the Wabash series; the black soils with a heavy, highly calcareous subsoil in the Lamoure series; the black soils with a light-colored subsoil in the Cass series; and the brown soils with a light-colored subsoil in the Sarpy series.

The types in the Wabash series are characterized by black surface soils. The subsoil varies considerably in color, ranging from light gray to black. The topography of these soils is generally flat. In this survey the Wabash silt loam only is mapped.

The Lamoure series includes black surface soils, with heavy subsoils ranging in color from light gray to dark gray or drab. The series differs from the Wabash in containing large amounts of calcium carbonate in the lower subsoil. The Lamoure soils have poor natural drainage. The fine sandy loam and silt loam types are mapped in Polk County.

The surface soil of the types included in the Cass series is dark brown to black. The subsoil varies from light yellow to gray. The topography as a rule is flat and the soils are poorly drained. Their agricultural value is low. In this county the Cass sandy loam, fine sandy loam, and very fine sandy loam types are mapped.

The types included in the Sarpy series are characterized by light-yellow surface soils and light-yellow to almost white subsoils. The topography is ridgy and the soils are well drained. They have a low agricultural value. Only the fine sand of this series is developed in this county. It occurs in the first bottoms of the Platte Valley.

In addition to the 15 soil types grouped in the 10 series mentioned, the miscellaneous type of Riverwash is mapped. This consists of the unassorted silts, sands, and gravels along the Platte River. The areas of Riverwash are subject to constant overflow.

The various soil types are described in detail in the following pages of this report. Their distribution is shown on the accompanying map, and their actual and proportionate extent of each are given in the table below.

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Grundy silt loam	173,184	62.9	Scott silt loam	6,016	2.2
Waukesha silt loam	15,488	5.6	Sarpy fine sand	4,992	1.8
Cass sandy loam	14,080	5.1	Cass very fine sandy loam	4,224	1.6
Knox silt loam	13,632	5.0	Judson fine sandy loam	3,136	1.1
Cass fine sandy loam	9,024	3.3	Lamoure fine sandy loam	1,216	.4
Lamoure silt loam	8,064	3.0	Riverwash	1,152	.4
Plainfield fine sand	2,560	2.9	Wabash silt loam	320	.1
Rolling phase	5,376				
Plainfield silt loam	6,656	2.4	Total	275,200	.....
Plainfield sand	3,968	2.2			
Rolling phase	2,112				

GRUNDY SILT LOAM.

The surface soil of the Grundy silt loam is a dark-brown to dark grayish brown silt loam, 6 to 14 inches deep. It is underlain by a brown, very heavy silt loam, which extends to a depth of about 20 inches. The material gradually becomes more compact, and between the depths of 20 and 24 inches the texture changes from a heavy silt loam to a silty clay loam. The color gradually becomes somewhat lighter with depth, and below the level of 20 inches is usually light brown. The deeper subsoil is sometimes faintly mottled with dark-brown stains. The dark color of the surface soil is due to the large content of organic matter.

The depth of the surface soil varies considerably with the topography. On the flat areas it is usually 8 to 14 inches deep, while in areas somewhat eroded the depth ranges from 6 to 8 inches. The surface soil on the lower slopes is deeper and darker in color than typical. It has a depth of 15 to 20 inches, and is underlain by a subsoil ranging in color from pale yellow to dark brown. Patches of Knox silt loam and Scott silt loam, 1 to 5 acres in extent and too small to map, are included with this type, the Knox soil occurring along draws and the Scott soil in slight depressions.

The Grundy silt loam is the most extensive soil type in the county, covering more than three-fifths of the total area. It is the predominant soil type from the bluffs along the Platte Valley southward to the county line. The type covers the entire upland, except where interrupted by narrow stream valleys and small depressions in which other types are developed.

The topography of the Grundy silt loam is flat to gently rolling. Where streams have cut back into the original loess plain the topography is rolling, but away from the streams the topography gradually becomes smoother. Over considerable areas where drainage channels have not invaded the upland the surface is nearly level. The most rolling areas occur along the Big Blue River Valley, where the topography varies from gently rolling to hilly.

The silty material of this type erodes quite easily. Erosion is especially rapid where the unweathered material, which wears away readily, is exposed on the slopes. Erosion is checked by leaving the roughest land in pasture and by placing brush, weeds, and straw in the draws.

Practically all the Grundy silt loam is under cultivation. The most important crop grown is corn. A large percentage of the corn production of the county is grown on this type. The soil is very well adapted to this crop, yielding 40 to 50 bushels per acre on the average and giving higher returns in good years. The crop of second importance is wheat, the acreage of which is gradually increasing.

