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Soil Survey
of
Stanton County, Nebraska

By

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and
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Nebraska Soil Survey

Bureau of Chemistry and Soils

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University of Nebraska State Soil Survey Department
of the Conservation and Survey Division

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SOIL SURVEY OF STANTON COUNTY, NEBRASKA

By F. A. Hayes, in Charge, and W. J. Moran, U. S. Department of Agriculture, and R. L. GEMMELL, Nebraska Soil Survey

COUNTY SURVEYED

Stanton County is in northeastern Nebraska. (Fig. 1.) Stanton, the county seat, in the central part of the county, is about 80 miles northwest of Omaha. The county is rectangular, being 24 miles long, from north to south, and 18 miles wide. It comprises an area of 428 square miles or 273,920 acres.

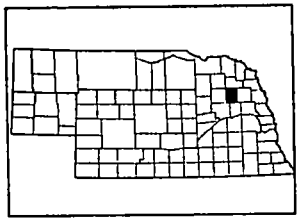

FIGURE 1.—Sketch map showing location of Stanton County, Nebr.

The county lies within the prairie region of the United States, the area having been mantled at one time by a deposit of loess. The region, however, has been rather thoroughly dissected and the loess mantle partly or wholly removed by the erosional influence of the streams of the drainage system of Elkhorn River. Remnants of the old constructional plain are confined to irregular-shaped and generally small tabular watershed ridges scattered throughout the uplands. The largest of these are in the southwestern, east-central, and northeastern parts of the county. The combined area of these remnants, however, does not exceed 8 square miles. The greater part of the county consists of a rather severely eroded loess-covered plain locally modified by rolling or hilly sandy areas and intersected by numerous strips of alluvial land.

The eroded plain, excluding the sandy areas and alluvial lands, occupies about 75 per cent of the county. The more severely eroded areas lie north of Elkhorn River which crosses the northern part of the county in a general east-west direction. Here steep slopes characterized by a succession of contourlike shelves, caused by sliding action and known as catsteps, are numerous. The divides lie from 60 to 80 feet above the floors of the drainage ways. Some slopes are steep, but only a comparatively small proportion of the land is too rough for cultivation. South of Elkhorn River the divides rarely lie more than 40 feet above the tributary valley floors. The ridges are generally a little more rounded, the slopes are more gradual, and catsteps are less numerous than on the north side of the stream.

The sandy areas, comprising about 14 per cent of the county, lie from 10 to 30 feet below the general level of the constructional plain, occurring wherever erosion has completely removed the loessial mantle and exposed an underlying sand sheet. The largest area consists of a somewhat discontinuous strip from 3 to 6 miles wide adjoining the southern edge of the Elkhorn River alluvial lands, and a smaller area is in the extreme northwestern part of the county. The relief in these localities ranges from nearly level to hummocky and in a few places is hilly, the surface features being determined

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largely by the amount of wind action to which the sandy material has been subjected subsequent to its exposure. The greater part of the sandy land is characterized by a succession of low rounded ridges and knolls from 5 to 15 feet high.

The alluvial lands of Stanton County, which occupy about 10 per cent of the total area, include the terraces and flood plains along the larger streams. The largest developments are along Elkhorn River and Union, East Fork Maple, Humbug, and Spring Creeks, where they occur as continuous strips ranging in width from one-eighth mile to more than 3 miles.

Terraces occur at several distinct levels well above overflow. The highest terrace remnants, lying from 30 to 40 feet above the stream channel, occur about halfway between Stanton and Pilger on the north side of Elkhorn River. The most extensive terrace areas lie also on the north side of this stream but from 12 to 15 feet below the higher terrace remnants. Some of the lowest terraces, lying from 5 to 7 feet above the stream channels, are along Union Creek in the southwestern part of the county, though low terraces are also numerous along Elkhorn River. The slopes between the several terrace levels and that to the flood plains are, in general, short and rather abrupt, whereas those to the uplands are more gradual. The surface of the terraces is nearly level or very gently undulating.

The flood plains in Stanton County are wide along all the major streams. They occupy the lowest positions in the county and are subject to overflow during periods of high water. They occur as continuous strips ranging from one-eighth mile to about 1 mile wide along Elkhorn River, Spring Creek, and East Fork Maple Creek.

The average elevation of Stanton County is about 1,500 feet above sea level. The highest elevations are on the uneroded remnants of the old loessial plain in the southwestern part and the lowest are in the Elkhorn River channel in the northeastern part of the county. The altitude at Stanton is 1,472 feet and at Pilger 1,410 feet above sea level.[1] Both towns are in the Elkhorn River Valley. The range in elevation in the county is probably not more than 200 feet, and the prevailing slope is eastward.

The major streams are intrenched from 50 to 75 feet below the general upland level. They all have fairly steep gradients and are actively deepening their channels. Except locally throughout the bottom lands and in scattered basinlike depressions on the uneroded remnants of the old constructional plain, all the county is well drained.

Well water of excellent quality is readily obtained in nearly all parts of the county. The upland wells range in depth from 60 to 150 feet, and those in the alluvial lands are from 10 to 50 feet deep.

Native trees, consisting chiefly of willow, ash, elm, boxelder, and cottonwood, occur only along the major streams. Practically none of them are used for lumber, but they are of value for posts and fuel. The native grasses in situations not disturbed by cultivation are of the tall-grass sod type, chiefly big bluestem and little bluestem.

Between 1856 and 1862 the area now included in Stanton County was a part of Izard County, which was square and comprised 16 townships. The name Izard was changed to Stanton in 1862. The first permanent settlement was made on Humbug Creek in 1865. In

[1] GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES (FOURTH EDITION) U. S Geol. Survey Bul 274, 1,072 p 1906.

1867 Stanton County was organized, and its four eastern townships were ceded to Cuming County. Since that time the county boundaries have remained unchanged.

The early settlers came largely from the Eastern and East-Central States and were chiefly of German descent, though a large proportion were of American birth. The 1920 census reports 84.9 per cent of the inhabitants as native-white persons and the remainder foreign-born whites. Those of foreign birth are largely of German, Czech, Swedish, or Danish descent.

According to the census data the population of the county has steadily increased. In 1880 the county had 1,813 inhabitants, and according to preliminary reports from the 1930 census,[2] the population is now 7,809. The density of the population, all of which is classed as rural, is about 18 persons to the square mile. The population, except in Stanton and Pilger, is rather evenly distributed. Stanton, in the central part of the county, is the county seat and largest town. Its population according to the 1930 census is 1,479. Pilger, in the northeastern part of the county, has 578 inhabitants. Both towns are on the main line of the Chicago & North Western Railway and serve as markets and distributing points for farm products, implements, and supplies.

Transportation facilities are good. The railroad mentioned follows the Elkhorn River Valley across the county and furnishes good connections with outside points. A State highway extends east and west across the northern part, and another extends north and south nearly across the eastern part. Both highways are surfaced with gravel. The county roads, which usually follow section lines, are of earth construction and are kept in good repair. Cement bridges and culverts are common on nearly all roads.

All parts of the county are served with rural mail delivery; telephones are in common use, and the public-school system is highly developed.

CLIMATE

Climatic conditions influence crop yields and farming practices regardless of the character of the soils and must be considered in the selection of crops best adapted to any region.

The climate of Stanton County is continental. It is characterized by wide variations in temperature between winter and summer, but is well suited to the production of grain, vegetable, and hay crops and the raising of livestock. In spring the weather is cool and rather rainy, which favors rapid growth of winter wheat and spring-planted small grains. The summers are long, with warm days and nights, which are especially favorable to the growth of corn. The fall season is long and pleasant, with only occasional periods of rainy weather, giving the farmer ample time in which to prepare and seed the land for winter wheat. Low temperatures frequently occur in winter but are usually accompanied by snow which protects winter-grown crops from serious injury. Variations in topography are not sufficient to cause appreciable differences in climate within the county.

Table 1, compiled from the records of the Weather Bureau station at Stanton, gives the more important climatic data.

[2] Soil survey reports are dated as of the year in which the field work was completed. Later census figures are used whenever possible.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Stanton, Nebr.*

[Elevation 1,472 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1905)	Snow, average depth
	°F	°F	°F	Inches	Inches	Inches	Inches
December	24.0	67	−26	0.90	1 10	0 10	5 8
January	20.4	65	−41	59	40	1 70	5 6
February	22.6	69	−35	82	,20	.65	7.1
Winter	22.3	69	−41	2.31	1 70	2.45	18 4
March	35 6	91	−20	1 17	48	1 00	5 4
April	49 5	99	10	2.81	3 85	3 88	2.7
May	59 4	98	19	3 75	1 95	10 02	(1)
Spring	48 2	99	−20	7 73	6 28	14.90	8.1
June	69 1	100	34	4.39	4 12	4.02	0
July	73 8	107	40	3 75	1 22	3 25	0
August	71.9	104	36	3 42	.91	2 86	0
Summer	71 6	107	34	11 56	6 25	10 13	0
September	64.2	103	27	3 00	42	7 36	0
October	51.5	93	9	1 59	1 87	80	8
November	36.6	80	−11	.98	.17	3 08	3.3
Fall	50 8	103	−11	5 57	2 46	11 24	4,1
Year	48.2	107	−41	27.17	16 69	38 72	30 6

[1] Trace.

The average date of the last killing frost is May 6 and that of the first is October 4. This gives an average frost-free period of 150 days which is ample for the maturing of all farm crops common to the region. Killing frosts have occurred as early as September 12 and as late as May 27. During the 20 years from 1895 to 1914, there were five years in which killing frosts occurred 10 or more days earlier in the fall than the average date, and three years in which they were 10 or more days later in the spring.

The precipitation varies greatly from year to year. In the 20-year period, 1895 to 1914, the precipitation during five of the years was less than 85 per cent of the annual mean. About 78 per cent of the mean annual precipitation falls from April to September, inclusive, or during the principal part of the growing season.

In summer the precipitation usually occurs as heavy thundershowers, although torrential rains are rare. Droughts are almost unknown during May and June, but in the latter part of July and during August short dry periods sometimes occur. However, crops seldom suffer from lack of moisture when properly tended, as most of the soils have a high available moisture capacity.

The snowfall varies annually from a few inches to several feet, the average over a period of years being 30.6 inches.

From about October 1 to April 1 the prevailing wind is from the northwest, and during the remainder of the year it is from a southerly direction. Strong winds are common, but tornadoes are infrequent.

AGRICULTURE

Prior to 1865 the area now included in Stanton County was inhabited chiefly by Indians, hunters, and cattlemen. The land was covered with a luxuriant growth of prairie grasses. The range was free, and cattle raising was very profitable. At the time the county was organized (January, 1867) there were only 14 permanent settlers within its limits, but in 1868 and 1869 settlement increased rapidly and the cattlemen were forced to move farther west. The first settlers located in the valleys where water was easily obtained and fuel was abundant, but later settlement spread into the uplands. In 1880 the railroad was completed across the county, and by 1890 all the desirable land had been taken up under the homestead and preemption laws.

