U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF SOILS

IN COOPERATION WITH THE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

SOIL SURVEY OF DOUGLAS COUNTY SOUTH DAKOTA

BY

W. I. WATKINS, IN CHARGE, AND B. H. WILLIAMS

[Advance Sheets—Field Operations of the Bureau of Soils, 1923]

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
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[PUBLIC RESOLUTION.—No. 9.]

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

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

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

Approved, March 14, 1904.

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

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SOIL SURVEY OF DOUGLAS COUNTY, SOUTH DAKOTA

By W. I. WATKINS, in Charge, and B. H. WILLIAMS

DESCRIPTION OF THE AREA

Douglas County, South Dakota, lies in the southeastern part of the State, on the divide between the Missouri and James Rivers. The county is triangular in shape, having a maximum length east and west of 30 miles, and being 21 miles wide on the eastern edge and 9 miles wide on the western edge. Aurora and Davison Counties form the northern boundary, Hutchinson County the eastern, and Charles Mix County the southern and western boundaries. The southern boundary follows the old Yankton Sioux Indian Reservation line. The county has an area of 445 square miles, or 284,800 acres. The general elevation is probably between 1,400 and 1,600 feet above sea level.

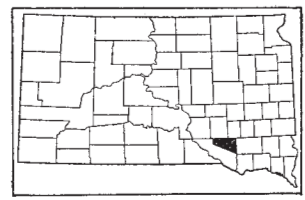

FIG. 18.—Sketch map showing location of Douglas County, S. Dak.

The first settlement in what is now known as Douglas County was made in the northeastern part of the county in 1879, and another settlement was made the following year along Choteau Creek about 5 miles northeast of the present site of Armour. The county was formed from parts of Yankton, Charles Mix, and Aurora Counties in 1882. In 1886 the railroad was built into the county and Armour was laid out as the terminus of the road. After being located in other small towns at different times, the county seat was moved to Armour in 1894.

The topography of the county varies from flat to rolling; but by far the greater part is flat to undulating, the extreme northeast corner, east of South Fork Twelvemile Creek, probably having the smoothest surface. However, other areas almost as level are found west of Delmont between East and Middle Choteau Creeks, west of Choteau Creek in Independence Township, and in the eastern part of Walnut Grove and western part of Garfield Townships. The southeastern corner of the county has a gentle slope north and west to East Choteau Creek. The topography of Holland, Joubert, and Clark Townships is slightly undulating, whereas that in the eastern part of Iowa Township is more undulating. More rolling areas are found north of Armour in Grandview and Valley Townships and along Choteau Creek in Garfield and Lincoln Townships, the land closest to the stream in the northern part of the county being the roughest.

Drainage is fairly well established in the eastern three-fifths of the county, this portion practically all being drained south through

Choteau Creek and its branches. The main branch of this creek enters the county in the eastern part of Walnut Grove Township and flows south and then east to the middle of Garfield Township, then south through the middle of Valley and Independence Townships. Another branch originates in the southwestern corner of Washington Township and leaves the county about 2 miles east of the main creek, which it joins in Charles Mix County. This branch is joined from the east by East Choteau Creek. South Fork Twelvemile Creek flows east and drains most of Washington Township. Andes Creek originates in the vicinity of Corsica and flows almost due south to Lake Andes in Charles Mix County.

The western part of the county has no naturally developed drainage ways. The surplus water in this section collects in the numerous lakes, sloughs, potholes, and low places. These vary in size from less than an acre to a square mile or more in area, "Holland Lake" and Mud Lake being the largest. There are two artificial drainage ditches in Joubert, Holland, and Walnut Grove Townships. One drains what is locally known as Meadow Valley and flows into tributaries of Platte Creek, which drain the northwestern corner of the county. The other flows east through what is locally known as Garden Valley, entering Choteau Creek in section 24 of Walnut Grove Township. Most of the undrained spots contain water during wet years and in the early spring, but occasionally dry up sufficiently in the fall to allow the cutting of some grass for hay. Most of these sloughs support a luxuriant growth of water-loving plants, such as water pepper (smartweed) and cat-tails. These swampy spots are also rather numerous in the eastern half of the county on the divides between the streams where stream dissection has not advanced enough to establish good surface drainage.

There are no well developed lakes of any importance in the county. Several small shallow lakes are mapped in Iowa Township and one at the junction of Walnut Grove, Garfield, Grandview, and Valley Townships. The largest lake, Mud Lake, lying north of New Holland along the county line, has been drained.

A large proportion of the population of Douglas County is of foreign extraction. The population of the four western townships, notably Holland and Joubert, is mostly of Dutch descent; that of the northeastern portion of the county, mainly German; and the remainder, settlers from Iowa, Wisconsin, and Minnesota.

The population of Douglas County in 1920, as given by the census, was 6,993, all of which was classed as rural, averaging 16.1 persons per square mile. Deducting the population of the towns and villages in the county, the average farming population is about 10 or 12 persons per square mile.

The county has only one railroad, a branch of the Chicago, Milwaukee & St. Paul Railway. It leaves the main line at Tripp in Hutchinson County, and runs to Stickney, in Aurora County, crossing the southern part of the county through Delmont to Armour, then turning north through Corsica. Most farms in the county are within 12 miles of a shipping point. About one-third of the county is closer to railroad service outside the county at such points as Platte and Academy on the west and Parkston and Dimock on the east.

The principal towns are Armour, the county seat, in the south-central part; Corsica, near the center; and Delmont, in the south-eastern corner. Corsica has the largest trade area and seems to be the most important shipping point in the county. Harrison, New Holland, and Joubert, west of Corsica, and Hillside, in Washington Township, are inland towns and trading centers.

Sioux City, Iowa, is the principal outside market for the various products of the county. Some products are shipped to St. Paul, Chicago, and Minneapolis.

As a whole, the county has many well constructed dirt roads. A graveled road extends from Corsica to Armour and then south 3 miles. This road is to be extended through Delmont to Tripp in Hutchinson County, and other roads in the county are to be graveled.

Good schools are found in all the towns and through the country districts.

CLIMATE

The climate of Douglas County is very similar to that of the eastern part of the State, but the range of temperature is not so great as in the northern part. The summers are comparatively short, with hot, dry days, but usually cool nights. The winters are long, with fluctuating temperatures usually below the freezing point. The mean annual temperature is 46.4° F., with a recorded maximum of 109° and a minimum of —45°. The average date of the last killing frost in the spring is May 5, and the average date of the first in the fall is September 30. This gives an average growing season of 148 days, which is usually sufficient for maturing the crops. The latest recorded killing frost in the spring occurred on May 18 and the earliest in the fall, on September 15.

The average annual precipitation is 23.97 inches. The total rainfall for the driest year on record (1916) was 17.35 inches; and for the wettest year (1915), 33.57 inches. The heaviest rainfall occurs from April to October, inclusive. The rainfall during the growing season is well distributed, and is usually sufficient for crops, especially if there has been enough snowfall during the winter to saturate the ground. The winter months are usually the driest.