Wheat yields 20 to 30 bushels per acre. Tame grasses are not grown extensively, but their acreage is being increased each year. The type gives good results with alfalfa, yielding four cuttings, which aggregate 3½ or 4 tons per acre. Clover and timothy do well, yielding between 1½ and 2 tons per acre.

This soil is very easy to handle, being friable and stone-free. Two and three horse hitches are used for most farm operations. The four-horse hitch is employed for the heavier work.

No commercial fertilizers are used, but barnyard manure is usually applied to corn land. The soil retains moisture well when properly handled, the principal requirements being deep plowing and shallow cultivation.

The Grundy silt loam is the most highly prized soil in the county. Farms on this type sell for $175 to $225 an acre, depending on the location and improvement.

The following table shows the results of the mechanical analyses of samples of the Grundy silt loam:

Mechanical analyses of Grundy 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.*	*Per cent.*
371807	Soil	0.1	0.2	0.2	0.8	21.2	62.6	15.2
371808	Subsoil	.1	.1	.1	.4	16.2	59.3	24.3

KNOX SILT LOAM.

The Knox silt loam varies considerably from place to place in depth and composition. On the steeper slopes of the bluffs the soil is brown to light blown or yellowish brown in color and open, friable, and easily cultivated. It is underlain at a depth of 10 to 20 inches by a lighter colored subsoil, which extends to a depth of 36 inches. The subsoil is slightly compact, owing wholly or in part to cementation with lime. The type is very calcareous, the lower subsoil sufficiently so to effervesce with acid. Numerous small lime concretions are common here. Where the soil has been washed down the slopes the darker surface soil, with the addition of colluvial material, ranges from 12 to 24 inches in depth and is underlain by a light-yellowish, heavy, compact subsoil.

The Knox silt loam occurs mainly in a continuous strip, one-half mile to 2 miles wide, along the bluffs of the Platte River. This area extends the width of the county in a northeast to southwest direction. Patches of the Knox silt loam too small to map occur within areas of the Grundy silt loam along the Big Blue River and Prairie Creek.

The topography of the Knox silt loam is gently rolling to rough. Where the type breaks from the upland the surface is gently rolling, but near the valley, where the draws become deeper, the surface is cut by V-shaped draws. Because of the rolling topography and the ease with which this soil erodes, the utmost care is necessary in its cultivation. The type does not withstand drought as well as the Grundy silt loam.

On account of its rough topography and susceptibility to erosion very little of the Knox silt loam is cultivated. The few areas that are farmed give good yields. In the more level situations alfalfa is grown successfully. A few fields are devoted to wheat, which yields 20 to 25 bushels per acre. The crop is hard to harvest.

Selling prices on this type are based upon the value of pasture land. There are very few farms on this soil alone, and it is usually sold in connection with some adjoining type.

SCOTT SILT LOAM.

The surface soil of the Scott silt loam is a dark-gray, dark-brown or almost black friable silt loam, 8 to 10 inches deep. It is underlain by a light-gray or ashen-gray upper subsoil 4 to 12 inches in thickness, varying in texture from a light silt loam to a compact silt loam, or, in rare cases, a friable silty clay loam. This passes abruptly into a tough, plastic, dark-drab silty clay. In some areas the lower subsoil is gray, mottled and splotched with brown. The lower subsoil is very compact and impervious.

The marshy condition of the type and its occurrence in depressions have favored the accumulation of black organic matter in the surface soil, and in many areas thin layers of muck or peat have formed on the surface. In some areas there has been a concentration of lime, and both surface soil and subsoil are highly calcareous.

The Scott silt loam occurs in depressions or basinlike situations within areas of the Grundy silt loam. It is developed most extensively in the more nearly level areas of the latter type and does not occur where the surface is very rolling. The type is everywhere poorly drained. During periods of excessive rainfall water drains into the low-lying areas and in places remains on the surface for several days. Some of the deeper depressions are permanent marshes. Because of the flat topography of the surrounding country, some of the areas would be difficult to drain. A large number of the smallest areas of the type are not shown on the map, being included with the Grundy silt loam.

The surface soil of the Scott silt loam consists of sediment washed in from the Grundy silt loam, incorporated with organic matter. The lower stratum of the subsoil is probably derived from the settling of clay and silt in standing water.

The type has little value for farming, and its selling price can not be definitely stated, as it generally occurs only in small bodies included in farms with the Grundy silt loam. As a rule this soil detracts from the value of farms. The largest bodies of the type are usually left in their native grass growth. Crops are uncertain, owing to the poor drainage conditions in the spring. Where the areas are small and the soil dries out rapidly, fairly good results are obtained with oats and corn. The type in all cases needs draining for the best results, and this improvement is seldom practicable.