Sod corn was generally the first crop grown by the early settlers, and this, together with game and beef, formed the chief means of sustenance As conditions became more stable, wheat, oats, barley, and garden vegetables were grown.

The early agricultural development, as throughout most of the prairie region, was somewhat retarded by lack of familiarity, on the part of the farmers, with local climatic and soil conditions and by insect pests. Most of the first seed used was brought from eastern States and was not suited to the local climate. The seed bed was poorly prepared, and consequently the first yields were low. In 1874 grasshoppers destroyed most of the crops, and in the early nineties droughts were especially severe. However, the settlers profited through the experiences of farmers who had become established in counties to the east and southeast and rapidly adjusted their crops, seed, and farming practices to the requirements of the new region.

Corn has been the leading crop in the county since farming began. Wheat ranked second in acreage until about 1900. The importance of wheat in the early agricultural development of the county was due partly to the fact that the crop was needed for both food and cash, and partly because the settlers came from regions where wheat was a very profitable crop. In Stanton County most of the wheat grown by the early settlers was of the spring varieties and was not well suited to climatic conditions Consequently, the yields and profits derived from the crop were low. As the farmers became better established, livestock became an important source of revenue and more feed was needed. Oats, being an important feed crop and well adapted to the soil and climate, were grown more and more extensively at the expense of the wheat acreage and since about 1900 have ranked second to corn in total acreage.

Table 2 gives the acreage and production of selected crops of the county in 1879, 1889, 1899, 1909, 1919, 1924, and 1928, and Table 3 gives the number and value of domestic animals and poultry on farms in 1910, 1920, 1925, and 1928. The data for all the years except 1928 are from the Federal census reports; those for 1928 are from the Nebraska agricultural statistics

TABLE 2.—*Acreage and production of crops in Stanton County, Nebr., in stated years*

Crop	1879		1889		1899		1909	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	7,234	143,715	36,971	1,406,716	84,135	2,680,650	75,049	3,223,653
Oats	2,143	18,815	8,308	187,634	26,817	849,780	42,018	990,079
Wheat	9,084	13,203	9,378	127,162	33,307	363,880	6,645	114,218
Rye	300	742	636	8,526	1,382	16,820	851	11,180
Barley	530	1,680	926	12,960	957	26,430	731	17,634
Potatoes		10,779	514	50,012	715	83,967	678	60,649
		Tons		*Tons*		*Tons*		*Tons*
Hay, all kinds	4,842	10,470	27,188	38,138				
Wild hay					27,992	30,336	24,024	36,002
Timothy alone							1,470	2,212
Clover alone					293	439	96	174
Timothy and clover							3,218	5,491
Alfalfa					1,629	4,547	5,156	14,960
Millet and Hungarian grass					2,962	6,339	1,003	2,224
Sweetclover (pasture and hay)								
			Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples			1,631	270	20,734	2,007	19,884	29,129
Plums							1,859	281
Cherries							4,130	700
					Vines	*Pounds*	*Vines*	*Pounds*
Grapes					5,764	8,900	6,010	41,595

Crop	1919		1924		1928	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	76,472	2,447,815	80,524	1,896,594	97,785	2,640,195
Oats	41,132	1,212,593	43,600	1,279,644	49,290	1,626,570
Wheat	8,077	70,946	1,117	22,953	2,188	47,751
Rye	1,828	19,912	880	9,946	1,521	21,294
Barley	776	16,300	181	3,150	433	13,423
Potatoes	690	29,155	457	47,250	576	48,384
		Tons		*Tons*		*Tons*
Hay, all kinds			32,807	51,162		
Wild hay	16,883	21,462	15,548		15,750	17,325
Timothy alone	408	504	143		235	282
Clover alone	386	582	1,306		173	260
Timothy and clover	1,569	2,340	1,039		619	990
Alfalfa	16,113	37,406	14,117		12,242	26,932
Millet and Hungarian grass						
Sweetclover (pasture and hay)					9,714	
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	
Apples	10,304	5,493	10,676	8,621	15,378	
Plums	1,161	41	2,239			
Cherries	2,583	493				
	Vines	*Pounds*	*Vines*			
Grapes	6,997	32,107	11,074			

TABLE 3.—*Number and value of domestic animals and poultry on farms in Stanton County, Nebr., in stated years*

Animals	1910		1920		1925		1928	
	Number	*Value*	*Number*	*Value*	*Number*	*Value*	*Number*	*Value*
Horses	8,293	$944,500	7,633	$767,421	7,387	$485,371	7,394	$454,604
Mules	536	73,483	624	87,377	813	67,683	726	55,730
Asses and burros	8	1,110	2	55				
Cattle	32,504	903,952	35,766	2,169,148	38,016	1,263,208	37,662	1,810,603
Sheep	1,388	6,198	9,308	82,897	1,005	11,012	5,232	47,764
Goats	22	92	13	70	11	77		
Swine	65,938	480,658	67,234	1,406,920	70,400	12,956	95,121	1,459,175
Poultry	108,251	46,586	129,879	114,522	142,045	113,636	129,776	113,554

According to the Nebraska agricultural statistics, the value of all crops in Stanton County, except fruit, seed, and sorgo sirup, was $3,036,010 in 1928. The value of all livestock, including poultry on hand January 1, 1929, was $3,941,430. Dairy products, excluding butter and whole milk sold or consumed on the farms, were produced to the value of $366,804 and poultry and eggs to the value of $265,321.

Corn, oats, wild hay, alfalfa, and winter wheat are the leading grain and hay crops. Table 4, compiled from the 1928 Nebraska agricultural statistics, shows the average acre yield of these crops during the period, 1916–1925, inclusive, and the acre yield and the approximate percentage of the county devoted to each crop in 1928.

TABLE 4.—*Average yields of principal crops in Stanton County, Nebr., in stated periods, and percentage of county occupied by each crop in 1928*

Crop	Average yield per acre		Approximate percentage of county occupied by crop in 1928
	1916–1925	1928	
	Bushels	*Bushels*	*Per cent*
Corn	35.4	27	35.3
Oats	32.5	33	17.8
Winter wheat	17.6	22	.8
	Tons	*Tons*	
Wild hay	1.33	1.1	5.7
Alfalfa	3.02	2.2	4.4

The acreage devoted to winter wheat is comparatively small, usually less than that of sweetclover. Most of the land planted to sweetclover, however, is used for pasture. The minor crops of the county, including rye, timothy and clover, barley, potatoes, and garden vegetables, rank in acreage during most years in about the order named.

The Federal census shows that 90.6 per cent of the county was in farms in 1930 and that a large percentage of the farm land was improved. Most of the farms range in size from 100 to 500 acres. The average size in 1920 was 230.2 acres and in 1930 was 215.7 acres.

Owners operated 55 per cent and tenants 44 per cent of the farms in 1930. The few remaining farms were operated by managers. On farms operated by tenants either the cash or share rental system or sometimes a combination of the two is used. The cash system is most popular, and 57 per cent of the rented land was rented for cash in 1928. Under this system the tenant pays from $3 to $6 an acre for the land including the pasture areas. When the land is rented for a share of the crops, the owner usually receives two-fifths of the grain delivered to him and from $3 to $4 an acre for the pasture land. All seed, labor, and machinery is furnished by the tenant. When alfalfa land is rented on shares, the owner receives half the hay stacked in the field. Tenants on the better farming land, which includes that on the terraces and the more nearly level parts of the uplands, usually rent on the share basis.

The farms, as a rule, are well improved, and practically all of them are equipped with modern labor-saving machinery. Most of the buildings are painted and kept in good repair. The farms are fenced

and cross-fenced, mainly with barbed wire, but much woven-wire fencing is used around alfalfa fields and feed lots. Four-horse teams perform the greater part of the farm work, but a few tractors are used on the more nearly level farms. According to the Nebraska agricultural statistics, there were 86 grain threshers, 508 gas engines, 310 tractors, 245 trucks, and 1,325 automobiles on the farms in 1928. The more expensive farm machinery is sheltered.

Farm laborers are usually rather plentiful except during the small-grain harvest season, when there is often a scarcity of good help. Wages range from $30 to $40 a month, with board and lodging. Day laborers during the harvest season are paid from $4 to $5. Corn shuckers usually receive 4 or 5 cents a bushel The customary charge for threshing is 6 or 7 cents a bushel for wheat and 3 or 4 cents for oats.

Cattle and hogs are the chief sources of revenue in Stanton County. A large percentage of the cattle are raised locally. Growing calves are fed oats during the winter. When 2 or 3 years old, the animals are placed in feeding yards and fattened on corn and alfalfa for a period ranging from 60 to 90 days, after which they are shipped to the Omaha market. Many farmers annually purchase from one to three carloads of pasture-fed cattle (for fattening) from ranchers in more western counties. Only a few of the locally raised beef cattle are purebred, but most of the herds are headed by a purebred Shorthorn or Hereford bull, and all the animals are of good breeding. Most of the cattle purchased from western counties are of Shorthorn breeding.

From 20 to 60 hogs are raised each year on most farms, and many farmers have herds of several hundred. The feeding ration for brood sows and young pigs consists largely of oats and alfalfa, but corn is used chiefly in fattening hogs for market. Practically all the hogs in the county are fattened on the farms where raised, and many are fattened in connection with the feeding of beef cattle. All the hogs are of good breeding and there are numerous purebred herds in the county, Duroc-Jersey, Poland China, and Hampshire predominating. Most of the hogs are sold in Omaha. Cholera sometimes disastrously affects hog raising, but this disease can be largely controlled through vaccination and sanitation.

As throughout eastern Nebraska generally, dairy products are an important source of revenue on most farms in Stanton County. No farm is devoted exclusively to the dairy industry, but most farmers keep from 5 to 10 milk cows, chiefly of mixed beef and dairy breeding, and sell their surplus dairy products to local cream buyers. The milk cows are fed corn, oats, and alfalfa hay during the winter but receive little grain or hay during the grazing season. The abundance of oats and alfalfa, to balance the corn ration, and good market facilities favor the extension of the dairy industry Most of the dairy products are shipped by the local buyers to Norfolk, Fremont, or Omaha.

Sheep raising receives little attention A few farmers annually ship in a carload or two of sheep for fattening, but very few sheep are raised in the county. The animals to be fattened are generally placed in fenced-off parts of the cornfields in the fall and allowed to feed on the unhusked corn. Alfalfa hay and oats are usually added to the ration. The fattened sheep are sold in the Omaha markets.

Most farmers raise only enough horses to supply their needs, and horse raising is confined chiefly to the breeding of work mares. There are six or eight horses on the average farm, the animals being of heavy-draft types, chiefly of Percheron breeding. Purebred stallions are kept on a few farms. The principal horse feeds are oats and prairie hay.