The following table gives the more important climatic data as recorded at the United States Weather Bureau station at Armour:

Normal monthly, seasonal, and annual temperature and precipitation at Armour

[Elevation 1,521 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1916)	Total amount for the wettest year (1915)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	22.3	65	—39	0.76	0.55	0.75	6.7
January	17.2	65	—45	.56	1.38	.40	5.3
February	18.0	71	—45	.70	.25	2.95	6.5
Winter	19.2	71	—45	2.02	2.18	4.10	18.5

Normal monthly, seasonal, and annual temperature and precipitation at Armour—Continued

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1916)	Total amount for the wettest year (1915)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
March	32.7	84	−15	1.16	.32	1.60	7.5
April	47.3	97	1	2.68	2.58	2.00	3.0
May	58.5	97	17	3.35	3.69	4.16	.1
Spring	46.2	97	−15	7.19	6.59	7.76	10.6
June	68.2	106	30	3.85	3.68	7.16	0
July	73.2	109	40	3.29	.41	6.86	0
August	72.1	107	36	2.70	2.50	3.21	0
Summer	71.2	109	30	9.84	6.59	17.23	0
September	62.9	109	17	2.02	.83	2.28	T.
October	50.9	90	0	2.08	.79	2.02	1.4
November	33.7	81	−15	.82	.37	.18	3.2
Fall	49.2	109	−15	4.92	1.99	4.48	4.6
Year	46.4	109	−45	23.97	17.35	33.57	33.7

AGRICULTURE

Originally the soils of Douglas County were carpeted with a luxuriant growth of prairie grass, and cattle grazing was naturally the first important agricultural operation. However, with the coming of more settlers and the development of railroads this was rapidly displaced by wheat; and as the country became more thickly settled, forage and feed crops were introduced, principally oats and corn. To-day a general system of agriculture prevails, consisting of the growing of grains, supplemented by the feeding of hogs and cattle, and the production of dairy and poultry products.

The acreage and production of the principal crops grown and the increase in the acreage of land in farms since 1889, as reported by the census, will give a very good idea of the general trend in agriculture during the last 30 years.

Acreage and production of principal crops in 1889, 1899, 1909, and 1919

Crop	1889		1899		1909		1919	
	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels
Corn	26,842	495,151	34,748	647,120	48,628	1,000,649	58,761	1,097,785
Oats	8,529	71,778	9,067	241,860	16,252	421,221	14,725	410,892
Wheat	22,310	154,780	40,674	501,780	38,573	466,534	58,823	446,072
Barley	1,457	9,963	1,584	30,890	7,661	148,910	1,827	32,993
Rye	684	5,281	254	2,510	131	1,498	18	244
Emmer and spelt					692	17,484	443	10,720
Flaxseed	3,488	18,416	111	520	2,154	16,591	339	1,818
		Tons		Tons		Tons		Tons
Hay	21,988	24,017						
Timothy					603	771	225	276
Timothy and clover					972	1,489	196	276
Clover					56	109	22	21
Alfalfa					653	1,510	9,198	16,336

Acreage and production of principal crops in 1889, 1899, 1909, and 1919—Cont.

Crop	1889		1899		1909		1919	
	Acres	*Tons*	*Acres*	*Tons*	*Acres*	*Tons*	*Acres*	*Tons*
Other tame grasses			950	1,530	517	697	148	141
Wild grasses			24,247	28,257	35,186	33,280	26,074	22,202
Silage crops							764	2,851
Coarse forage			398	600	152	267	3,499	4,933
	Bushels		*Bushels*		*Bushels*		*Bushels*	
Potatoes	594	34,603	338	26,035	517	28,545	433	14,182
	Trees		*Trees*		*Trees*		*Trees*	
Apples	4		259	17	2,188	486	1,740	501

Land area in farms and improved land in farms, in 1890, 1900, 1910, and 1920

Census year	Area of county	Total farms	Area in farms		Improved land	
			In farms	Per farm	In farms	Per farm
	Acres	*Number*	*Per cent*	*Acres*	*Per cent*	*Acres*
1890	278,400	773	59.9	216.0	59.8	128.7
1900	278,400	691	89.0	358.6	60.9	218.5
1910	278,400	837	93.3	310.4	79.6	247.2
1920	278,400	912	91.3	278.7	71.7	199.7

These tables show a fairly steady increase in the acreage of the principal crops, the area of land in farms, and the proportion of farm land classed as improved land. The figures show a steady growth in the agriculture of the county which has been accompanied by a proportionate increase in the value of farm property.

The yield of corn per acre in the census years has been between 18 and 20 bushels; but it is believed from reports of farmers that the average yield per acre has been somewhat increased in the last few years, and that at present it is between 20 and 25 bushels per acre. The small-eared varieties common to this part of South Dakota give the best results. Some excellent yields of large-eared varieties were produced in 1923, but these were not so well matured as the smaller-eared varieties. The principal varieties grown and those best adapted to the climatic conditions in Douglas County are Wimple Yellow Dent, Minnesota No. 13, and some varieties of squaw corn. The acreage of corn in 1923 no doubt was much larger than that in 1919, and the yields were about normal. A large part of the corn is used for feeding livestock and work animals, and the remainder is sold. It is one of the principal money crops of the farmer.

In growing corn the general practice is to "flat-break" the soil in the fall, if possible, and disk or harrow it into a good seed bed in the spring. Most of the corn is checkrowed, but some is listed or drilled. The crop is usually cultivated three or four times with 2-row cultivators. In harvesting, some of the corn is machine picked and husked, some is hand picked in the field, and some is cut with corn binders and husked from the shock. It is stored in wooden cribs or cribs made of wire fencing. A small portion of the corn crop is used for silage, and some of it is "hogged down." Cattle and hogs are usually turned into the fields to clean them up.

Wheat was originally the principal cash crop grown; but it has gradually decreased in importance, owing to the uncertainty of the

yields. The wheat acreage, as reported by the census, has shown a steady increase since 1899 until the time of the World War, when the high price and demand for wheat caused a large increase in acreage. However, after the low yields and decline of price in 1920, it is doubtful if wheat will ever again reach a place of more than secondary importance. It is giving way to oats, corn, barley, and some rye. Most of the wheat grown is spring wheat, mainly Marquis and varieties of durum wheat. The seed bed is prepared in the fall, drilling begins as early as possible in the spring, and harvesting begins about July 1. Although some winter wheat is sown, it is a more or less uncertain crop, owing to the prevailingly dry weather during the fall planting season. Wheat is almost exclusively a cash crop.

The acreage of oats has been increasing gradually since 1889 except for the year 1919, when it occupied a smaller area, owing to the large acreage of wheat sown. The acreage lost has been regained, and in 1923 it was probably almost as large as the acreage of wheat. The principal varieties grown are Silvermine and Sixty-day. Oats are grown both for feed and as a cash crop.

Alfalfa and sweet clover are rapidly becoming the principal hay crops, as both produce good yields. Sweet clover has almost as large an acreage as alfalfa. These legumes are gradually replacing wild hay which is confined almost exclusively to wet or poorer soils. Only occasionally is wild hay cut on the better lands.

The importance of flax for seed is rapidly decreasing. Since it is planted as a first crop on newly broken prairie sod, its importance diminishes in proportion to the decrease in the acreage of unbroken prairie sod.

Potatoes are grown principally for home consumption and local markets. Other crops of minor importance are barley and rye. These crops are gaining in importance; their acreage fluctuates with the increase and decrease in the acreage of wheat.