The following table shows the results of mechanical analyses of samples of the Scott silt loam:

Mechanical analyses of Scott 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.*	*Per cent.*
371801	Soil	0.1	0.2	0.2	0.8	21.8	61.1	16.2
371802	Subsoil	.0	.1	.1	.3	12.9	51.7	35.1

JUDSON FINE SANDY LOAM.

The surface soil of the Judson fine sandy loam is a grayish-brown to brown fine sandy loam, 10 to 15 inches deep. This is underlain by a light-brown to yellowish-brown fine sandy loam, which extends to a depth of more than 36 inches. The color usually becomes somewhat lighter with depth. In some places the subsoil contains a small percentage of silt, approaching a silt loam in texture, and in others alternating layers of silt and sand occur.

The type occurs in the Platte Valley, principally in two long, narrow strips extending along the foot of the bluffs for more than half the distance across the county. The strip is mainly less than one-fourth mile wide, but in one place the width increases to 1 mile.

The surface of the type varies from undulating to rolling, the topography being that of alluvial fans and foot slopes extending away from the bluffs. The steepness of the slope decreases with distance from their foot.

The type is everywhere well drained and is mainly under cultivation. It is a productive soil, and good yields of corn, wheat, and alfalfa are obtained.

WAUKESHA SILT LOAM.

The surface soil of the Waukesha silt loam is a dark-brown to dark grayish brown smooth silt loam, 12 to 15 inches deep. It is underlain by a lighter colored, slightly compact subsoil, which varies in color from brownish-gray to yellowish-gray. As the depth increases the color usually becomes lighter. The subsoil is moderately calcareous.

The lime content is much lower than that of the Knox silt loam, and even the lower subsoil does not effervesce with acid. The soil is high in organic matter.

The Waukesha silt loam occurs in rather large bodies on the outer margin of the Platte Valley and on narrow terraces along the Big Blue River. In the Platte Valley the type has a yellowish-gray subsoil, while the subsoil in the Big Blue Valley is usually dark gray to yellowish gray. This variation in color may be due to the fact that in the Big Blue Valley the type is composed to a large extent of material washed from the Grundy silt loam, while in the Platte Valley it is derived mainly from Platte River sediments and local wash from the Knox silt loam.

Along the Big Blue River the type occurs on distinct terraces. Some of these lie 40 to 75 feet above the river, while others lie scarcely above overflow level. The soil on the lower terraces has only recently been left above overflow by the deepening of the stream channel and is difficult to distinguish from the Wabash silt loam. Small areas of the latter first-bottom type along the Big Blue River are included with the Waukesha silt loam where they could not be indicated on the soil map. In the Platte Valley the bench is quite marked, but the slope to the first bottom is gradual and it is difficult to locate the boundary between the first and second bottoms.

The topography is usually quite flat, but the type is very well drained. It withstands drought well.

Almost all the land is under cultivation. Corn is probably the most important crop at present, but there is a tendency toward the growing of more wheat and alfalfa and less corn. Corn yields about 40 bushels per acre, and wheat between 20 and 30 bushels. Alfalfa does well, yielding $2\frac{1}{2}$ to 3 tons in four cuttings. Potatoes are grown for home use only.

As a rule no definite system of crop rotation is followed. Corn is planted on the same ground for a number of years in succession and followed by another crop selected without much regard for maintaining the soil productiveness. On the farms where a definite rotation is practiced, corn is usually grown for two years, followed by oats for one year, and this crop by wheat for one or two years, after which either corn or alfalfa is put in. The alfalfa is usually left for four or five years. Very little clover is grown, because of the difficulty in obtaining a stand.

The Waukesha silt loam is very easy to cultivate, being stone-free, porous, and friable. No commercial fertilizers are used. Barnyard manure is applied, usually to corn land, and this material is sometimes used as a top-dressing for grass.

The value of farm land on the Waukesha silt loam is $175 to $200 an acre.

PLAINFIELD SAND.

The soil of the Plainfield sand to a depth of 8 to 12 inches is a dark-brown to grayish-brown loamy sand. This is underlain to the depth of 36 inches by a lighter colored sand. As the depth increases the subsoil becomes almost yellow in color and very loose and incoherent in structure. In places gravel is encountered.

The Plainfield sand occurs on terraces of the Platte River Valley. The topography is flat, with occasional small hummocks in places. Owing to the open nature of the subsoil, the drainage is nearly everywhere excessive and crops suffer after short droughts.

This soil is not very extensive, being developed only in the northeastern part of the county. Little of the land is under cultivation, the type being used mainly for pasturage. With continuous cultivation the productiveness seems to decrease unless much organic matter is incorporated in the soil. No commercial fertilizers are applied.