Chickens are an important source of income in Stanton County, and poultry raising is receiving increased attention. Most farmers keep from 50 to 60 chickens, and some maintain flocks of several hundred. The principal breeds are Plymouth Rock, Leghorn, and Rhode Island Red. Poultry products are either sold or exchanged for farm supplies in the local towns.

Farming practices in Stanton County are similar to those throughout northeastern Nebraska as a whole. Wheat is the only crop planted in the fall, and it usually follows oats in the rotation. Late in the summer the land to be used for wheat is plowed and harrowed, and the grain is planted with a press drill in the latter part of September. The seed germinates and the crop generally makes a good growth before killing frosts occur. The ground freezes to a depth ranging from 12 to 30 inches in the winter, and the young wheat plants remain dormant until early spring. The chief varieties of wheat are Turkey and Kanred.

During the winter months, on the average farm, work is rather slack and consists chiefly of feeding the fattening cattle and hogs, doing the customary chores, repairing the farm equipment, and hauling manure from the feed lots or barns to the fields.

As soon as the frost is out of the ground, the land to be used for oats is plowed, disked, and harrowed, and the seed is planted in the same manner as wheat. Oats are used chiefly as a step between corn and alfalfa in rotations and are seldom grown on the same land two years in succession. Kherson is probably the chief variety grown, although Nebraska No. 21 is an important variety.

Both wheat and oats usually mature in July and are cut and shocked or stacked for threshing. The wheat is generally sold direct from the threshing machine, but practically all the oats are consumed on the farms where produced. Wheat yields are sometimes considerably reduced by covered smut which distorts the kernels, prevents their normal growth, and gives the grain an offensive odor. Loose smuts reduce both wheat and oat yields during prolonged periods of rainy or cloudy weather. Injury from smuts, however, can be largely prevented by killing the smut spores before the seed is planted. Methods of treatment for controlling smut in various grains are given in a circular published by the University of Nebraska Agricultural College extension service.[3]

Corn is planted between the first and middle of May, either with a corn planter or lister. The crop is cultivated at intervals of two or three weeks until early in July, when it is "laid by" and receives no further attention until harvest, except to remove the more injurious weeds by hoeing. The corn crop matures in September or early in October, depending on the season. The greater part of the grain is

[3] NEBRASKA UNIVERSITY, AGRICULTURAL COLLEGE EXTENSION SERVICE, DEPARTMENTS OF BOTANY AND PLANT PATHOLOGY. CEREAL SMUTS AND THEIR CONTROL Nebr Agr. Col Ext Circ 126, 8 p., illus 1925

husked from the standing stalks, after which cattle and horses are pastured in the fields until spring. Some farmers cut part of the corn for fodder, and on farms equipped with silos, from 15 to 20 acres of corn are cut each year for silage. Many farmers annually fence off a few acres of unhusked corn for fattening hogs and cattle, thereby saving part of the expense of husking.

The chief variety of corn grown is probably Iowa Silvermine, although Reid Yellow Dent is grown extensively. Careful seed selection is not generally practiced. Some farmers purchase seed grown outside the county, but this practice is not usually rewarded by the highest yields because such seed, although belonging to one or another of the varieties known to be well suited to the soils of the county, may have become adapted to different climatic and soil conditions than those under which it is to be used. The Nebraska Agricultural Experiment Station at Lincoln recommends the selection of seed corn known to have been grown in the locality and to have become adapted to local climatic and soil conditions.[4]

Corn is customarily grown on the same land two years in succession, and on tenant farms it is often grown for five or six years. On farms where some attention is given to rotations, corn usually follows small grains, especially in the uplands, and in the bottom lands it frequently follows alfalfa.

Rye and barley are planted and the crops are harvested in the same manner as oats. These crops are not important in Stanton County. They are used chiefly for hog feed, though rye is also used to some extent for hay and pasture.

Alfalfa seed is generally sown in April or August. An important factor in obtaining a good stand of this crop is thorough seed-bed preparation. Fifteen pounds of good seed is regarded as the standard seeding rate, and the seed is either sown broadcast and harrowed in or planted with a press drill. The varieties of alfalfa grown are among the most hardy obtainable, including Common, Grimm, and Cossack, all of which are resistant to winter killing. A stand of alfalfa is usually allowed to remain for 5 or 6 years on upland soils and from 10 to 14 years on the subirrigated soils of the first bottoms. A field is rarely frozen out.

Alfalfa on the finer-textured upland soils does nearly as well as on the bottom-land soils for the first 5 or 6 year cropping period, after which the yields in the uplands decline, probably on account of insufficient moisture. A second cropping to alfalfa in the uplands is seldom as profitable as the first, regardless of the length of time the land has lain idle or has been used for other crops subsequent to its first use for alfalfa. The alfalfa plant has an exceptionally large root system and extracts soil moisture from a considerable depth.

A recent publication[5] by agronomists at the Nebraska Agricultural Experiment Station shows that alfalfa on soil receiving moisture from precipitation alone in eastern Nebraska, as do nearly all the upland soils in Stanton County, can deplete the stored soil moisture to depths far beyond the reach of ordinary cereal crops within 2 years, and that within 5 or 6 years it can almost completely exhaust the available moisture in the substratum to depths exceeding 25 feet. The publi-

[4] KIESSELBACH, T. A. PRODUCTIVE SEED CORN. NEBR AGR. EXPT STA. BUL 188, 35 p., illus 1923.
[5] KIESSELBACH, T. A., RUSSEL, J. C., and ANDERSON, A. THE SIGNIFICANCE OF SUBSOIL MOISTURE IN ALFALFA PRODUCTION. Jour. Amer Soc Agron. 21 241-268, illus 1929.

cation indicates that alfalfa in Nebraska must depend almost entirely on precipitation for its growth after the first 5 or 6 years, except in situations where the precipitation is supplemented by a favorable moisture supply from other sources. Throughout the uplands, therefore, reduced yields may be expected from a second cropping to alfalfa. The continued use of this crop in rotation should be discouraged because the alfalfa plant requires more moisture for its maximum growth than is supplied by the normal precipitation of the region.

According to the same publication, the removal of deep-seated moisture does not materially affect grain crops, because they dry out the soil as deep as their roots extend equally as fully as does alfalfa. However, unfavorable yields of grain crops following alfalfa often occur, but this is because the normal supply of moisture is insufficient for the increased vegetative growth produced in subsequent crops by the nitrogen stored in the soil by the alfalfa.

Alfalfa is usually cut three times during the summer, and occasionally a fourth cutting is obtained. The hay is stacked in the field and hauled to the feed lots as needed. Although alfalfa is an important cattle and hog feed, it is seldom fed to work animals on account of its laxative properties. On many farms hogs are allowed to run in the alfalfa fields during the summer, but cattle are seldom allowed to graze for long periods on green alfalfa, on account of the danger of bloating.

The wild hay produced in Stanton County is used chiefly as feed for work animals. It is stacked in the fields or stored in barns for winter feeding.

Most of the sweetclover in the county is used for pasturing hogs and cattle, although some sweetclover hay and seed are produced. Land to be used for this crop is prepared and seeded in the same manner as that to be used for alfalfa. Sweetclover has an unusually wide adaptation. It thrives on both comparatively wet and dry soils and on soils of either coarse or fine texture. It is very valuable for soil improvement, as it not only adds nitrogen and organic matter to the soil, but, in common with other legumes, has a power of fixing atmospheric nitrogen in the nodules on its roots. It is a good soil binder and is especially valuable on steep slopes where erosion is severe. Sweetclover probably improves the productivity of the soil as fast as alfalfa. It is adapted to shorter rotations than that crop and is being grown more extensively each year.

The acreage devoted to mixed stands of timothy and clover is very small in Stanton County. Most of the stands occur on the bottom lands and lower terraces where moisture conditions are most favorable. Thorough seed-bed preparation is necessary in order to obtain satisfactory results. The seed is usually sown broadcast at the rate of 10 or 12 pounds each of timothy and clover seed to the acre and is covered by harrowing. The hay is cut once a year, and most of it is fed to work animals.

No commercial fertilizer is used in Stanton County. Considerable barnyard manure is produced, but little care is taken to preserve it. On most farms the manure is piled out of doors where much of its fertilizing value is lost by leaching. The manure is generally spread on the land to be used for corn or oats. On tenant farms little effort is made to apply the manure where it is most needed, and the greater part is spread on land nearest the barnyard.

SOILS AND CROPS

A diversified farming system, including the growth of feed crops and the raising and fattening of livestock, is almost universally practiced in Stanton County, partly because the climate and soils favor the production of feeds for livestock and partly because the county is within short hauling distance of Omaha, Nebr., and Sioux City, Iowa, both of which cities are important livestock markets. This system enables the farmer to rotate his crops in such a manner as to continually maintain his soils in a highly productive state without detracting from his net annual returns. The grain and hay crops are used for feed, and the farmer can grow leguminous crops on land not producing satisfactory grain yields, whenever necessary, without reducing his feed supply. He can also increase the productivity of a particular field by applying manure from his feed lots at no expense except that required for labor. The more extensive soils of the county produce high yields of all crops commonly grown on them.

The crops most extensively grown are corn, oats, and alfalfa, all of which are essential in the raising and fattening of cattle and hogs. The spring weather is cool and moist, favoring the development of good stands of oats, and the summers are characterized by long warm days and nights that especially favor the production of corn and alfalfa. According to the Nebraska agricultural statistics, approximately 64 per cent of the land in the county was cultivated, 30 per cent was in range and pasture land, and about 2 per cent was in woodland in 1928. The remainder was occupied largely by highways, building sites, or feed yards. According to the same statistics, corn was grown on about 51 per cent, oats on about 28 per cent, and tame hay on about 8 per cent of the cultivated land. Of the tame-hay acreage about 84 per cent was used for alfalfa and most of the remainder for sweetclover and timothy and clover mixed. Among the minor cultivated crops wheat, rye, and barley, ranking in acreage in the order named, are the most important. Practically all the barley and rye grown in the county is used for feed.

Wheat, which is practically the only cash crop, was grown on only about 2,000 acres in 1928. It does not seem to be well adapted to the climatic conditions prevailing in the county, as the winter varieties freeze out rather frequently. Spring wheat is often injured by smut and rust. Not being a feed crop, wheat does not fit in well with the general-farming system. It can not be used as a nurse crop for alfalfa and clover as advantageously as oats, and its straw has a lower feeding value than that of oats.

The land not under cultivation occupies the rougher, the more sandy, and the more poorly drained parts of the county and is used chiefly for grazing and hay land In 1928, 49,921 acres were used for range and pasture and 15,750 acres for native hay.