Very little fruit is grown within the county, apples and plums leading. Of the small fruits, the principal ones are strawberries and gooseberries. Large quantities of fruits are shipped in.

The estimated value of animals sold and slaughtered in 1919 was $925,275. Hogs are the principal animals raised in Douglas County. During the progress of the survey work in 1923, large herds of well-bred hogs were observed throughout the county. The principal breeds are Duroc-Jersey, Poland-China, and Hampshire, and some Chester White. Not many cattle were seen during the survey, but most of those seen were of the better breeds, principally Shorthorn. Only a few sheep are raised, which in recent years have proved very profitable. Sioux City, Iowa, affords a ready market for all livestock and livestock products.

Dairy and poultry products have increased rapidly in value since 1899, as shown by the following table:

Value of dairy and poultry products in 1899, 1909, and 1919

Products	1899	1909	1919
Dairy	$49,153	$91,783	$213,103
Poultry	12,627	97,640	273,086

Some good dairy herds were noticed, especially in the vicinity of Armour. The dairy cattle are principally Holsteins and Jerseys. Several cream stations are located in Armour and in all the other villages and trading centers throughout the county. The cream stations are also the chief centers for the disposal of poultry products.

In 1879 only one farm was located in Douglas County, then Dakota Territory. By 1889 this number had jumped to 773, and has gradually increased to 912, in 1920. With the gradual increase in the number of farms since 1899, the acreage per farm has decreased from 358.6 acres in 1899 to 278.7 acres in 1919. Although there has been a slight decrease in the acreage of improved land per farm, the proportion of improved land has increased almost 10 per cent; and although the farms have decreased in size, they have increased in value. The total average value per farm was $5,123 in 1899, and $38,044 in 1919; but now it is probably slightly lower. Land is the principal asset in farm value, being 66 per cent of the total value in 1899, and 80 per cent in 1919. The average value of land per acre, as reported by the census, increased from $9.43 to $109.05 during the same period.

Farms are operated mostly by owners. The proportion operated by owners has decreased from 65.6 per cent in 1899 to 61.9 per cent in 1919, with a corresponding increase in the percentage of tenant-operated farms.

Practically all of the plowing is done with 2-bottom or 3-bottom gang plows drawn by horses or light tractors.

The chief items of expense on the farms are for feed and labor. According to the census, $277,181 was expended for labor in 1919 on 673 farms, or an average of $411.86 per farm reporting. The same authority reports an expenditure of $334,135 for feed on 587 farms, or an average of $569.22 per farm.

SOILS

The soils of Douglas County show by their most important characteristics the predominating influence of climate. Climatic conditions, uniform for the entire area, have acted upon materials assumed to have been variable in character and have produced soils that are remarkably uniform in appearance and composition. Minor variations have resulted from differences in the texture of the original material or from restricted drainage, both of which have retarded or modified the action of the soil-forming processes.

The rainfall of the region is comparatively low; and though it has not been sufficient to support a forest vegetation, it has been favorable to the growth of short prairie grasses. These grasses have been the source of the humus which imparts the black color to all the soils of the county. Though the supply of moisture is sufficient to favor the accumulation in the soil of large quantities of organic matter from a vegetation of grasses, it is not sufficient to leach the soil to any great depth. On well drained areas carbonates are not present in the surface soils, but they are in such abundance below depths of from 18 to 24 inches that an actual concentration is indicated.

The soils of the well drained upland have reached a fairly uniform stage of weathering, a stage that may be regarded as normal for this climatic zone. Although the soils may vary in minor features, their

profiles, where typically developed, have the following common-to-all characteristic layers, or horizons:

1. From 0 to 10 inches, a very dark grayish-brown or almost black surface layer having a single-grained or fine granular structure. In most places, below 4 inches in the virgin soil, the texture is slightly heavier and the consistence more compact than the topsoil.

2. From 10 to 20 inches, a very dark grayish-brown material which, with depth, becomes brown, more compact, and heavier in texture than the surface soil. This material assumes a columnar structure in place, but clay cleavage causes it to shatter into small clods.

3. From 20 to 40 inches, a light grayish-brown material with spots or streaks of white. This material is more friable than the horizon above, and is often mellow and floury. It has no apparent structure, and it breaks into large irregular clods. This horizon contains a high quantity of lime carbonate, and is regarded as a zone of lime accumulation.

4. From 40 to 60 inches, material variegated in color, consisting of the parent rock which is very little altered by weathering. The color is usually a variegated gray and brown with iron stains and concretions. Faint streaks of lime may be seen, but the accumulations are not so noticeable as in horizon 3.

The profile as described above may be taken as typical of the dark-colored, well-drained soils which contain accumulations of lime carbonate, being representative of the Barnes and Bearden series. The Pierce and Sioux soils have profiles similar to this, but only partially developed. The latter soils are underlain, at depths of from 12 to 24 inches, by gravelly strata derived from the parent material.

The soils of the Beadle series occur on nearly level areas of the upland and differ from the Barnes in having an extremely heavy and compact second horizon. This heavy clay pan is, no doubt, due to the action of alkali salts originally present in the parent material; and its development was probably favored by the restricted drainage, and in places by the impervious nature of the parent material.

Soils occurring on areas of still more restricted drainage, such as prevails in the upland depressions, on flat terraces and low flood plains, have also developed distinct profiles. Here the surface soils are deep, black, and overlie gray or mottled, highly calcareous, and heavy-textured subsoils. The soils in the wet upland depressions and on the poorly drained terraces have been grouped in the Fargo series; and those occuring on first bottoms along the stream courses, in the Lamoure series.

The soils described above have been grouped into series principally according to structure, and the source, character, and process of accumulation of the parent material. The soils constituting each series are called types, these differing from each other in the texture of their surface soils.

During the Pleistocene period the eastern half of South Dakota was overrun by glacial ice sheets. The one furnishing the parent materials of the soils of Douglas County is known as the Wisconsin sheet. This glacier brought from the regions farther north a heterogeneous mass of rock débris picked up in its southward progress, and mixed it with the material of local origin. This ice deposit was laid down as a fairly smooth plain which has been only slightly changed

by erosion and weathering. A small area, including the old stream terraces, has for its parent material reworked glacial drift. Materials which were laid down as glacial outwash or stream terraces, except where it is composed largely of gravel, have developed soil profiles similar to those of the undeveloped upland.

The most extensive and important soils mapped in the county belong to the Barnes series. The surface soils of this series are very dark grayish-brown or black in color, loose and silty, and underlain by dark-brown or brown materials which are heavier in texture than the surface soils. At lower depths the materials are friable, predominantly yellow in color—though varying from grayish yellow to brownish yellow—and contain large quantities of lime carbonate. At depths ranging from 30 to 40 inches, occurs the parent material, a calcareous glacial drift. Various grades of sand, gravel, and bowlders may be found on the surface and throughout the profile of these soils, but these coarser materials are not always present. Two types of this series, Barnes loam, including a rough stony phase, and Barnes silt loam, including a stone-free phase, are mapped in this county.

The Beadle soils have surface soils ranging in color from very dark grayish-brown to almost black, to depths of from 5 to 9 inches, underlain by brown, heavy, compact layers which vary considerably in thickness, usually from 6 to 12 inches, which are hard and brittle when dry, and which have columnar structure. The next lower horizon is friable, highly calcareous material having a light olive-brown or grayish-yellow color. The surface soils and subsoils of these soils are similar to those of the Barnes soils, differing from them only in the presence of compact subsurface layers. One type of the Beadle series, Beadle silt loam, is mapped in Douglas County.