Plainfield sand, rolling phase.—The rolling phase of the Plainfield sand consists of a brown to dark-brown sand, 8 to 12 inches deep, underlain by a light-brown sand which gradually passes into a yellow sand. The surface layer of 3 or 4 inches is often much darker than the underlying soil, owing to the accumulation of organic matter. In some areas a considerable percentage of gravel is found in the surface soil and subsoil, and in the more eroded situations, as on the borders of the terrace upon which the phase occurs, the subsoil and substratum are made up of loose sand and gravel.

Three areas of this soil occur in the northeastern part of the county between Clear Creek and the upland. The largest body, comprising more than 2 square miles, extends beyond the limits of the county.

The topography varies from gently rolling to rolling. Over a large part of the phase the surface sand has been heaped up by the wind into dunes. In other places the original surface has been modified by erosion. Drainage over the entire phase is good and in most places excessive.

The soil material of this phase originally consisted of alluvial sediments brought down by the Platte River. Left in a terrace position by the lowering of the river channel, the surface has been modified by erosion of wind and streams, while the composition of the soil has been changed by leaching and by the addition of organic matter to the surface layer.

On account of its droughty nature, only a very small part of the soil is farmed. Wheat and garden crops are grown. In favorable seasons good yields are obtained, but the average yields are low, as crops nearly every year suffer to some extent from the lack of moisture.

PLAINFIELD FINE SAND.

The Plainfield fine sand consists of a dark-brown sandy loam, 8 to 12 inches deep, underlain to the bottom of the 3-foot section by a light-yellow fine sand. As mapped, the type includes small areas of the Plainfield loam too small to be separated.

The Plainfield fine sand occurs on the terraces of the Platte River and is developed in rather small areas. The topography varies from gently rolling to rolling. The type is derived from old terrace material deposited by the Platte River. The surface soil has been reworked to some extent by the wind and modified by the addition of wind-blown sands. Drainage is good to excessive.

Only a small total area of this type is under cultivation. The soil under tillage is subject to wind erosion. It is used mainly for pasture or the production of wild grasses.

Plainfield fine sand, rolling phase.—The soil of the rolling phase of the Plainfield fine sand is a brown or dark-brown fine sand, ranging from 8 to 15 inches in depth. The surface 3 or 4 inches is occasionally dark gray or dark brown, and in some places is almost black. This surface layer is extremely dark only where conditions have favored the accumulation of organic matter. The subsurface layer varies with the topography. On the wind-formed hills and ridges it is of a lighter color and consists entirely of fine sand, but in valleys and in small flat areas there may be a mixture of coarser sand and often of gravel.

The subsoil consists of a light-brown fine sand, passing into yellow fine sand. This phase occurs where the original terrace material lies immediately below the wind-blown material. The soil varies widely in water-holding capacity. On the higher dunes and in areas where the loose, porous sand and gravel are near the surface it is droughty, but many areas occur where the land is well watered by seepage or where the subsoil is more retentive of moisture and the surface soil is deeper and more loamy. Many of the included patches of lowland soil belong with other types, being mapped with this phase on account of their small extent.

The rolling phase of the Plainfield fine sand occurs in two principal areas in the northeastern part of the county. The largest of these, comprising several square miles, lies directly south of the Duncan Bridge. The other occurs east and slightly north of this, passing out of the county. Smaller areas are encountered within short distances of these more extensive developments.

The topography varies from gently rolling to rolling. Over a considerable proportion of the phase a dunelike surface prevails. The inequalities of the surface are due both to wind action and to erosion of the ancient terrace on which the soil occurs.

The soil of this phase has been derived by weathering from alluvial materials deposited by the Platte River and subsequently left on high terraces. The surface has been greatly modified by wind action and by water erosion. The changes that have taken place in the composition of the original material are the accumulation of organic matter in the surface layer and the leaching out of the soluble constituents of the soil through the porous subsoil.

More than half the total area of the soil is under cultivation. Corn is the principal crop. Alfalfa is grown in the more favorable situations, and small grains are grown to some extent. The average yield of all crops on the more rolling areas is low on account of the droughty nature of the subsoil, but the more level areas and the well-watered lowlands are fairly productive.

On the whole, this soil supports almost as many farms to the square mile as the Plainfield silt loam, although yields are not so high. Some of the land is used for pasture. In the better areas a heavy growth of grama and other nutritious grasses furnishes good grazing. In the more rolling, droughty situations the vegetation consists of a sparse growth of sedges, grama grass, and occasional cactus plants.

PLAINFIELD SILT LOAM.

The surface soil of the Plainfield silt loam consists of a brown to grayish-brown silt loam, extending to a depth of 6 to 10 inches. This is underlain by a light-brown to yellowish-brown silt loam. The color is somewhat lighter than that of the Waukesha silt loam and as a rule the subsoil is not as compact. In places pockets of fine sand and very fine sand may be encountered at a depth of about 2 feet. Generally the soil contains a small percentage of very fine sand.