Prior to 1865 most of the land supported a luxuriant growth of prairie grasses. The annual decay of the grass roots produced an abundance of black well-decomposed organic material, and all the soils, except those in severely eroded localities or those developed on the most recently deposited stream sediments, have accumulated enough of this material to make their topsoils dark. In addition to their dark color most of the soils in the county are characterized by a crumblike or granular structure in their topsoils, this feature per-

sisting to greater or less extent in all except the more sandy soils. A third fairly uniform characteristic in the soils of the county is the presence of lime in the subsoils in sufficient quantities for crop needs, especially in the finer-textured soils. The organic matter and granular structure are valuable soil assets especially for the production of corn which requires a mellow seed bed, a rather even soil temperature, and an abundance of moisture and nitrogen. The organic matter increases the water-holding capacity of the soil, assists in maintaining uniform soil temperature, and promotes favorable tilth. It is also the chief source of nitrogen. The granular or crumblike structure facilitates easy penetration of crop roots and allows free passage of air and water, which change the raw vegetal and mineral constituents of the soil into food suitable for the growing corn crop. Lime, although not a special requirement of corn, benefits this crop because it prevents the development of a sour or acid condition and assists in preserving the organic-matter supply and crumblike structure in the soil. It is a necessary soil constituent for successful alfalfa production.

All the grain and tame-hay crops commonly grown in the county are produced on all soils suited to cultivation. However, some of the soils are more productive of one crop than of another, and differences in their producing powers have determined to a large extent the proportional acreages devoted to the different crops grown on them.

Corn, because of its ability to adapt itself to a wide range of soil and moisture conditions and because it is needed as feed for livestock, is naturally the leading crop on all the cultivated soils, but the proportional acreage devoted to corn is greater on those soils which consistently give higher returns when used for corn than when used for other crops. Oats occupy a higher percentage of the areas characterized by well-drained and fine-textured soils than of those including sandy or poorly drained soils, whereas alfalfa, which requires an abundance of moisture, occupies a larger percentage of the bottom-land than of the upland or terrace soils and is seldom grown in the more sandy parts of the uplands and terraces.

Although the soils differ more or less in their agricultural values so far as their use for certain crops is concerned, they may be placed in groups, each of which includes soils that are more uniform in their producing powers and crop adaptations and which are used for some particular crop or crops more extensively than soils belonging to another group. In Stanton County four soil groups, based on soil characteristics and other features that affect agriculture, are recognized, namely: Well-drained upland and terrace soils; excessively drained upland and terrace soils; poorly drained upland soils; and bottom-land soils

In addition to differences in drainage the soils differ in other characteristics which affect agriculture, such as surface features, moisture content, and tendency to erode. No group is confined to any particular part of the county, although some of the soils in each group are very local in their distribution.

In the following pages the individual soils of the different groups are described in detail and their crop adaptations are discussed. The soil map accompanying this report shows the distribution of the soils in the county, and Table 5 gives their acreage and proportionate extent.

TABLE 5.—*Acreage and proportionate extent of soils mapped in Stanton County, Nebr*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Moody silt loam	94,208	34.4	O'Neill loamy fine sand	2,624	1.0
Moody silt loam, deep phase	38,592	14.1	Dune sand	5,312	1.9
Moody very fine sandy loam	3,968	1.4	Fillmore silt loam	128	.1
Moody fine sandy loam	5,632	2.1	Wabash silt loam	13,824	5.0
Marshall loamy sand	2,880	1.1	Wabash silt loam, light-colored phase	1,152	.4
Marshall fine sandy loam	2,304	.8	Wabash very fine sandy loam	2,688	1.0
Hall silt loam	3,584	1.3	Wabash fine sandy loam	2,304	.8
Hall very fine sandy loam	2,624	1.0	Lamoure silty clay loam	1,536	.6
Hall fine sandy loam	1,536	.6	Lamoure fine sandy loam	2,304	.8
Waukesha silt loam	3,712	1.4	Lamoure silt loam	2,816	1.0
Waukesha very fine sandy loam	1,024	.4	Lamoure silt loam, light-colored phase	704	.3
Waukesha fine sandy loam	2,752	1.0	Cass loamy sand	7,360	2.7
Valentine sand	16,384	6.0	Cass fine sandy loam	6,080	2.2
Valentine loamy sand	6,144	2.2	Cass very fine sandy loam	2,880	1.1
Knox silt loam	19,584	7.1	Sarpy sand	2,240	.8
Knox fine sandy loam	2,752	1.0	River wash	960	.3
Dickinson loamy sand	6,336	2.3			
Dickinson loamy fine sand	4,096	1.5	Total	273,920	
Shelby loam	512	.2			
Shelby loamy sand	384	.1			

WELL-DRAINED UPLAND AND TERRACE SOILS

The well-drained upland and terrace soils occupy about 60 per cent of the total area of the county. They occur throughout all parts of the well-drained, loess-covered uplands, wherever erosion is not severe, and include all but one of the terrace soils. Their surfaces range from nearly level to strongly rolling, and all the soils have adequate surface and subsoil drainage. The group includes the Moody, Marshall, Hall, and Waukesha soils. The first two occupy upland positions, and the last two are on terraces All these soils have weathered from the light-colored floury and limy loess formation which covers most of the county.

The topsoils of the soils of this group are loose and mellow, are well supplied with organic matter, and are very dark grayish brown or almost black. They average deeper and darker than in the soils of any other group except the bottom-land soils. They range in texture from loamy sand to silt loam, the silt loam predominating. The subsoils are friable, allowing easy root penetration and free air and water movement. They all contain lime in sufficient quantities for crop needs, but the amount of lime and the depth of its occurrence vary somewhat in the different soils. These soils have high moisture-storing capacity. About 90 per cent of the area occupied by the group is under cultivation, and the remainder is used largely for pasture land.

The main crops of the county are grown with excellent results on all the soils in the group. Slight differences occur in the yields on different soils, but these are due more to differences in topographic features, particularly the slope of the land and its elevation with respect to surrounding areas, than to differences in the soils themselves. The upland soils of the group have more sloping surfaces, as a rule, than the terrace soils, and less of the rainfall sinks into these soils than into those on the benches. In addition the upland soils are not so favorably situated to receive moisture from higher levels as the terrace soils and are naturally a little less productive. However, all soils of the group are more productive than any upland

soil not belonging to the group and are adapted to a wider range of crops than any of the bottom-land soils in the county.

Corn is grown on about 60 per cent of the area occupied by the group, oats on about 25 per cent, and alfalfa on about 5 per cent.

Moody silt loam.—Moody silt loam occupies 34.4 per cent of the total area of Stanton County and is the most important general-farming soil. It occurs in nearly all parts of the uplands except on the high flat-topped remnants of the old loessial plain, the lower parts of valley slopes, and the areas occupied by sandy soils. The surface of the soil ranges from gently to steeply rolling, and drainage is everywhere thorough.

The topsoil is friable silt loam which in most places is well supplied with organic matter, is very dark grayish brown, and is 10 or 12 inches thick. In some areas, especially on the steeper slopes, erosion has removed the dark-colored material, giving the soil a spotted dark and light appearance. However, such areas are very local, and although nearly all the soil is subject to some erosion, a negligible part of it has lost its dark-colored topsoil. The subsoil, which continues to an average depth of 4 feet, is grayish-brown, light grayish-brown, or almost white mellow silt loam. It is very limy and in the upper foot or so contains numerous small, hard, almost round lime concretions from one-fourth to three-fourths inch in diameter.

This soil as mapped includes a few small patches of Moody very fine sandy loam and Moody silty clay loam, but as a whole it is rather uniform throughout the areas of its occurrence in the county.

About 90 per cent of the Moody silt loam is under cultivation or occupied by building sites and feed yards. The remainder, which includes the more severely eroded areas, is used chiefly for pasture land. About 65 per cent of the cultivated land is in corn, 25 per cent in oats, and 5 per cent in alfalfa. The remainder is used largely for wheat, barley, sweetclover, and potatoes, all of which are grown in small fields on most farms.

Crop yields on this soil are about the average for those of the county as a whole. They are a trifle lower than those obtained on the deep phase of this soil and on the Waukesha and Hall soils, because those soils occupy more nearly level areas where more of the precipitation sinks into the ground and where the soils, being less subject to erosion, have developed deeper topsoils than has typical Moody silt loam. Yields of corn and alfalfa on this soil are lower than on most of the bottom-land soils of the county, where ground water is within reach of corn and alfalfa roots. However, Moody silt loam gives higher yields of all crops than any of the sandy or light-colored upland or terrace soils and higher yields of small grains than any of the bottom-land soils in the county. The average yield of corn on this soil over a period of years is about 35 bushels an acre and that of oats about 32 bushels. Alfalfa yields about 3 tons of hay an acre during the first 4 or 5 year cropping period, after which yields decline as on all upland soils in Nebraska because the alfalfa roots exhaust the deep-seated moisture supply and the plant can not make optimum growth on the moisture supplied by precipitation alone.

This soil is easily handled and if care is taken to prevent erosion on the steeper hillsides it maintains its high productivity year after year. It can be cultivated under a fairly wide range of moisture conditions.

Clods are formed if it is plowed when wet, but the lumps are easily reduced by subsequent tillage.

Moody silt loam, deep phase.—The deep phase differs from typical Moody silt loam chiefly in the greater thickness and higher organic-matter content of its topsoil. It occurs on scattered flat-topped remnants of the old loess plain and on a few of the more gradually sloping valley sides. The largest developments are in the southwestern, east-central, and northeastern parts of the county.

This deep soil is well drained but has not been subjected to erosion, and organic matter has accumulated in larger amounts than in typical Moody silt loam.

The topsoil is 18 or 20 inches thick in contrast to the 10 or 12 inch topsoil in the typical soil. The upper part of the subsoil is light brown, and the lower part is gray. Both topsoil and subsoil are friable and highly retentive of moisture. Lime in sufficient quantity to effervesce with acid lies much deeper than in Moody silt loam, being about 3 feet below the surface of the ground in the areas on gradually sloping valley sides and from 4 to 10 feet below the surface on the nearly level loess-plain remnants. However, no part of the soil appears to be deficient in lime so far as crop needs are concerned.

The deep phase of Moody silt loam is the strongest and most productive soil in the uplands. The same crops in about the same acreage ratio are grown as on Moody silt loam, and yields average about 5 per cent higher.

Moody very fine sandy loam.—Moody very fine sandy loam differs from Moody silt loam only in that it contains a little more very fine sand in the topsoil. The sand content, although sufficient to make the soil a trifle easier to handle than Moody silt loam, does not noticeably reduce its moisture-holding capacity or its susceptibility to erosion. The surface features are similar to those in the silt loam, and the soil has about the same producing power as that soil.

Moody very fine sandy loam occupies only a small total area in Stanton County. Most of it occurs in bodies of various sizes within or adjacent to areas of more sandy soils, and admixtures of wind-blown sand are largely responsible for the slightly sandy texture of its topsoil. Practically all the land is under cultivation.