The Pierce soils have very dark grayish-brown surface soils with brown subsurface layers usually slightly heavier in texture than the surface soil. At a depth of 18 or 20 inches occur beds of stratified calcareous sand and gravel. Areas of these soils have a hummocky, morainic topography. They are cultivated to some extent, but are somewhat droughty. Pierce fine sandy loam is mapped in this area.

The Bearden soils have dark-colored surface soils underlain by brown subsoils which are heavier in texture than the surface soils. The materials at greater depth are grayish-yellow to brownish-yellow in color, friable and silty materials which are characteristic of the normally developed soils of this region. The soils of the Bearden series, derived from glacial outwash and river-terrace materials, have profiles similar to the upland Barnes soils. Gravel is not usually found in any quantity in the Bearden soils. Three soils of this series are mapped in this county, Bearden silt loam, Bearden loam, and Bearden fine sandy loam.

The Sioux soils have dark-colored surface soils underlain by brown materials, as heavy or heavier in texture than the surface soil. At depths varying from 14 to 20 inches the fine-textured surface soils are underlain by beds of stratified sand and gravel. The types of this series are very similar to those of the Pierce series, differing principally in the topography of their areas, and in origin. Areas of Sioux soils are flat to gently sloping, since they

occur on outwash plains or stream terraces. These soils are droughty to a degree depending on the depth to gravel. Sioux loam and Sioux fine sandy loam are mapped in Douglas County.

The Fargo soils have dark-brown or black surface soils and heavy, gray or mottled subsoils. A high percentage of lime carbonate is present in the subsoils. These soils occur in old lake beds and on lake and river terraces. Four members of this series are mapped in the county, namely loam, silt loam, including a meadow phase, silty clay loam, including meadow and swamp phases, and clay, including a swamp phase.

The Lamoure soils, occurring on the flood plains, consist of alluvium of comparatively recent deposition, having profiles very similar to those of the Fargo soils. The surface soils are dark brown or black, gradually becoming heavier in texture and lighter in color with depth. The subsoils consist uniformly of dark-gray plastic clays which contain varying quantities of lime carbonate. Three types of this series are mapped in this county, Lamoure silty clay loam, Lamoure silt loam, and Lamoure loam.

In subsequent pages of this report the soils of Douglas County are described in detail and their various agricultural possibilities and uses are discussed. Their distribution is shown on the accompanying soil map. The acreage and proportionate extent of the various soil types are given in the following table:

Extent of different soil types

Soil	Acres	Per cent	Soil	Acres	Per cent
Barnes silt loam	146,560	56.5	Bearden silt loam	4,736	1.7
Stone-free phase	14,208		Bearden loam	3,776	1.3
Barnes loam	46,208	16.9	Sioux fine sandy loam	3,776	1.3
Rough stony phase	1,984		Pierce fine sandy loam	2,816	1.0
Fargo silt loam	17,856	7.6	Bearden fine sandy loam	2,240	.8
Meadow phase	3,776		Sioux loam	1,792	.6
Beadle silt loam	10,048	3.5	Lamoure loam	1,088	.4
Lamoure silt loam	9,216	3.2	Fargo loam	576	.2
Fargo silty clay loam	2,496	3.1	Lamoure silty clay loam	320	.1
Swamp phase	5,312		Total	284,800	
Meadow phase	768				
Fargo clay	3,008	1.8			
Swamp phase	2,240				

BARNES SILT LOAM

The surface soil of Barnes silt loam is a very dark grayish-brown or black, friable, heavy loam or silt loam, from 4 to 7 inches deep. This is underlain by a brown, friable, heavier silt loam or silty clay loam material, ranging in depth from 16 to 26 inches. The next lower horizon consists of a friable silty clay loam material, predominantly yellow in color but varying in color from grayish yellow to brownish yellow with some iron stains. The grayish color in this third horizon is probably due to carbonate of lime which is always abundant at this depth. In many places the lime is segregated into spots and streaks. Bowlders and some small gravel are common on the surface and throughout the soil section. In some places the subsoil contains considerable quantities of gravel or coarse sand, whereas in other places the subsoil material is uniform

in texture only to a shallow depth, and appears to be a wind-laid or water-laid deposit.

Associated with the Barnes silt loam are large numbers of depressions or sloughs. They vary much in size and degree of indentation, some having well-defined shore lines and others grading imperceptibly into the surrounding Barnes soils. These low areas are mapped as Fargo and Beadle soils when of sufficient size to be shown on the map. Many of the smaller areas are only a few square rods in size, these being known as buffalo wallows. In virgin areas these low areas are easily distinguished, since they occur in positions a few inches below the surface of the surrounding Barnes soil; but with cultivation, this surface feature gradually disappears, when they can be located only by boring, or during excessively wet or dry years, by the appearance of the crops. Alkali is usually present in the buffalo wallows. These low-area soils vary considerably, but the majority have black silty surface soils with dark-brown or black clay subsurface layers, to 26 or 30 inches, usually compact in the lower part. The lower yellow subsoil material is like that of the typical Barnes soils. The compact layer seems to be the cause of both excessive moisture and droughtiness during years of extremes in moisture conditions. These depressions are most abundant in the areas having flat topography. Deep plowing with heavy applications of manure are said to be beneficial.

The Barnes silt loam mapped in the four western townships usually has a slightly heavier or more compact subsoil than most of the type. This is especially true of the flatter areas, such as that in the vicinity of Harrison and New Holland. The type mapped in sections 10, 15, 16, 20, 21, 22, 28, 29, 32, and 33, just west of Choteau Creek, in Independence Township, has a heavier surface soil and heavier, deeper, and slightly more compact subsurface layer than typical. This area is flat and appears to have a terrace position.

The greater part of the type bordering Andes Creek and extending eastward shows little variation, except that stones and gravel appear to be more abundant east of the Choteau Creek drainage basin. Most of it has been cleared of stones, except along stream slopes; but it is still necessary sometimes for the farmers to clear off the stones which come to the surface. On the soil map, areas having so much stone as to preclude their profitable clearing are indicated by means of stone symbols.

Barnes silt loam occurs throughout the county and is the most important soil type mapped. It is a good all-round soil, being adapted to small grains as well as to corn and alfalfa. Yields of 40 and 50 bushels of corn and 2½ tons of alfalfa per acre are not uncommon. The average corn yield is about 25 bushels per acre. Corn does not seem to do so well in the western townships. Probably as much as 90 per cent of the type is in cultivation. Its value, depending on improvements and nearness to markets and good roads, ranges from $75 to $150 or more an acre.

Barnes silt loam, stone-free phase.—Three areas of Barnes silt loam, stone-free phase, are mapped; one in the extreme northeastern corner of the county, one in the southeastern part, and a third covering parts of sections 8, 9, 10, 15, 16, and 17 of Garfield Township.

The first area mentioned is very similar to the Barnes silt loam mapped in the eastern part of the county, except that it is slightly heavier, and contains more level patches where the subsurface is deeper and darker, and has fewer stones. It has less waste land, and being less stony, is more economical to farm.