The Plainfield silt loam occurs in the higher and better drained parts of the Platte Valley. It occupies a definite topographic position along the outer margin of the valley and is separated from the foot of the bluffs by a comparatively narrow strip of Waukesha silt loam. The largest area lies 7 miles north of Shelby and extends east to and beyond the county line. Another area extends almost across township 15, Range 2, while smaller bodies occur along this zone in about the same topographic position with reference to the river.

The topography varies from almost level to gently rolling. The surface has not been modified to any great extent by erosion of incoming streams, so the drainage ways issuing from the bluffs spread out without definite channels when they reach the more level bottom lands. There is, however, some surface inequality in the lower areas, resulting from the old stream channels which remain as cut-off lakes

and depressions. The type as a whole, owing to its comparatively elevated position and its permeable subsoil, is well drained.

The Plainfield silt loam is of mixed origin. The greater part of the original material was derived from the loessial areas of the upland. This has gradually spread out over the valley from the foot of the bluffs, and with it has been incorporated both alluvial material brought from long distances by the Platte River and sands and silts blown from the river deposits.

The Plainfield silt loam was originally in prairie grasses. Practically all the land is now under cultivation. Corn, oats, wheat, and alfalfa are the main crops. Wheat yields between 25 and 30 bushels per acre, corn 35 to 40 bushels, and oats about 35 bushels per acre.

The Plainfield silt loam, because of its smooth surface and silty texture, is easily handled. It clods and bakes if plowed when wet, but under proper moisture conditions it can easily be put in good tilth. No commercial fertilizers are used, but barnyard manure is usually applied to the corn crop. No definite system of crop rotation is practiced.

The selling value of land of this type varies considerably. As a rule the type is not favorably situated with respect to transportation lines and markets. Valuations range from $85 to $150 an acre.

WABASH SILT LOAM.

The surface soil of the Wabash silt loam, extending to a depth of 8 to 15 inches, is a dark-gray or black silt loam. The subsoil is a dark-gray to drab silty clay loam to silty clay. In places the subsoil is gray or drab, mottled with brown. Neither surface soil nor subsoil is sufficiently calcareous to effervesce with acid. The low lime content is the only essential difference between this type and the Lamoure silt loam.

Although the Wabash silt loam occurs in numerous narrow strips along the Big Blue River and its tributaries, and in small bodies in the Platte Valley in association with the Lamoure silt loam, only two small areas near Osceola are of sufficient size to indicate on the soil map.

The type as mapped occupies the lower bottoms of Prairie Creek and is subject to overflow at frequent intervals. In other parts of these alluvial lands a similar soil, developed just above the limit of overflow or subject to overflow at very rare intervals, is mapped with the Waukesha silt loam. Very narrow strips of the Wabash silt loam are also included with the Waukesha.

The surface of the Wabash silt loam is level, but the areas are narrow and therefore easily drained by surface ditches. The runoff is rapid, and in ordinary seasons good yields are obtained. Corn is the principal crop. In favorable seasons the yields are higher

than on the upland, but on the average they are somewhat lower. Wheat and oats are grown to a less extent. The undrained areas of the type are used as hay land.

LAMOURE FINE SANDY LOAM.

The surface soil of the Lamoure fine sandy loam to a depth of 8 or 10 inches is a black fine sandy loam. Below this, to a depth of about 18 inches, the material consists of a dark-gray fine sandy loam. Below the depth of 18 inches and continuing throughout the 3-foot section the texture is somewhat heavier and the color gradually changes from very dark gray to gray. In places the subsoil in the lower part of the 3-foot section becomes more silty. The subsoil and, in places, the surface soil contain a large percentage of lime.

The Lamoure fine sandy loam is not an extensive type. It occupies first-bottom areas in the Platte Valley. The topography is nearly flat. The type occurs at a slightly higher level than the Lamoure silt loam and because of this elevation and the open texture of the soil it is much better drained.

The Lamoure fine sandy loam originally supported a growth of cottonwood, willow, elm, ash, and wild grasses. Practically all the land is now cleared of the tree growth. The greater part of the type is still used for the growing of wild grasses. The remainder is devoted to the growing of corn and wheat, which give fairly good yields.

The soil is easily cultivated, but it clods to some extent if broken when wet.

LAMOURE SILT LOAM.

The Lamoure silt loam consists of a black, rather heavy silt loam, 8 to 15 inches deep, underlain by a dark-gray or drab silty clay loam or silty clay. In places the lower subsoil is gray in color, mottled with brown. Both surface soil and subsoil have a large content of lime. In the subsoil, and often in the surface soil, the content is sufficient to cause effervescence with acid.