Moody fine sandy loam.—Moody fine sandy loam is the most sandy of the Moody soils in Stanton County. The sand, however, occurs only in the topsoil and, although sufficient to considerably thicken this layer in places, it is intimately mixed with an abundance of silt and organic matter and does not render the soil unstable or droughty. The sand is of slightly coarser grade than that in Moody very fine sandy loam, and the soil is able to absorb moisture a little faster than any other Moody soil in the county. The subsoil is similar to that of Moody silt loam except that lime in sufficient quantities to effervesce when acid is applied lies from 12 to 20 inches deeper than it does in the subsoil of Moody silt loam.

Practically all this soil is under cultivation and is used for the same crops as the finer-textured Moody soils. The high sand content of the topsoil diminishes the tendency to erode, and the relief as a rule is a little more even than that of Moody silt loam or Moody very fine sandy loam. Light-colored spots rarely occur on the hillsides. The soil can be cultivated a little sooner after rains than the finer-textured Moody soils without danger of its becoming cloddy. However, the

advantages mentioned are slight and the soil is not generally regarded as superior to Moody silt loam in producing power or adaptation to crops. It occupies only a small total area in Stanton County, occurring chiefly in small bodies within or adjacent to more sandy soil areas.

Marshall loamy sand.—Marshall loamy sand occupies several small areas within or adjacent to areas of sandy soils in the east-central, central, west-central, and northwestern parts of the county. The largest two bodies, each of which includes about 400 acres, are southwest of Pilger and along Sand Creek, in the east-central and west-central parts of the county, respectively. The remaining bodies are much smaller, and the total area of the soil is only 4.5 square miles.

The topsoil is from 12 to 16 inches thick It is composed largely of loose gray sand containing an abundance of organic matter which gives the soil a dark color and considerable stability but does not entirely prevent the sand from drifting, especially in cultivated fields. The topsoil rests on light-gray floury silt similar to that underlying Moody silt loam except that it does not contain sufficient lime to react with acid.

The surface ranges from nearly level to gently rolling. Surface run-off is not established, because the topsoil absorbs the precipitation as fast as it falls. Underdrainage is good but not excessive, and the soil is very retentive of moisture. Most of the soil is used for the production of corn, which is grown in rotation with alfalfa or sweetclover. These crops yield about the same as on Moody silt loam. Most of the sweetclover is used for pasture Small-grain crops are grown to some extent but do not yield so high as on the more silty soils of the uplands, especially in seasons having considerable dry windy weather which causes the soil to drift, exposing the shallow roots of small grains to drought.

This soil can be cultivated under almost any moisture conditions without injury, provided care is taken to prevent soil drifting. On account of the less stable character of its topsoil, it is regarded as slightly inferior to Moody silt loam by most farmers.

Marshall fine sandy loam.—Marshall fine sandy loam is similar to Marshall loamy sand except that it contains more silt in its topsoil and is more stable. It is as well suited to, and as productive of, all crops commonly grown in the county as Moody silt loam Practically all the land is used for corn, oats, and alfalfa, which rank in acreage, during most years, in the order named. However, the soil occupies only 3.6 square miles and is of little agricultural importance in Stanton County. It occurs as small bodies in the same general localities as areas of Marshall loamy sand.

Hall silt loam.—Hall silt loam occupies about one-third of the terrace lands in Stanton County. Most of it is on the north side of Elkhorn River between Stanton and Pilger. Its total area is 5.6 square miles.

This soil has developed from gray loess which is similar to that underlying the Moody soils of the uplands but which was carried to its present position by streams and deposited along their courses when they were flowing at higher levels. Subsequent deepening of the stream channels left the deposits from 8 to 20 feet above the

present bottom lands, and prolonged weathering, together with the accumulation of organic matter, produced the present soil

The surface of the soil is nearly level or very gently undulating, but the slope down the valleys and toward the streams is sufficient to afford ample surface drainage, and all the soil has good underdrainage

The topsoil is very dark grayish-brown mellow silt loam, from 16 to 20 inches thick, well supplied with organic matter. The upper part of the subsoil is brown or grayish-brown silt loam which is a little more compact than the topsoil but is friable throughout The lower part of the subsoil, beginning at a depth of about 40 inches, is light-gray floury silt which continues to a depth exceeding 7 feet. It is very limy and in the upper 18 or 20 inches frequently contains scattered hard concretions of lime from one-eighth to more than one-fourth inch in diameter. The soil is retentive of moisture It is remarkably uniform throughout the area of its occurrence in Stanton County

Hall silt loam is well adapted to all crops commonly grown in the region and is one of the most valuable general-farming soils in the county It occupies a much smaller area than the leading upland soils but is more favorably situated to receive moisture from higher levels, and this moisture together with that received through precipitation makes this soil somewhat more productive than the best upland soil

Practically all the Hall silt loam is under cultivation. About 70 per cent of it is devoted to corn, about 15 per cent to oats, and about 10 per cent to alfalfa. The remainder is used largely for wheat, barley, sweetclover, and other crops grown for food or feed.

The average yield of corn or oats is about 40 bushels, that of wheat about 20 bushels, and that of barley about 25 bushels an acre. Alfalfa yields about 3¼ tons of hay an acre. Most of the sweetclover is used for hog pasture The yields of small grains on this soil are not exceeded on any other soil in the county, and the yields of corn and alfalfa are exceeded only on some of the bottom-land soils.

Hall very fine sandy loam.—Hall very fine sandy loam occupies about 4 square miles in Stanton County, occurring chiefly on the terraces along Union Creek southwest of Stanton. A few small bodies are on the Elkhorn River terraces This soil is identical with Hall silt loam in all features except the texture of its topsoil, this layer containing a little more very fine sand than occurs in the corresponding layer of the silt loam type. However, the sand content is not sufficient to make the soil droughty or unstable, and Hall very fine sandy loam is regarded as equal to Hall silt loam in producing power and adaptation to crops. Practically all the land is under cultivation and is used for the same crops as are grown on Hall silt loam.

Hall fine sandy loam.—Hall fine sandy loam occupies small areas on the Elkhorn River terraces in the central and western parts of the county.

The topsoil of this soil is very dark grayish-brown fine sandy loam, differing from that of Hall silt loam only in that it has a higher sand content and from the corresponding layer of Hall very fine sandy loam in that its sand is of a slightly coarser grade. The subsoil is similar in all characteristics to the subsoils in the other Hall soils of the county.

All of this soil is under cultivation and is used for the same crops as are grown on Hall silt loam. The land can be cultivated with a little less power and under a somewhat wider range of moisture conditions than Hall silt loam but does not differ from that soil in producing power or adaptation to crops.

Waukesha silt loam.—Waukesha silt loam is identical with Hall silt loam in all features except that its subsoil is not so abundantly supplied with lime as the corresponding layer of Hall silt loam It occupies a total of 5.8 square miles in Stanton County, occurring chiefly on the Elkhorn River terraces in the vicinity of Pilger and along Tracy Creek in Dimick Precinct.

The surface features and drainage conditions are similar to those of Hall silt loam. Both soils occupy comparable terrace levels and are used for the same crops in about the same acreage ratios. Although Waukesha silt loam is not so well supplied with lime as Hall silt loam, it is not deficient in this material and is as productive of all crops as the Hall soil.

Waukesha very fine sandy loam.—Waukesha very fine sandy loam occurs on terraces of about the same elevation as those occupied by the Hall soils The largest developments in Stanton County are along Union Creek in the southwestern part and along Elkhorn River west of Stanton This soil has good surface drainage and underdrainage, and all the land is under cultivation. It resembles Hall silt loam in all features except that it contains a little more very fine sand in its topsoil and has a less limy subsoil. However, it is not droughty or deficient in lime and is as productive and as well adapted to all crops commonly grown in the county as any of the Hall soils Owing to its small extent it is of little agricultural importance in Stanton County.

Waukesha fine sandy loam.—Waukesha fine sandy loam occurs in several small bodies on stream terraces, chiefly in the central part of the county. The largest area, comprising about 600 acres, is on the south side of Elkhorn River 4 miles east of Stanton. The surface of the soil is nearly level or very gently undulating and lies from 10 to 15 feet above the stream channels. The land is well drained.

The topsoil of Waukesha fine sandy loam is as deep and as dark as that of any of the Hall or Waukesha soils in the county. Although this soil contains a little more fine sand than Waukesha very fine sandy loam and its subsoil has a lower lime content than the subsoils of the Hall soils, it is highly retentive of moisture and is not deficient in lime so far as crop needs are concerned. Practically all the land is under cultivation, and it is as well adapted to all crops commonly grown in the county as Hall silt loam and is as productive as that soil. In fact, there is little or no difference in producing power and adaptation to crops between any of the Hall and Waukesha soils in Stanton County.

EXCESSIVELY DRAINED UPLAND AND TERRACE SOILS

The excessively drained group of soils, which occupies about 23 per cent of the county, includes the Valentine, Knox, Shelby, Dickinson, and O'Neill soils and dune sand. The soils of the first four series named, as well as dune sand, are in the uplands and the O'Neill soil occurs on terraces. All the soils, except those of the Knox series, which occupy the more steeply sloping or more hilly parts of loessial

areas and which are composed largely of silt, have developed from materials consisting chiefly of loose sands or gravel and are porous throughout

The sandy soils of the group occur mainly on the valley slopes south of Elkhorn River but are also developed north of that stream in the western part of the county. The silty soils of the group occupy numerous areas in all parts of the uplands.

A few of the soils have fairly dark-colored surface layers, but they are all rather low in organic matter in comparison with soils of the well-drained upland and terrace group, and several of them are characterized by decidedly light-colored topsoils. Either because of the steepness of the slopes or because of the porous character of the soil materials, none of the soils belonging to this group is able to retain, for crop use, as much of the moisture which falls on it as is retained by the well-drained upland and terrace soils.

The sandy soils of the group are low in lime, and most of them have rather incoherent topsoils which are subject to drifting during dry windy weather. The silty topsoils are very limy, but in most places they are topographically unsuited to the use of farm machinery. Only about 40 per cent of the area occupied by soils of this group is under cultivation, the remainder being used for pasture or hay land.

Corn occupies about 75 per cent of the cultivated land, and rye, sweetclover, and alfalfa, ranking in acreage in the order named, occupy the rest. Corn is the most extensively grown crop, largely because it is needed for feed but also because it is better able than other crops to adapt itself to the sandy conditions prevailing over most of the area occupied by the soils of the group. Corn does not produce such high yields on these soils as on those of the well-drained upland and terrace group, but it gives larger returns than oats or alfalfa, especially on the sandy soils. Most of the rye is grown on the sandy soils, most of the alfalfa on the silty soils, and sweetclover on both the sandy and silty soils of the group.

Valentine sand.—Valentine sand occupies both large and small irregular-shaped areas in the sandy uplands south of Elkhorn River, and it is also developed in the northwestern part of the county. The soil occurs wherever wind action has prevented the upland sands from accumulating much organic matter but has not produced a strongly rolling or hilly relief such as occurs in dune sand areas. It is extensively developed on the divide between Elkhorn River and Union Creek in the western part of the county and also around dune sand areas south of Stanton.