The area in the southeastern corner of the county has a lighter-colored surface soil than the typical silt loam and a brown, deeper subsurface which, in many places, becomes decidedly heavier in the lower portion, though usually moderately friable. The yellow subsoil occurs at a depth ranging from 26 to 30 inches, consisting of material uniformly silty clay loam in texture. Very few gravel or stones are found on the surface or through the soil section, except near the deep gullies which have cut back into the area from the north. The soil here appears to be more weathered or better oxidized than the typical Barnes soil occurring on flat areas, as farther south in Charles Mix County.

The stone-free area of Barnes silt loam in Garfield Township has a dark-brown, friable surface soil, a brown, friable subsurface layer, and a subsoil of friable, grayish-yellow, calcareous, silty clay material which very much resembles the Bearden subsoil in uniformity and texture.

This phase of soil does not differ materially in productiveness from the typical Barnes silt loam, the chief feature in its favor being its ease of cultivation.

BARNES LOAM

The surface soil of Barnes loam is a very dark grayish-brown or nearly black loam, from 4 to 7 inches deep, single grained or finely granular in structure. It is underlain by a brown, friable, heavy loam or silty clay loam material to a depth of from 14 to 20 inches; and deeper, by a subsoil consisting of a friable, highly calcareous material, yellow, grayish yellow, or brownish yellow in color and silty clay loam in texture. Gravel and some bowlders are found on the surface and in the subsoil, and in general this type is more gravelly than the silt loam. The area in the northern part of Walnut Grove and Holland Townships is especially gravelly. Gravelly knolls exist throughout the mapped areas of this type of soil.

Barnes loam is confined mostly to the rolling country. The largest area is in the eastern part of the county along Choteau and Middle Choteau Creeks. Other areas occur just north of Armour, along Andes Creek near the southern county line, along the north county line just west of the railroad, and small areas in Joubert and Clark Townships.

Barnes loam has a more uniform texture and a more yellow subsoil than Barnes silt loam. Some borings in Joubert and Holland Townships showed a tendency to compactness in the heavy subsurface layer. Some knolls are found throughout areas of the type where the surface soil has been practically all eroded, leaving only an inch or two of black soil. Included in mapped areas of Barnes loam are a few patches of fine sandy loam, as along Choteau and East Choteau Creeks.

This kind of soil is considered better land for corn than for wheat, wheat yielding about as well as on the silt loam. The rougher areas

of this type are found near the streams and are usually in pasture or meadow. Land of this type is currently valued somewhat lower than the silt loam type.

Barnes loam, rough stony phase.—The rough stony phase of Barnes loam differs very little from the typical loam except in topography and stoniness. It is mapped almost exclusively on the rough stony areas along Choteau Creek and its tributaries. The largest area occurs along the northern part of Choteau Creek in Garfield Township. Other areas are found in sections 9, 25, and 36 of Belmont Township and section 17 of Lincoln Township. This phase is chiefly valued as pasture land, although some of the smoother and less stony areas have been cleared and cultivated, corn being the chief crop.

BEADLE SILT LOAM

Beadle silt loam has a dark-colored, almost black, silty surface soil with a finely granular structure, from 5 to 9 inches deep, underlain by a brown or reddish-brown, compact, heavy silty clay loam or clay layer which extends to depths varying from 18 to 24 inches. Below this subsurface layer is the true subsoil which is friable, highly calcareous, and yellow or brownish yellow in color, similar to that of the Barnes soils. The feature which distinguishes this soil from the Barnes soils is the heavy, compact clay layer which has developed within the brown soil horizon. This compact layer, commonly known as hardpan, varies from 3 to 12 inches in thickness. It usually occurs in the lower part of the brown horizon, but is often found in the upper part. This type contains more iron stains in the subsoil horizon below the heavy material than the Barnes soils. Patches of Barnes soils occur throughout mapped areas of Beadle soils, that is, they are small bodies of soil in which the compact layer has not developed. This makes it difficult to separate this type from the numerous small areas of Barnes silt loam, consequently the boundaries of the Beadle silt loam areas have been more or less arbitrarily drawn.

Most of the Beadle silt loam occurs in Holland, Clark, and Iowa Townships. The largest area extends southwest from Harrison to just south of New Holland. Another area occurs in the southwestern corner of the county, and other small areas are mapped throughout the county. The areas in the western half of the county are associated with the flatter and rather poorly drained soils, thus indicating, probably, that water standing on the surface at some time has had something to do with the development of Beadle silt loam. In many places on the flat areas of Barnes soils which are adjacent to areas of Beadle soils, the subsoil shows a tendency toward compactness. Alkali is more often associated with Beadle silt loam than with the Barnes soils, and in many places the alkali gives it a rather grayish cast when dry. Buffalo wallows are more numerous on areas of this type than on the Barnes soils. These buffalo-wallow patches are very noticeable in cultivated fields during droughty or wet seasons. Some of the areas mapped adjacent to the Bearden and Pierce soils in the northern part of Holland and Joubert Townships have loamy surface soils.

This type of soil is considered better for small grain than for corn, although corn does very well during average years. It is not regarded so valuable as the Barnes soils.

PIERCE FINE SANDY LOAM

The surface soil of Pierce fine sandy loam is dark brown in color, and extends to depths varying from 5 to 10 inches. This surface layer is underlain by a friable, brown, fine sandy loam or loam material, to depths ranging from 16 to 26 inches, usually about 18 or 20 inches. This, in turn, is underlain by stratified, highly calcareous sand and gravel. In many places there is a layer of gray calcareous loamy material just above the gravel, which varies considerably in thickness. It may be entirely absent in one place, and within a few feet it may have a thickness of 3 inches.

The largest area of this type of soil is in the northwestern corner of the county. Other areas occur in sections 11, 12 and 13 of Holland Township, along the county line in Walnut Grove Township, along Middle Choteau Creek, and in section 15 of Belmont Township.

Pierce fine sandy loam is considered a very good soil, as it warms up early in the spring, permitting early planting. Corn and legumes are the principal crops, to which the soil is considered best adapted. It produces best during wet or moderately wet years, since the subsoil is very open and allows the soil moisture to drain off rapidly. In the drier years, as 1923, the crops are much damaged by drought. During such years crops do better in the lower situations into which alluvium has been washed from the surrounding higher land, which makes such areas more drought resistant. Considerable areas of this type are in pasture, especially the rougher land.

Areas of Pierce fine sandy loam are undulating to sharply rolling in topography, those in the extreme northwestern corner of the county having the more rugged topography.

Pierce fine sandy loam is not valued so highly as the Barnes and Beadle soils. The gravel underlying this soil is used in road building, and is excellent for the purpose.

BEARDEN SILT LOAM

The surface layer from 5 to 7 inches deep of Bearden silt loam is a very dark grayish-brown or nearly black silt loam, grading into a brown, single-grained or finely granular silty clay loam subsurface layer, to depths varying from 14 to 22 inches. This subsurface layer is underlain by a yellow or grayish-yellow, friable, highly calcareous silty clay. The entire soil section is more uniform in texture than the Barnes silt loam, although some borings showed a slight compaction in the subsoil. Gravel is seldom found except near gravel-bearing soils or where coarse stream wash has been deposited.