The soil is easily tilled when in the proper moisture condition, but when broken while too wet it clods to some extent. Moisture is well retained and crops seldom suffer from drought.

The Lamoure silt loam is confined to the Platte Valley. The largest areas are developed about midway across the alluvial land, but several small bodies occur near and parallel to the river. The higher areas are not subject to overflows by the Platte, but by reason of their relatively low position with respect to surrounding soils they have poor natural drainage. They are often covered with standing water. The restricted natural drainage probably accounts for the concentration of calcium carbonate. The greater part of the type

in the depressions on the higher alluvial lands can be drained without great difficulty. Much of this land has been reclaimed and brought under cultivation. In some areas small open ditches have afforded adequate drainage.

The undrained areas of the Lamoure silt loam consist of wet grass lands and marshes. These lands are used for pasture or hay production. The yield of wild hay ranges from one-half to 2 tons per acre. The better drained areas of the type are quite productive. On account of the excessive moisture it is difficult to get the land into condition for early planting, but the type is fast being improved in this respect. Corn is the principal crop, and under favorable conditions this cereal gives large yields. A very small area is devoted to wheat. Oats grow too rank and the crop is likely to lodge. Very little of this soil is in alfalfa, but with better drainage this crop will without doubt be extensively grown.

The price of improved land of this type ranges from $75 to $125 an acre.

CASS SANDY LOAM.

The Cass sandy loam consists of a dark-brown to black sandy loam, about 6 inches deep, underlain by a gray sandy loam which extends to a depth of 8 to 15 inches. The subsoil is a gray to yellow, incoherent sand which becomes coarser as the depth increases. In some cases gravel is encountered within the 3-foot section. The surface soil contains a large percentage of organic matter.

In a development along Clear Creek the evil varies from typical. There is here an abrupt change from the dark-brown or black sandy loam to a loose, incoherent sand, yellowish gray in color and frequently mottled with brownish iron stains.

In another variation, occurring in two areas along Clear Creek, the soil consists of a dark-brown sandy loam to a depth of 16 or 18 inches. The surface soil usually contains some gravel. Between the depths of about 18 and 24 inches the soil becomes somewhat lighter in color and a loamy sand in texture. It is underlain to a depth of 40 inches by a gray sandy loam, open in structure and containing numerous calcareous concretions. The drainage of this soil is usually poor and the water level is close to the surface. The land is generally covered with a white incrustation of alkali. It is cultivated in only a few places, being kept mainly in wild grasses.

The Cass sandy loam is developed in the first bottoms of the Platte Valley, occurring mainly in long, narrow areas along Clear Creek or between that stream and the Platte. It has a nearly level topography, but because of the ridges of Sarpy fine sand (too small to be shown on the map) traversing this type the surface appears to be ridgy. Surface drainage is good, but the water table through-

out the greater part of the type lies near the surface, keeping the subsoil in a wet condition. This type is seldom overflowed, a ridge of Sarpy fine sand acting as a natural levee against high water in the Platte River.

Very little of the Cass sandy loam is under cultivation. It gives better results as pasture and wild-hay land. Where it has been broken and cultivated the productiveness and value of the soil have decreased. Wild hay yields 1 to 2 tons per acre. Corn does not do well, yielding only 10 to 20 bushels per acre. The raising and feeding of cattle is the most important interest on this type.

The price of farm land on the Cass sandy loam ranges from $75 to $100 an acre.

CASS FINE SANDY LOAM.

The Cass fine sandy loam consists of a dark-gray to black fine sandy loam, 4 to 6 inches deep, underlain by a light-gray to dark-gray loam which extends to a depth of 12 or 18 inches. In some places this subsurface layer is a very fine sandy loam in texture. The lower subsoil consists of yellowish-gray to yellow fine sand which becomes coarser as the depth increases. In the lower part of the 3-foot section gravel is sometimes encountered. Some small silt layers are intermingled with the subsoil.

The Cass fine sandy loam occurs in the first bottoms of the Platte Valley. The topography is nearly level. The type lies 4 or 5 feet above the Cass sandy loam, and is subject to inundation only in periods of exceptionally high water. The surface drainage is good and the subsoil is probably a little better drained than that of the sandy loam type.

Practically all the Cass fine sandy loam is used for pasture or the production of wild hay. The type affords good pasturage, as grass makes a good growth and good water is very easily obtained. The raising and feeding of beef cattle is the most important interest on farms on this type. Small areas are cultivated to pumpkins, melons, and garden crops. A small acreage of corn is grown, but the yields are low, ranging from 15 to 20 bushels per acre. Wild hay yields 1 to 2 tons per acre. No barnyard manure is applied, except on garden crops. Farm lands on the Cass fine sandy loam sell for $75 to $100 an acre.

CASS VERY FINE SANDY LOAM.