Valentine sand consists of loose incoherent gray or grayish-brown sand to a depth exceeding 4 feet. In most places the 3 or 4 inch surface layer is slightly darker than the remainder of the soil owing to a small content of organic matter. The organic constituent, however, is nowhere sufficient to prevent the soil from drifting when the native sod is destroyed. The soil is very low in lime.

The relief ranges from almost level to gently rolling. The greater part of the surface is characterized by low rounded hummocks and ridges separated by shallow and in most places elongated depressions. The range in relief in a particular locality rarely exceeds 6 feet. No surface run-off occurs, as the loose porous sand absorbs and carries off the rain water as fast as it falls.

Valentine sand is of little value for crop production on account of its low organic-matter content, low water-retaining capacity, and the tendency to drift when the native sod is destroyed. Probably not more than one-fifth of the land is under cultivation. Some corn, sorgo, and sweetclover are grown in the lower areas where moisture conditions are most favorable, but yields are generally low except in the most favorable seasons. Most of the land remains with its natural covering of grasses and is used for cattle grazing and hay production The natural vegetation consists largely of sand grass, Stipa, and big bluestem. These grasses support about 25 head of cattle on each 160 acres during the summer grazing season or when cut for hay yield about one-third ton an acre.

Valentine loamy sand.—Valentine loamy sand differs from Valentine sand only in that its topsoil contains a little more organic matter and is a trifle thicker. This soil occurs in close association with Valentine sand but is much less extensive. The largest area, comprising about 700 acres, is about 5 miles southwest of Stanton, and a slightly smaller area is about 5 miles east of that town. The remaining areas rarely exceed 320 acres each and are rather scattered. The relief and drainage conditions are about the same as those of Valentine sand.

The higher organic-matter content causes the soil to produce somewhat higher yields than Valentine sand, especially during the first two or three years after the land is broken, and for this reason about 50 per cent of the soil is used for crops, chiefly corn. However, the organic matter, which is not sufficiently abundant to prevent the sand from drifting when the native sod is destroyed, rapidly decreases under cultivation, and the Valentine sand areas are annually becoming larger at the expense of those of Valentine loamy sand.

The average yield of the first two or three crops of corn is about 18 bushels an acre, after which the yield is much lower except during seasons of unusually high precipitation. The uncultivated parts of the soil support the same species of grasses as those growing on Valentine sand, but the grasses grow a little more luxuriantly and the soil has a higher hay-producing and grazing value. During average years about 30 head of cattle can be grazed on each 160 acres, or when the grasses are cut for hay about one-half ton an acre is obtained.

Knox silt loam.—Knox silt loam is the most extensive and the most widely distributed of the excessively drained upland and terrace soils in Stanton County. It occurs in numerous bodies throughout the uplands wherever the light-colored loessial material has been severely eroded. These bodies occupy the sharper hilltops, ridges, and steeper slopes within or adjacent to areas of Moody soils. Most of them range in size from 2 to 10 acres but a few occupy more than a square mile. One of the largest areas, comprising about 3 square miles, is south of Union Creek in the western part of the county, and another large body is about 6 miles north of Stanton. The larger areas are hilly, and all the soil has excessive surface drainage.

The topsoil is grayish-brown or gray friable silt loam, in few places more than 6 inches thick. It rests on floury light-gray or yellowish-gray limy silt similar to that underlying the subsoil of Moody silt loam. The soil is simply loess, the surface layer of which has accumulated barely enough organic matter to give it a slightly darker color than the remainder of the loessial deposit.

Knox silt loam is retentive of moisture, and were it not for its unfavorable relief and low organic-matter content it would be a valuable farming soil. A few small areas which are not too rough for the use of farm machinery are devoted to corn and alfalfa. Alfalfa seems to do nearly as well as on Moody silt loam, probably because it can obtain much of the necessary nitrogen from the air. Corn yields much less than on Moody silt loam, but the returns derived from this crop far exceed those which could be obtained if the areas remained in natural grasses.

Nearly all this soil is in pasture land. The grasses, which consist chiefly of little bluestem, are well established except on the sharper hilltops and steeper slopes, and in average years they support about 40 cattle on each quarter section during the summer grazing season.

Knox fine sandy loam.—Knox fine sandy loam is similar to Knox silt loam in all characteristics except that it has sufficient sand mixed with the silt in its 4 or 6 inch surface layer to give that part of the soil a fine sandy loam texture.

The soil occupies a few small areas, most of which border areas of sandy soils. The largest bodies, one of which includes about 400 acres, are south of Union Creek in the western part of the county. Smaller areas are around the northern edge of the loessial uplands south of Elkhorn River and in the northwestern part of the county.

The relief is similar to that of Knox silt loam. Practically all the soil is used for pasture and has about the same grazing value as Knox silt loam The coarser texture of the topsoil is due largely to the addition of wind-blown sands from near-by sandy soils.

Dickinson loamy sand.—Dickinson loamy sand occurs throughout the uplands wherever exposures of almost pure sand have lain in their present positions long enough to have accumulated sufficient organic matter to give a pronounced dark color to the surface layers The topsoil is very dark grayish-brown, in many places almost black, loamy sand from 7 to 12 inches thick. The remainder of the soil is incoherent sand which is pale brown immediately beneath the topsoil and gray in the lower part. Both surface soil and subsoil are low in lime.

The largest body of this soil comprises about 800 acres and is south of Pilger in the eastern part of the county Numerous smaller bodies occur in the sandy uplands south of Elkhorn River and in the northwestern part of the county.

Areas of this soil are nearly level or gently rolling. Surface drainage is not established, because all moisture is rapidly absorbed by the porous sand. This soil is less retentive of moisture than any of the soils in the well-drained upland and terrace group, and were it not for the high organic-matter content of its topsoil it would be rather droughty. The organic matter enables the soil to retain more moisture than any of the Valentine soils. It also gives the sand greater stability than in those soils but does not entirely prevent soil drifting, especially in cultivated fields.

About 80 per cent of the Dickinson loamy sand is used for corn, about 5 per cent for alfalfa, and the remainder is uncultivated. Corn and alfalfa, having comparatively large root systems, are not greatly injured by drifting sand, and although the moisture supply is too low for maximum yields of these crops, in average years the land gives higher net returns when used for them than when used for any other crop. The average yield of corn is about 20 bushels an acre and that

of alfalfa 2 tons of hay. The uncultivated parts of the soil support luxuriant growths of big bluestem and needle grass and are used for pasture or hay land. These grasses will support about 50 head of cattle on each quarter section, or when cut for hay will yield about one-third ton an acre Practically all the pasture and hay land is cultivable. The soil is poorly adapted to small-grain crops on account of the danger of the sand drifting and exposing the shallow roots to drought.

Dickinson loamy fine sand.—Dickinson loamy fine sand differs from Dickinson loamy sand only in the slightly finer texture of the sand and the slightly higher content of the silt in the topsoil of the loamy fine sand It is a little more stable than the coarser-textured Dickinson soil and can be used for small grains in addition to corn and alfalfa. The higher silt content of the topsoil also makes this soil more retentive of moisture than Dickinson loamy sand, and all crops yield about 5 per cent higher than on that soil. The subsoil, however, is loose incoherent sand with low moisture retentiveness, and none of the crops yield so well as on the more silty soils of the county

This soil occupies scattered areas in the sandy uplands south of Elkhorn River and in the northwestern part of the county Most of the areas are small, their combined area being less than that of Dickinson loamy sand

Shelby loam.—Shelby loam occupies about 500 acres in Stanton County, occurring as several small bodies in the northwestern corner. The topsoil is from 8 to 12 inches thick and consists of dark grayish-brown friable loam or sandy loam which is well supplied with organic matter The soil has developed from brown heterogeneous mixtures of sand, clay, and gravel of glacial age, and the subsoil in any particular locality depends largely on the character of the glacial deposit at that place. The subsoil invariably contains an abundance of gravel but in most places has more fine material than the corresponding layers in the Dickinson soils. It ranges in color from brown to grayish brown and is generally low in lime The topsoil has high moisture-retaining power, but the subsoil in most places is rather porous.

Practically all the soil is under cultivation, mainly to corn, although some oats and alfalfa are grown. Crop yields average a trifle higher than on the Moody soils.

Shelby loam rarely occupies more than a small part of the farms on which it occurs and is of little agricultural importance in Stanton County.

Shelby loamy sand.—Shelby loamy sand occupies a few small areas all of which occur in the same general locality as the bodies of Shelby loam, but they are less numerous. The loamy sand covers less than 400 acres in Stanton County. It has weathered from glacial deposits but apparently in localities where these deposits contained more sand than in localities occupied by Shelby loam. The topsoil, although generally rather dark, rarely exceeds 6 or 8 inches in thickness and consists largely of fine or medium sand containing considerable gravel. In few places is the content of fine material sufficient to give the topsoil much body, and the soil as a whole is rather unstable. The subsoil is an incoherent mass of gray sand and gravel and is very low in lime.

About 80 per cent of this soil is under cultivation, and practically all the cultivated part is used for corn The soil is rather droughty, and corn yields are low except in the most favorable seasons. That part of the soil not in corn is used for pasture.

O'Neill loamy fine sand.—O'Neill loamy fine sand is the only terrace soil belonging to the excessively drained upland and terrace soil group in Stanton County. This soil has developed from gray incoherent sand, similar to that underlying the Dickinson soils, which was washed from the sandy uplands and deposited in the bottom lands when the streams were flowing at higher levels. Subsequent deepening of the stream channels left the deposits from 8 to 15 feet above the present flood plains.

The soil occupies several small areas on the Elkhorn River terraces, chiefly in the western part of the county. The largest body, comprising about 500 acres, is about 2 miles south of Stanton. The remaining bodies, although numerous, are much smaller.

O'Neill loamy fine sand is similar to Dickinson loamy sand except that the sand in its surface layer is slightly finer The topsoil, which is well supplied with organic matter, is very dark and is 10 or 12 inches thick. The high organic-matter content gives the soil material some stability but not enough to entirely prevent soil drifting when the native sod is destroyed. The subsoil is porous and incoherent. The upper 6 or 8 inches of the subsoil is brown and the remainder is gray. The soil is very low in lime.

The surface of this soil is nearly level except in a few places where wind action has produced slight depressions and low rounded ridges, but even in these localities differences in elevation rarely exceed 2 feet. Surface drainage is not established. The organic matter in the topsoil is able to hold some moisture, but the subsoil has low moisture-retaining power, and the soil as a whole is rather droughty.

About 80 per cent of the O'Neill loamy fine sand is cultivated, and the remainder is native pasture or hay land. About 90 per cent of the cultivated land is in corn, and most of the remainder is in alfalfa or sweetclover. Most of the sweetclover is used for pasture. Corn yields about the same as on Dickinson loamy sand. In a few places alfalfa seems to do even better than on the best silty soils in the uplands, probably because its roots are able to reach the underlying water table Over the greater part of the soil, however, alfalfa yields about the same as on the coarser-textured Dickinson soils. Small-grain crops are seldom grown on O'Neill loamy fine sand.