This type is a terrace or outwash-plain soil, and is similar to the upland Barnes soils in its composition and stage of development. The topography of areas of this type is flat or gently sloping, but the soil is thoroughly drained.

The largest area mapped occupies a valley position just south of Delmont. Other areas occur along the various branches of Choteau Creek and along Andes Creek, and one comparatively large area is in the northwestern corner of Holland Township. The area mapped south of Delmont grades so imperceptibly into the Barnes soils to the south that the boundary between them has been rather arbitrarily drawn. This area contains some spots of gravel washed from the uplands during heavy rains.

Although of small extent, Bearden silt loam is one of the most highly prized soils of the county. It is level and stone free, and consequently, it is economical to cultivate. It is well adapted to all the crops grown in the county, withstands drought, and at the same time has good internal drainage, although the area south of Delmont is subject to overflow after heavy rainfall. Crops were uniformly good on this soil during 1923, and probably the best corn in the county was seen on it. Its current value is $125 or more an acre.

BEARDEN LOAM

The surface soil of Bearden loam, from 6 to 9 inches deep, is a very dark grayish-brown, friable loam underlain, to depths of from 18 to 24 inches, by a brown or grayish-brown material having a heavier loam or silt loam texture. The subsoil is a yellow or grayish-yellow, friable, uniform silt loam material, containing a high percentage of lime.

The largest areas of Bearden loam are found in the northern part of Joubert and Holland Townships and in the northwestern corner of Walnut Grove Township. Other areas occur along the various branches of Choteau Creek, the largest one being in East Choteau Township. The areas along East Choteau Creek contain gravel spots, the material of which having been washed from the hills to the south during heavy rainfalls. These areas are also a little less uniform, in that they contain patches of lighter and heavier Bearden soils.

The areas in the northwestern part of the county probably represent old glacial outwash materials. Here the soil grades so gradually into the surrounding soils that the boundaries between the areas are more or less indefinite. Also, these areas are somewhat patchy with Bearden fine sandy loam and small areas of soil having lighter subsoils.

The topography is flat to slightly undulating. Bearden loam is considered a better soil for corn and alfalfa than for small grains, although the latter crops do very well.

BEARDEN FINE SANDY LOAM

The surface soil of Bearden fine sandy loam is a dark-brown fine sandy loam, from 5 to 10 inches deep, underlain by a brown fine sandy loam subsurface layer, to depths varying from 14 to 20 inches. Below this is the subsoil proper, consisting of a yellow or grayish-yellow, highly calcareous fine sandy loam or loam material.

This type is not very extensive, practically all of it occurring in Joubert and Holland Townships. One small area lies about 4 miles southwest of Delmont; this area has a slightly lighter-textured sub-

soil than typical and has a tendency to droughtiness. This is also true of the area in sections 9, 10, and 16 of Joubert Township. The largest area is in the north-central part of Holland Township. The northern part of this area, adjacent to areas of Sioux and Pierce soils to the north, contains patches of soil closely resembling the Sioux types. These spots have a tendency to droughtiness. The southern part of this area is a low ridge on which the soil is much more uniform than the rest of the type, being probably of loessial origin.

Bearden fine sandy loam is best adapted to corn and legumes, producing excellent yields of these crops. It is owing to the occurrence of the Bearden soils in the northern part of Holland Township that this vicinity is called "Garden Valley."

SIOUX FINE SANDY LOAM

The dark-brown fine sandy loam surface soil of the Sioux fine sandy loam varies in depth from 4 to 6 inches. It is underlain by a brown loam extending to depths varying from 14 to 20 inches. The lower subsoil consists of beds of calcareous, stratified sands and gravel which extend to a depth of many feet. A layer of gray calcareous material, an inch or two in thickness, occurs in many places just above the gravel.

The largest area of this type is mapped 4 miles west of Delmont, and other areas are found in sections 5 and 8 of Belmont Township, section 10 of Garfield Township, and sections 9 and 10 of Holland Township. Patches of shallow Fargo soils are included in areas of the type. In these patches the soil is darker colored and has a greater depth to the gravelly subsoil than in case of the Sioux type.

The topography of areas of Sioux fine sandy loam is comparatively flat, as such areas represent stream-terrace or outwash materials. This kind of land is considered best adapted to early-maturing crops, as corn and barley. It produces best in wet years, whereas the crops suffer from drought in dry years. The gravelly substratum makes excellent road material. This type is not considered so valuable as Bearden fine sandy loam.

SIOUX LOAM

Sioux loam is a very dark brown loam, from 4 to 8 inches deep, underlain by a fine-textured heavy loam, to depths of from 20 to 30 inches. Below this beds of stratified sand and gravel, common to the Sioux soils, are encountered. Some borings showed no gravel within the 3-foot section, so that the type varies with respect to the depth to gravel.

Practically all of this type is mapped along Choteau and Middle Choteau Creeks west and northwest of Delmont. One area, mapped in section 10 of Garfield Township, more nearly approaches the Beloit soils. Here the water table is close to the surface, so that the soil is wet the greater part of the year. This particular area produces better in drier years. In general, the crops on Sioux loam do not suffer from drought except in spots where the gravel comes close to the surface. The principal crops grown are corn and some legumes. The type is considered more valuable than the Sioux fine sandy loam, but not so valuable as the Barnes and Bearden soils. Most of it occurs on stream terraces having a flat topography.

FARGO SILT LOAM

The surface soil of Fargo silt loam is a very dark brown to black, rather friable silt loam, from 4 to 8 inches deep. The subsurface layer in many places is a grayish or drab, friable, heavier silt loam, ranging in depth from 14 to 20 inches, where it grades into a dark-brown or dark-drab, plastic clay subsoil, to a depth of 36 inches. Some borings showed the absence of a grayish subsurface layer. In such places the surface soil at depths ranging from 10 to 14 inches graded into a dark-brown or drab, compact clay which extends to a depth of 36 inches. Brown iron stains and gray mottlings appear locally below a depth of 24 inches. In other places the soil profile consists of a black silt loam surface soil, a subsurface layer of a dark-brown or drab-colored clay, and a subsoil of drab clay. All three soil profiles are frequently found within small areas of only 8 or 15 acres. The gray, silty subsurface layer is usually present in the more poorly drained areas. The darker and more compact subsurface layer, in places, does not contain sufficient lime to effervesce with acid, whereas in other places it shows only slight effervescence in the lower 6 inches. In most places, however, lime is present in abundance below a depth of 24 inches. Partly weathered till is found locally below 28 inches. Such patches, resembling Beadle soils, were included in areas of Fargo soils, because of the character of the surface layer, and position. Alkali spots also occur, and in the large areas some patches of Barnes soils, occurring on small knolls, are included.

The type generally occurs in indistinct depressions, sloughs, and at heads of streams. It is mapped throughout the county, occurring most prominently on the flatter areas which have imperfect drainage. Some of these are sufficiently wet during the wetter years to injure crops, whereas during dry years they are subject to drought. This is particularly true of the smaller areas. This soil seems to produce all crops equally well. Heavy applications of manure and the growing and turning under of sweet clover have proved beneficial to those areas containing alkali.

Fargo silt loam, meadow phase.—The meadow phase of Fargo silt loam does not differ from the typical silt loam, but it is separated as a phase chiefly because of the slightly poorer drainage conditions. Areas included in the meadow phase are sufficiently wet during the spring to prevent cultivation, and are therefore used only for hay and pasture, as they produce an abundance of native grasses.