The Cass very fine sandy loam consists of a grayish-black very fine sandy loam, 8 to 12 inches deep, underlain by a light-yellow very fine sand to a depth of 36 inches.

This type is developed in the lower bottoms of the Platte River. It occurs on small, narrow ridges which run in a direction generally

parallel to the stream. The type is never overflowed, and because of its ridgy topography it is well drained.

This soil is derived from alluvium brought in and assorted by the Platte River. In places the surface soil has been reworked by the wind.

Little of the Cass very fine sandy loam is under cultivation. The type gives best results where used as pasture or wild-hay land. It is more subject to drought than the other types of this series.

The type does not occur in large areas. It is invariably sold in connection with some associated, predominating type, and for this reason its independent selling price can not be ascertained. The land has, however, a rather low agricultural value.

A silty variation of this type occurs in small areas associated with the typical soil. It consists of a dark-gray or dark-brown silt loam, 8 to 10 inches deep, underlain by a light-yellow silt loam, usually lighter in texture. The greater part of this soil is under cultivation. Fairly good yields of corn, oats, and wheat are obtained.

SARPY FINE SAND.

The surface soil of the Sarpy fine sand consists of a gray to light-brown fine sand 12 to 15 inches deep. This is underlain by a yellowish-brown fine sand which grades into an almost white fine sand at a depth of about 30 inches. The subsoil becomes coarser as the depth increases, and in some places gravel is encountered. Where the wind has transported the surface material the fine darker colored soil has been lost and the color is almost white. This white soil is especially noticeable along the banks of the Platte River.

The Sarpy fine sand occurs on several ridges, too small to map separately, in areas of the Cass sandy loam.

The Sarpy fine sand is developed in the first bottoms of the Platte Valley, where it forms a natural levee along the river. It also occurs on long, narrow ridges between abandoned stream channels on the valley floor. Drainage is good to excessive.

The soil consists of alluvial materials deposited by the Platte River and modified by the wind.

Scarcely any of this land is devoted to grain. It affords fairly good pasturage in the spring, but in the latter part of the summer the soil dries out and the grass has very little value. Where the soil is plowed and exposed to the wind it blows considerably. The native growth consists of prairie grasses and such trees as cottonwood, willow, wild plum, and elm. The trees occur mostly along stream courses.

RIVERWASH.

The miscellaneous type of Riverwash occupies sand bars and flats along the Platte River. The material consists of a mixture of light-yellow, fine, medium, and coarse sand, with very coarse sand and gravel. The type lies only a few feet above the normal flow of the river and is subject to inundation.

Riverwash is not permanent, as the material undergoes change with every overflow. Even when the river is at normal level the deposits are shifted about by the current. The type is also modified to a considerable extent by the wind.

Only a few square miles of Riverwash occur in this county. The land supports a scant vegetation and has little agricultural value.

SUMMARY.

Polk County is situated in the east-central part of Nebraska, about 45 miles northwest of Lincoln. It is bordered on the north by the Platte River. It has an area of 275,200 acres, or 430 square miles.

About two-thirds of the county consists of uplands of the loess plain and has a flat to undulating topography. On the north there is an abrupt break from this upland, and a strip of roughly rolling land intervenes between it and the broad valley of the Platte River. The alluvial lands of the valley are generally level or undulating, with local surface inequalities.

The elevation of Polk County above sea level ranges between 1,440 and 1,770 feet. The greater part of the county lies at elevations between 1,630 and 1,770 feet. Polk County is drained through the Big Blue River and the Platte River.

The population of Polk County, according to the 1910 census, is 10,521. About one-third of the people live in the small towns and villages. Railroad transportation facilities are fairly good. The dirt roads of the county are kept in good condition. Telephone service, schools, and churches are maintained throughout the county. Omaha and Lincoln are the principal markets.

The climate is healthful and invigorating. The growing season is long enough to insure the maturity of all the common crops.

The agriculture of Polk County consists of the growing of corn, oats, wheat, and hay, for sale and for home consumption, combined with dairy farming, the raising and feeding of beef cattle, and the raising of hogs and sheep. Poultry raising and gardening are carried on in a small way.

The farm dwellings are well kept and substantial. Heavy draft horses and improved farm machinery are found on practically every farm. The appearance of the farms indicates thrift and prosperity.

Crop rotation in some form is in common practice. The use of commercial fertilizers has not been resorted to. Farm labor is hard to obtain, especially during the harvest season.

The size of the farms varies considerably, depending upon the kind of farming carried on. The 1910 census reports 173.5 acres as the average size of farms. Farm lands vary in price from $40 to $225 an acre, depending on the nature of the soil, the location, improvements, and other factors.