Within or associated with areas of O'Neill loamy fine sand are a few patches of O'Neill soil in which the topsoil contains a little more silt than usual, approaching a fine sandy loam in texture. These patches, however, are too small and unimportant to warrant the establishment of O'Neill fine sandy loam in Stanton County, and they are included with the loamy fine sand on the soil map.

Dune sand.—Dune sand, although not a soil, is very loose and porous and for this reason is included with soils of the excessively drained upland and terrace group. It occurs chiefly in an irregular-shaped area comprising about 6 square miles southeast of Stanton. There are 4 or 5 smaller areas of the material, but none of them occupies more than 320 acres.

Dune sand is incoherent gray sand which has been whipped by the wind into a succession of irregularly distributed hills and ridges,

the tops of which are from 10 to 25 feet above the intervening valleys and pockets. Surface drainage channels are not established as all moisture is rapidly absorbed by the loose porous sand. The material in most places supports a fair growth of sand grass, Stipa, and little bluestem, but bare spots, locally called blow-outs, occupy a square rod or two on many of the hills, especially on the northwest side.

All the dune sand is used as pasture land except a few of the lower-lying and more stable areas which are used for hay production. The native grasses on this material support from 15 to 20 head of cattle on each 160 acres. The hay on the more stable areas yields from one-fourth to one-half ton an acre, depending on the rainfall.

POORLY DRAINED UPLAND SOILS

The only poorly drained upland soil occupies but 128 acres in Stanton County. It occurs in 15 or 20 basinlike depressions locally known as "buffalo wallows" or "lagoons," most of which are in the southwestern part of the county within areas of Moody silt loam, deep phase. The basins rarely comprise more than a few square rods. They have no natural drainage outlets, and the water which collects in them after rains disappears slowly through seepage and evaporation. The excessive moisture has noticeably leached the lower part of the topsoil and has resulted in the development of a dense claypanlike layer in the upper part of the subsoil. Even if drainage conditions allowed cultivation, the soil would remain poorly adapted to grain and tame-hay crops, because the topsoil is too thin to store much moisture and the dense clay in the upper part of the subsoil is too poorly aerated and releases its moisture too slowly for these crops.

Fillmore silt loam.—Fillmore silt loam is the only soil classed with the poorly drained upland soil group in Stanton County. Its topsoil is friable silt loam ranging from less than 6 to about 8 inches in thickness. In most places this layer is well supplied with organic matter and is rather dark, especially in its upper part. However, it invariably contains more or less light-gray silty material from which excessive moisture has removed the black organic matter, and in many places in the more poorly drained depressions the lower part of the topsoil is gray. The upper 24 to 30 inches of the subsoil consists of almost black dense clay which probably owes its extreme compaction and dark color to the addition of clay and organic matter carried down from the topsoil by percolating waters. The clay layer is underlain by a 10-inch layer of gray friable silt in which small lime concretions are numerous. Beneath this layer is the parent loessial material, a light-gray floury silt similar to that underlying Moody silt loam. The loess contains some lime in finely divided form, but lime concretions are very scarce.

The areas of Fillmore silt loam in Stanton County are not suited to crop production, as most of them are too poorly drained for cultivation. The dense claypanlike layer is almost impervious to water and is penetrated with difficulty by crop roots. It practically limits the storage of available crop moisture to the topsoil which is too thin to store sufficient moisture for grain crops, especially during prolonged dry periods. However, the soil occupies only a small part of the

farms on which it occurs and does not noticeably affect their general value. Most of it is included in pastures or is regarded as waste land.

BOTTOM-LAND SOILS

The bottom-land soils occupy 17 per cent of the area of the county. They have developed from sediments recently deposited in the bottom lands during periods of high water, and they include the Wabash, Lamoure, Cass, and Sarpy soils and a material designated as river wash. One or another of these soils occurs as bodies or strips along all the larger and many of the smaller streams. The largest areas are along Elkhorn River and Union, East Fork Maple, and Humbug Creeks.

The surface of the bottom land slopes almost imperceptibly down the valleys and toward the stream channels. The land is remarkably smooth except where traversed by old and present stream channels or where modified by slight elevations and shallow depressions. Surface drainage, although rather slow, is well established except locally. Much of the land is subject to overflow during high stages of the streams, but as most of it lies from 3 to 5 feet above the stream channels the water drains off within a few hours after the streams subside. About 90 per cent of the land is adequately drained and is used for cultivated crops. The ground water table ranges from about 4 to 15 feet beneath the surface of the ground, and the lower part of the subsoil is kept well supplied with moisture even during the drier years.

The sediments from which the bottom-land soils have developed are of such recent origin that none of them has been greatly altered by weathering, and their composition is the dominant factor in determining the character of the soils. The sediments deposited by the local upland streams flowing through areas of loess are uniform and silty, whereas those deposited by the more deeply intrenched streams which have cut through the loessial mantle into the underlying sands and gravel, are coarser. The mixing and reassorting of the fine and coarse particles have given rise to a varied assortment of sediments, especially in the bottom lands along Elkhorn River, where sediments came not only from the local uplands but also from regions to the west.

The Lamoure and Wabash soils have developed from the finer stream sediments, chiefly silts and clays, whereas the Cass and Sarpy soils are from the sands and gravel.

The soils on the bottom lands are naturally better supplied with moisture than those on the uplands or terraces because the precipitation received by them is supplemented by seepage from stream channels and the underlying water table and by run-off from higher levels. The run-off carries considerable organic matter and other plant foods to the lower levels. The moist conditions prevailing in the bottom lands have favored rapid vegetal growth and decay, and all the soils except the Sarpy, which is developed from the most recently deposited sands, have dark-colored, in many places almost black, topsoils owing to an abundance of organic matter. The high organic-matter content and the abundant moisture supply combine to make the darker-colored bottom-land soils the most productive corn and alfalfa soils in the county, and most of the area occupied by them is used for these crops, corn being grown on about

80 per cent of the cultivated land and alfalfa on about 15 per cent. The remainder is used largely for sweetclover and clover and timothy mixed.

Alfalfa can be grown as continuously as desired without decreasing the subsoil moisture to the point where yields decline as they do in the uplands under continued alfalfa cropping. Small-grain crops grow well on the bottom-land soils but have a tendency to produce rank vegetative growth with long weak stems which often break during windy weather. In addition the small-grain crops usually mature late and produce rather low yields. Oats yield fairly well provided short stiff-stemmed varieties are grown, but even these varieties have a tendency to grow rank at the expense of the grain and are of minor importance on the bottom-land soils.

The uncultivated parts of the bottom lands, including the more poorly drained spots and areas occupied by trees, are used for native hay or pasture land.

Wabash silt loam.—Wabash silt loam is the most extensive bottom-land soil in Stanton County, having a total area of 21.6 square miles. It occurs as continuous strips ranging in width from a few rods to about one-half mile along many of the upland creeks and is locally developed in the Elkhorn River bottom lands The widest strips are along Humbug and East Fork Maple Creeks in the northeastern and southeastern parts of the county, respectively.

The surface of the soil is nearly level except where modified by stream channels. However, surface run-off is well established, and practically none of the soil is too wet for cultivation.

The topsoil is dark-brown or black friable silt loam, from 18 to 24 inches thick, abundantly supplied with organic matter. This subsoil, which continues to an average depth of 4 feet, is heavy silt loam or silty clay loam which is only slightly lighter in color than the topsoil. The material in this layer is moderately compact but does not attain the density of a claypan and is easily penetrated by moisture and roots. Neither the topsoil nor the subsoil contains sufficient lime to noticeably react when dilute hydrochloric acid is applied, but the soil does not seem to be deficient in lime so far as crop needs are concerned.

Practically all the soil, with the exception of narrow forested strips adjacent to the stream channels, is under cultivation. Its high organic-matter content, abundant moisture supply, and nearly level surface combine to make it one of the most productive corn and alfalfa soils in the county. Corn occupies about 70 per cent of the land and alfalfa about 25 per cent. Most of the remainder is used for sweetclover or timothy and clover mixed. The average yield of corn over a period of years is about 48 bushels and that of alfalfa about 3¾ tons an acre.

Wabash silt loam, light-colored phase.—A few small bodies of soil mapped as the light-colored phase of Wabash silt loam occur in some of the narrower stream bottoms, chiefly in the southeastern quarter of Stanton County. Few of the strips exceed 40 rods in width and many are much narrower.

This light-colored soil consists of areas of Wabash silt loam in which the surface has been recently covered by light-colored silt washed from the loessial soils of the uplands and deposited in the stream bottoms. The deposit, which rarely exceeds 6 inches and in

most places is less than 4 inches in thickness, does not seem to affect the character of the underlying Wabash silt loam or to noticeably alter the crop adaptation or producing power of that soil. However, it entirely changes the surface color of the areas it covers, and for this reason such areas are differentiated on the accompanying map. The light-colored deposit in most places is rather limy.

Wabash very fine sandy loam.—Wabash very fine sandy loam resembles Wabash silt loam in all soil features except that it contains sufficient very fine sand to a depth of 8 or 10 inches to give the topsoil a very fine sandy loam texture. It is also similar to the silt loam in drainage and surface features. It occurs chiefly along Spring, Meskenthine, and Union Creeks and in the Elkhorn River bottoms northwest of Stanton. The soil is as productive and as well adapted to corn and alfalfa as Wabash silt loam, and practically all of it is used for these crops. The slightly higher sand content in the topsoil makes it a little easier to handle than Wabash silt loam, but this advantage is very slight and the two soils are regarded with equal favor by most farmers.

Wabash fine sandy loam.—Wabash fine sandy loam occupies a few areas in the Elkhorn River, Union Creek, and Butterfly Creek bottoms. The largest body, comprising about 640 acres, is along Butterfly Creek about 3 miles south of Stanton. The remaining bodies are few and small. This soil differs from Wabash silt loam in that it contains more sand in its topsoil, and from Wabash very fine sandy loam in that the sand in the topsoil is slightly coarser. The soil is used for the same crops in about the same acreage ratios as Wabash silt loam and has about the same productivity as that soil. The sand in the topsoil facilitates cultivation, and the soil can be tilled a little sooner after heavy rains than any of the other Wabash soils. However, this advantage is of minor importance because most of this soil is included in fields containing finer-textured soils, and it is not advisable to cultivate the fields until moisture conditions in all the soils are favorable.

Lamoure silty clay loam.—Lamoure silty clay loam occupies a few areas most of which are in the Elkhorn River bottom lands. One of the largest, comprising about 400 acres, is northeast of Pilger, and another area of similar size is 5 miles northwest of Stanton. The remaining bodies are small. Most of this soil occupies slightly lower positions than the other bottom-land soils, and the land is not quite so well drained. A few areas include spots in which alkali is present in sufficient quantities to injure tame-hay and grain crops, but most of the soil is sufficiently well drained and free from alkali for cultivated crops.