FARGO LOAM

The surface soil of Fargo loam varies from dark-brown heavy fine sandy loam to loam, from 6 to 9 inches deep. The subsurface layer is a gray loam extending to depths of from 22 to 28 inches, or it may extend to 36 inches, but usually the lower part of the 3-foot section becomes lighter textured, having characteristics somewhat similar to the subsoils of the Sioux soils. Alkali salt crystals occur in the lower part of the 3-foot section, and in many places brown and yellow mottlings occur at this depth. Lime carbonate is usually abundant below a depth of 18 inches.

This type is practically all mapped in Holland Township and is associated with the Bearden and Sioux soils, which it closely resembles. It occurs in lower positions, however, so that it is subject to submersion during wet years, at which times the crops suffer.

FARGO SILTY CLAY LOAM

The surface soil of Fargo silty clay loam is a black, plastic silty clay loam, from 4 to 8 inches deep, underlain by a subsurface layer of dark-brown or dark-drab clay which in places contains brown mottlings and iron concretions. At a depth of 18 or 20 inches this clay is usually underlain by a drab sticky and plastic clay subsoil containing lime. Locally the lower subsoil is darker colored and more compact than typical, and in such places there is little or no effervescence with hydrochloric acid in the lower part. In some places only a shallow covering of lacustrine material occurs, so that the weathered glacial till occurs at a depth of about 30 inches. In a few places the surface is covered by a layer of organic matter from 2 to 4 inches thick.

This type occurs in sluggish drainage ways, in depressions, and on flat areas which are slightly lower than the surrounding soils but which have no distinct margins, as the type gradually merges into the surrounding soils. Alkali is associated with this type.

Most of the type occurs in distinct depressions varying in area from 5 to 40 acres. The largest areas are south and west of Corsica and in Clark and Walnut Grove Townships. The more important areas have been drained and are in cultivation or are used for pasture.

Fargo silty clay loam, meadow phase.—The meadow phase of Fargo silty clay loam differs very little from the typical soil, except that the till occurs in more places in the deeper subsoil and that the subsoil is more often compact, approaching the characteristics of the Beadle soils. Since most of this land occurs in slight rather than distinct depressions, area limits are difficult to determine, the soil merging so gradually into the Barnes soils. Such areas appear more like large buffalo wallows than sloughs. Locally a distinction is made between these soils. The fact that the meadow phase supports a luxuriant growth of water grasses, which are cut for hay, constituted the chief basis for separating the phase from the typical soil. Areas mapped as meadow phase are seldom under water very long and are sufficiently wet only in the spring to prevent seeding. Some areas of the phase could be cultivated, but the farmers leave them in grass, as crops on them are uncertain. They produce good hay and pasturage, thus allowing the use of the better soils for market crops. Alkali is usually associated with this phase.

Fargo silty clay loam, swamp phase.—The swamp phase of Fargo silty clay loam is characterized by a black or dark-brown silty clay loam surface soil, ranging in depth from 7 to 24 inches, usually underlain by clay. At an average depth of 18 inches the color is generally drab or grayish, though the black color may extend to a depth of 3 feet. The surface soil may or may not effervesce when treated with hydrochloric acid, but the subsoil is always highly calcareous. The phase differs from the typical Fargo silty clay loam only in drainage.

This phase occurs in the low, poorly drained areas which are inundated during the spring and early summer and which support a growth of water-loving plants. Some areas become dry enough to allow the cutting of grass for hay, whereas others remain too wet. It is doubtful if many of these swamps could be drained economically. In their present condition they are valued chiefly for pasturage.

FARGO CLAY

Fargo clay is a very dark brown or black sticky clay, from 8 to 14 inches deep, underlain by a rather compact clay which is plastic and sticky when wet, which varies in color from light drab to dark brown, and which contains some iron concretions and iron stains. This clay layer ranges in depth from 10 to 30 inches, becoming lighter in color and more compact with depth, although in places it consists of a dark-brown or black clay. Where the clay is dark colored a layer of light-drab, somewhat friable clay occurs in the subsoil, containing an abundance of lime carbonate. In places where the compact dark-colored clay appears at a depth of 3 feet there is little or no effervescence with hydrochlorie acid. Only a few areas consistently showed this absence of lime, whereas the majority showed the presence of lime, varying from a small quantity to an abundance. Both conditions occur in the same areas.

Some patches included in mapped areas of Fargo clay appear to have till subsoils at a depth of 3 feet, below the depth of weathering and the lacustrine deposit. This condition prevails in the large areas east and 4 miles north of New Holland. The latter area, known as Mud Lake, has been drained. Water did not cover these areas continually, except in spots; and in these spots the depth to the till material is greater. This type of soil, in many places, has a covering of organic matter varying from 2 to 6 inches in thickness, this condition being more common in those areas having a well defined shore line, like those mapped north of Armour and in Iowa and Clark Townships. Lime is less abundant in such areas.

The largest areas of Fargo clay are near New Holland and 4 miles north. Comparatively large areas occur in sections 6 and 7 of Clark Township, sections 22 and 23 of Holland Township, and areas of from 20 to 100 acres in extent occur throughout the western half of the county. Very little of this soil is mapped in the eastern half of the county.

The large area north of New Holland was used formerly for cutting wild hay; but now that it is drained, it is gradually being brought under cultivation. This is also true of the area in Clark Township. Oats and sweet clover do very well on this land, but corn is not so well adapted to it.

Fargo clay, swamp phase.—The surface soil of the swamp phase of Fargo clay is a very dark brown to black clay ranging in depth from 10 inches to 2 feet, which may or may not effervesce when treated with hydrochloric acid. This grades downward into a brown or drab-colored, highly calcareous clay, in many places containing some yellow or brown splotches at a depth of 3 feet. In places the black color extends to a depth of 3 feet, but usually the profile con-

sists of a black surface soil with gray or drab subsoil. In many places there is an accumulation of 2 or 3 inches of organic matter on the surface.

This phase is under water for varying periods, some of it being wet throughout the year. In general this land can not be cultivated, except for the included patches of typical Fargo clay. Its chief value is for pasturage and hay. A few areas do not produce much of either, and only those areas which become dry during the late summer produce good crops of hay.

LAMOURE SILT LOAM

The surface soil of Lamoure silt loam may be a black silt loam or a heavy silt loam, from 6 to 18 inches deep, grading downward into a dark-brown or drab subsurface layer of clay, which extends to a depth of about 24 or 26 inches. The subsoil is practically of the same color and texture as the subsurface layer, but in some places it is lighter colored. Lime carbonate is abundant throughout the subsoil. Some sand is found in the subsoil on the areas in East Choteau Township, having been washed in from the hills during the early period of the development of the soil.

This type is a first-bottom or recent-alluvial soil. In the narrow strips of this type, about 100 yards in width, which occur in low areas along the larger streams, such as Choteau and East Choteau Creeks, the surface soils are loamy and the subsoils are lighter in texture than typical. These narrow areas are subject to overflow during the spring and in seasons of unusual rainfall. The remainder of this type is rarely overflowed.

Lamoure silt loam is mapped along the Choteau Creeks and Andes Creek. The largest areas are along Choteau and East Choteau Creeks in Valley, Independence, and East Choteau Townships.