The soils of Polk County may be classed in two main groups, upland, or residual, and alluvial. The loess which occupies the surface of the upland has contributed to the formation of three upland soil series, the Grundy, Scott, and Knox. The Judson series is developed at the foot of the upland slopes, and is derived largely from colluvial material. The alluvial soils along the North Fork of the Big Blue River and the Platte River are classed in the Waukesha, Plainfield, Wabash, Lamoure, Cass, and Sarpy series.

The Grundy silt loam, a dark-brown prairie soil with heavy subsoil, is the most extensive and most important type in the county. It is well suited to corn, oats, wheat, and grass. The Knox silt loam, the light-colored soil of the hilly region, is used mostly as pasture land. The soils in the valleys, especially the Waukesha and Lamoure soils, and the heavier types of the Plainfield series, give excellent results with corn, oats, wheat, and grass. The other alluvial soils are not very extensive.

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[PUBLIC RESOLUTION—No. 9.]

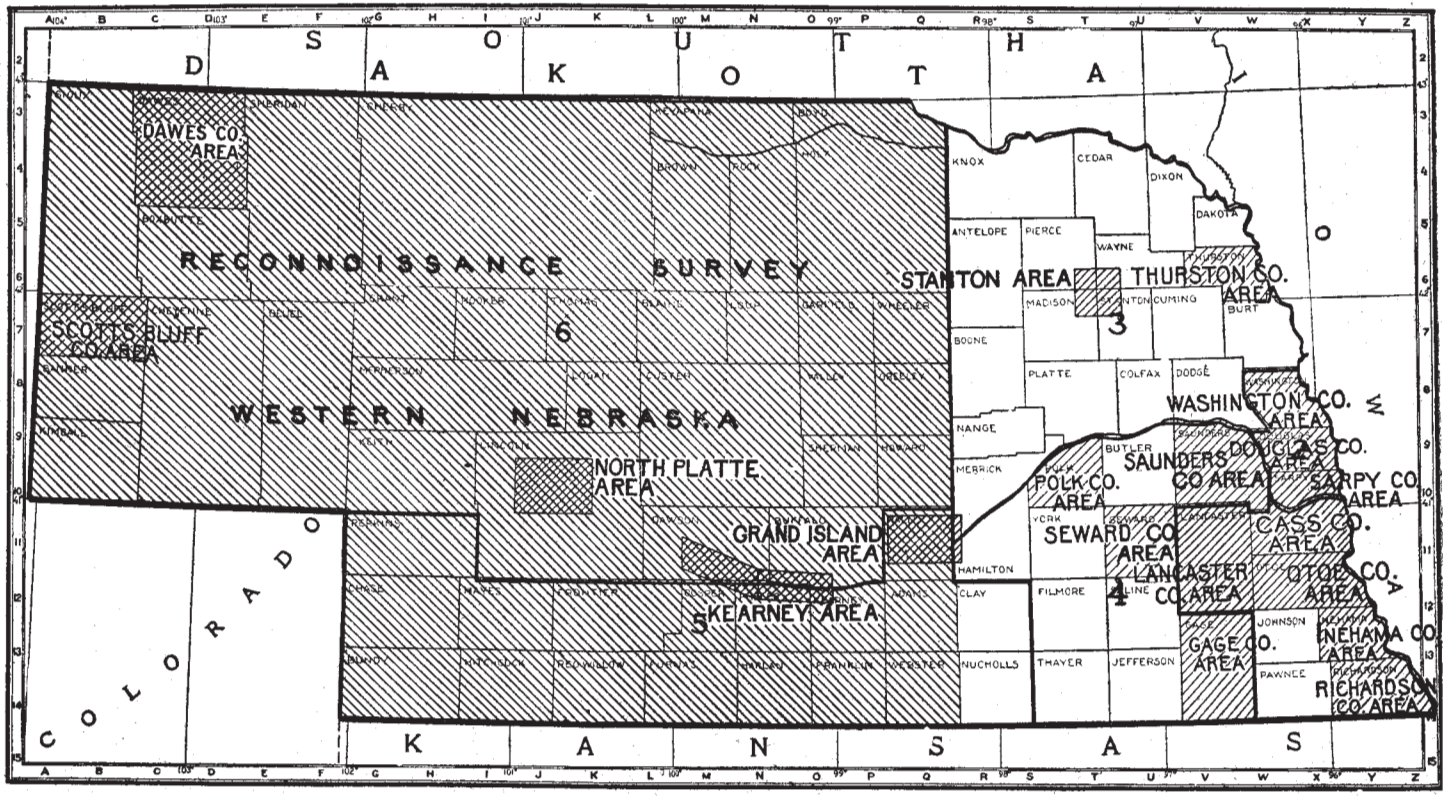
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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.]



Areas surveyed in Nebraska

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