This is one of the most fertile soils in the county. A large part of it is under the plow, the remainder being reserved as pasture and hay land. It is considered excellent for corn and legumes, and acre yields of 40 or more bushels of corn are not uncommon. In value it ranks with the best Barnes soils.

LAMOURE LOAM

Lamoure loam occurs on narrow flood plains along the streams, and consists of a dark-brown to black surface material which varies in texture from silt loam to fine sandy loam from 5 to 9 inches deep, underlain by a heavier-textured, semifriable material, to depths varying from 18 to 24 inches. The subsoil has usually a drab or grayish color and contains an abundance of lime. In many places sand and some gravel are present in the subsoil.

The type occurs on the flood plain, and is subject to overflow in the spring, giving rise to its varied profile. It is mapped chiefly along South Fork Twelvemile Creek, Middle Choteau Creek, the head of Choteau Creek, and the southern part of Andes Creek. It has a small total area and is valued chiefly as pasture land.

LAMOURE SILTY CLAY LOAM

The surface soil of Lamoure silty clay loam is black in color and from 5 to 8 inches deep. The subsurface layer is dark-brown, plastic clay extending to depths varying from 18 to 24 inches. The subsoil consists of a grayish-brown or drab, somewhat friable, calcareous clay. The type does not differ greatly from the Lamoure silt loam, except that it is heavier textured, has a tendency to clod when worked, and is more difficult to handle. It is commonly known as "gumbo." It usually occurs in lower positions than the silt loam, or it is found where backwater has allowed the settling of the finer soil particles.

The largest area lies along the southern county line where East Choteau Creek leaves the county. Two other areas are mapped in sections 10 and 27 of Independence Township. A part of the area in section 27 is wet during most of the spring, and is shown as intermittent swamp. Most of the type is used for growing corn or alfalfa.

SUMMARY

Douglas County is located in the southeastern part of South Dakota and has an area of 445 square miles, or 284,800 acres. It was organized in 1882.

The topography varies from flat to hilly, the greater part of the county being undulating. The drainage is fairly well established in the eastern half of the county through the Choteau Creek drainage system. The western half of the county has no natural surface drainage outlets, the surface waters draining into the numerous sloughs or swamps, some of which have been artificially drained. No prominent lakes are found in the county, but there are numerous shallow and marshy bodies of water.

The population of Douglas County was 6,993 in 1920. The average density is 16.1 persons per square mile. Armour is the county seat and the largest town. Other towns are Corsica, Delmont, Harrison, and New Holland.

A branch of the Chicago, Milwaukee & St. Paul Railway passes through the county. The principal outside markets are Sioux City, St. Paul, Chicago, and Minneapolis.

The climate is characterized by hot, dry summers with cool nights, and rather long winters with low temperatures. The average growing season is sufficiently long and wet to produce good yields of the crops adapted to this regon.

The first agricultural industry was the raising of livestock. This changed rapidly to wheat growing, and with the development of railroads and arrival of more settlers to a system of general agriculture.

The principal crops grown are corn, wheat, oats, barley, rye, and legumes. Small-eared varieties of corn are best adapted to the seasons; the average yield being about 25 bushels per acre. Wheat yields about 10 or 12 bushels, and oats 25 or 30 bushels per acre.

The chief breeds of swine are Duroc-Jersey, Poland-China, and Hampshire. The principal breed of beef cattle is Shorthorn.

Dairying and poultry raising are gradually becoming important. The principal breeds of dairy cattle are Holstein and Jersey.

The soils of the county are those common to the eastern part of the Dakotas. They are of glacial origin, weathered under conditions of moderate rainfall, rather uniformly developed, and have a zone of lime accumulation. Sixteen soil types, representing seven soil series, are mapped. The Barnes soils are the most extensive and important agricultural lands.

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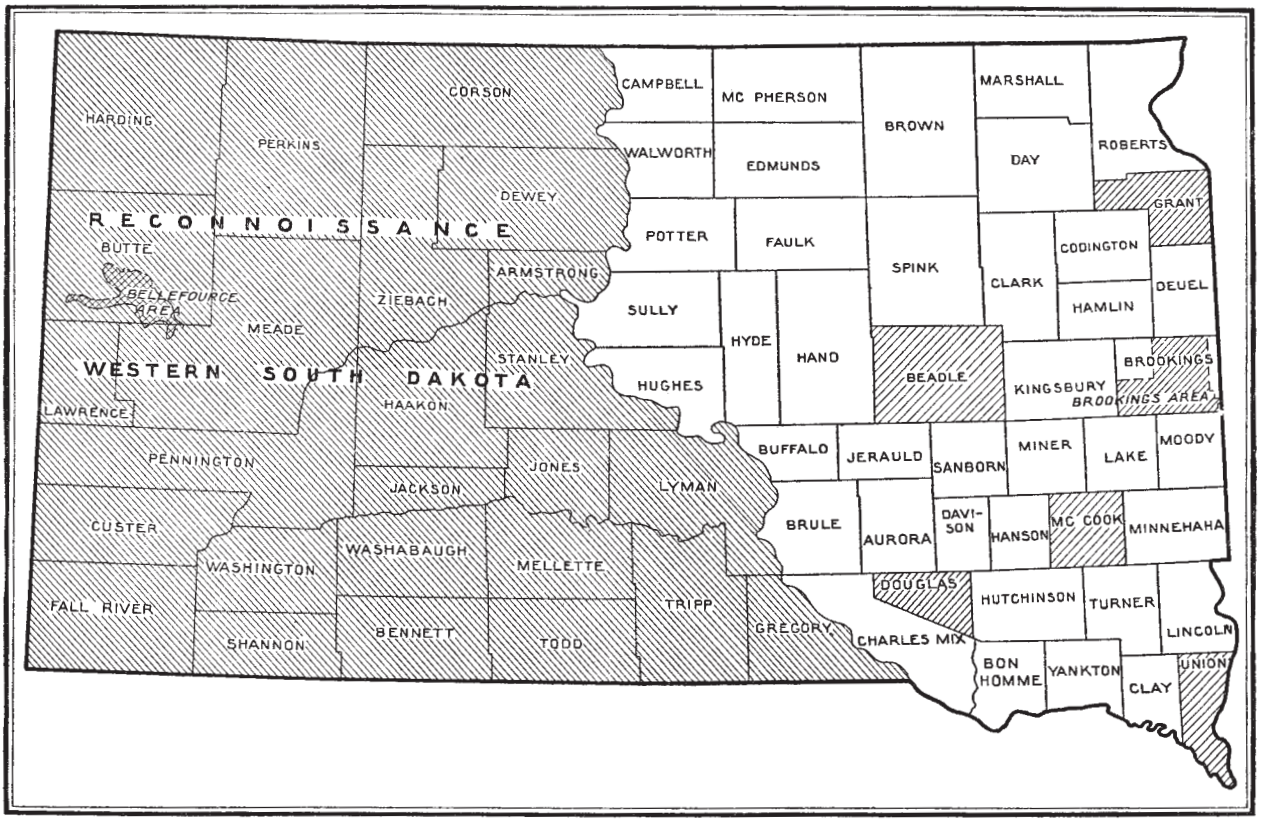

Areas surveyed in South Dakota, shown by shading

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