The topsoil, which averages about 20 inches thick, consists of almost black heavy silty clay loam containing an abundance of organic matter. The high clay content does not favor cultivation under so wide a range of moisture conditions as is possible on the more silty soils of the bottom lands. If plowed when wet clods are formed which require subsequent wetting and drying or freezing and thawing before favorable tilth is restored. It is almost impossible to cultivate the soil when its surface is extremely dry. However, under favorable moisture conditions the topsoil is easily kept in good tilth. The subsoil is gray, light grayish-brown, or mottled gray and and brown silty clay loam or clay which extends to an average depth

of 36 inches. It is generally slightly more compact than the topsoil but has no claypanlike features and is easily penetrated by moisture and roots. The material is very limy, the lime occurring in rounded soft and hard nodules, in irregular-shaped spots and splotches, and in finely divided form thoroughly mixed with the subsoil material.

This soil differs from Wabash silt loam in the heavier texture of its topsoil and in the lighter color and higher lime content of its subsoil. About 90 per cent of it is under cultivation; the remainder, comprising narrow forest-covered strips and the more poorly drained or more alkaline areas, is included in native pasture or hay land. Corn and alfalfa, in the proportion of about 8 acres of corn to 1 of alfalfa, occupy most of the cultivated land. Some oats are grown, but, owing to the abundance of moisture, this crop usually makes a rank vegetative growth and matures late. It also returns a rather low grain yield and is grown only as a step in the rotation between corn and alfalfa or as a nurse crop for alfalfa.

Corn and alfalfa yields are about the same as those obtained on Wabash silt loam, the average yield of corn being about 45 bushels and that of alfalfa about 3½ tons an acre. The farmers recognize little difference between Lamoure silty clay loam and Wabash silt loam in crop adaptation or producing power but prefer the Wabash soil because it is more easily handled.

Lamoure fine sandy loam.—Lamoure fine sandy loam is similar to Lamoure silty clay loam in all soil features except the texture of its topsoil which contains an abundance of fine and medium sand intermixed with the silt and clay. The soil also occurs in slightly more elevated positions than Lamoure silty clay loam, and all the land is well drained. The sand greatly facilitates tillage operations, and the soil can be cultivated under a much wider range of moisture conditions than Lamoure silty clay loam. The sand is not sufficiently abundant to reduce the stability or water-holding capacity of the topsoil.

Practically all of this soil is under cultivation. It is used for the same crops as the finer-textured Lamoure and Wabash soils and has about the same producing power. However, it occupies only a few areas, most of which are in the bottom lands along Elkhorn River, and is of minor agricultural importance in Stanton County. The largest body, comprising about 640 acres, is 4 miles northwest of Stanton.

Lamoure silt loam.—Lamoure silt loam occupies some of the narrower bottom-land strips throughout the county, chiefly along Butterfly Creek and its tributaries and along South Branch Humbug Creek.

Most of the Lamoure silt loam is subject to occasional overflow early in the spring, but the soil is seldom inundated during the growing season and practically all the land is under cultivation.

The topsoil averages about 20 inches thick and consists of almost black heavy silt loam containing an abundance of organic matter. It has a slightly higher clay content than the topsoil of Wabash silt loam but is not nearly so heavy as the corresponding layer in Lamoure silty clay loam. If plowed when wet it has a tendency to form clods, but these break down readily under subsequent tillage. The subsoil ranges in color from light gray to almost black. It consists of heavy silt loam or silty clay loam but is easily penetrated by roots and moisture. It is very limy, much of the lime, especially in the lighter-

colored subsoil, occurring in hard white concretions from one-eighth to one-fourth inch in diameter and in irregular-shaped spots and splotches.

This soil differs from Lamoure silty clay loam chiefly in the more silty and less compact character of its topsoil. Its subsoil also is a little more variable in color than the corresponding layer of the silty clay loam. However, these differences are of minor agricultural importance, and Lamoure silt loam is used for the same crops as Lamoure silty clay loam and produces about the same yields as that soil.

Lamoure silt loam, light-colored phase.—The light-colored phase of Lamoure silt loam bears the same relationship to the typical soil as the light-colored phase of Wabash silt loam does to Wabash silt loam. Where shown on the soil map the light-colored soil represents narrow strips of Lamoure silt loam which are covered to a depth of 4 or 6 inches by almost white limy silt washed down from the higher-lying loessial soils. Most of the strips occur in the south-central and southeastern parts of the county, in the bottom lands along the headwaters of Butterfly and East Fork Maple Creeks. This light-colored soil is not extensive and is of little agricultural importance in Stanton County. It is used for the same crops and has about the same producing power as typical Lamoure silt loam

Cass loamy sand.—Cass loamy sand is the most extensive sandy bottom-land soil in Stanton County, and practically all of it occurs in the Elkhorn River bottom lands. The largest area, which occurs south of the river in the western part of the county, comprises about 3 square miles, and several areas exceed 320 acres in size.

The almost black topsoil ranges from 8 to 12 inches in thickness. It is composed largely of medium or coarse sand and organic matter, the organic matter being responsible for the dark color. The subsoil is loose gray or grayish-brown sand which in most places becomes coarser with depth and in many places gravelly below a depth of 3 feet. It may or may not be limy.

Areas of this soil are gently undulating except locally where wind action has produced low ridges and shallow depressions similar to those in some areas of O'Neill loamy fine sand. Areas of Cass loamy sand lie from 2 to 4 feet above the normal stream level and the topsoil, except in local depressions, is well drained. However, the underlying water table during most years is within 6 or 8 feet of the surface of the ground and the subsoil, except in the driest seasons, is almost continually moist.

The topsoil, although composed chiefly of sand, is remarkably stable, owing largely to its high organic-matter content It is not subject to destructive wind erosion except in a few small spots where the content of organic matter is unusually low.

About 80 per cent of the land is under cultivation; the remainder, including the more poorly drained areas and those covered with forest growth, is used for native pasture or hay land.

Cass loamy sand is one of the strongest and most productive corn and alfalfa soils in the county. Yields of these crops are a trifle lower than on the Lamoure and Wabash soils but are higher than on any of the upland or terrace soils. The average yield of corn is about 45 bushels and that of alfalfa about 3½ tons an acre. Small grains grow well, but as on all bottom-land soils the abundant moisture

supply causes these crops to produce excessive vegetative growth and low grain yields in most places.

Cass fine sandy loam.—Cass fine sandy loam occupies many small areas in the Elkhorn River bottom lands and a few areas along Spring Creek and other small streams in the northwestern part of the county. The largest area, comprising about 640 acres, is along Spring Creek.

This soil has developed in the same manner as Cass loamy sand and differs from that soil only in that it is composed of a slightly finer grade of sand. The topsoil is very dark grayish-brown or almost black friable fine sandy loam from 8 to 12 inches thick. This layer rests on loose gray or grayish-brown fine or medium sand which is usually mixed with more or less gravel below a depth of 3 feet. Both topsoil and subsoil are faintly limy in most places.

This soil lies only a few feet above the normal level of the streams, but it is well drained and practically all under cultivation. Corn and alfalfa are the principal crops, although small fields of sweetclover or clover and timothy mixed occur on some farms. Corn and alfalfa return higher yields on this soil than on any of the upland and terrace soils and almost as high as on the finer-textured Wabash and Lamoure soils of the bottom lands Cass fine sandy loam is regarded by most farmers as slightly more productive than Cass loamy sand. Its surface is a little more even than that of the loamy sand, and the soil contains no spots which have been subjected to destructive wind erosion.

Cass very fine sandy loam.—The greater part of Cass very fine sandy loam occurs as small bodies in the Elkhorn River bottom lands, and it is locally developed along Spring and Union Creeks, in the northwestern and southwestern parts of the county, respectively.

This soil is very similar to Cass fine sandy loam except that its topsoil is finer in texture, most of the sand in this layer being of the very fine grades and the content of silt being large. The topsoil is well supplied with organic matter and is very dark. The subsoil, beginning at an average depth of 10 inches, is gray or grayish-brown loose sand similar to that in other Cass soils of the county.

The surface of this soil is nearly level and generally lies a few inches below that of the surrounding areas. The underlying water table is nearly everywhere within a depth of 6 feet and in wet seasons rises sufficiently to produce small patches of marshy land. Only about 45 per cent of this soil is sufficiently well drained for cultivated crops and is used chiefly for corn. Where adequate drainage is assured corn yields are as high as on any of the other Cass soils in the county and are greater than on any of the upland or terrace soils. Alfalfa yields also are high during the first two or three seasons, but the exceptionally wet conditions prevailing in the subsoil seem to be unfavorable for alfalfa roots, and yields of this crop decline in subsequent seasons. The poorly drained areas of the soil support a luxuriant growth of water-loving grasses which are used for hay and pasture.

Sarpy sand.—Sarpy sand occurs as small bodies and narrow strips in the Elkhorn River bottom lands, most of the soil lying adjacent to the river channel.

This soil is developed from recently deposited river sands which have not accumulated much organic matter. In many places it

resembles river wash but is more stable and is not so greatly influenced by each slight rise of the stream.

The topsoil consists of gray or grayish-brown incoherent fine or medium sand, from 8 to 10 inches thick. This layer is underlain to a depth exceeding 5 feet by material of similar consistence though slightly coarser in texture and lighter in color. The 1 or 2 inch surface layer of the topsoil generally contains some organic matter and is a little darker than the rest of the soil. However, the organic matter is not sufficient to prevent soil drifting when the natural vegetation is destroyed, and it rapidly disappears if the soil is overgrazed or brought under cultivation. The soil is not limy.

The surface of this soil is about 4 feet above the normal level of the river and although subject to occasional overflow is not covered with water except during unusually high stages of the stream. The subsoil is moist but not poorly drained.

About 20 per cent of the Sarpy sand is used for corn, about 10 per cent for alfalfa, and most of the remainder supports a scattered tree growth and is included in pasture land. Although the organic-matter content of the soil is very low, the moisture supply is abundant and fair yields of corn are obtained on the cultivated areas in most years. Alfalfa seems to do almost as well as on the dark-colored Cass soils, probably because this crop does not depend entirely on organic matter for its nitrogen supply. The average yield of corn over a period of years on Sarpy sand is about 20 bushels an acre and that of alfalfa about 3 tons of hay.

River wash.—River wash, although not a true soil, has been formed from recently deposited stream sediments and is included in the group of bottom-land soils It consists of sand bars, islands, and sand flats adjacent to or within the channel of Elkhorn River, and only the larger areas are shown on the soil map. The material differs from Sarpy sand in its less stable character and the almost total absence of organic matter. River wash lies only a few inches above the normal level of the stream and undergoes change with each slight rise of the stream. Even during normal flow small areas are shifted about, added to, or carried away by the varying current. The material represents the first stages of alluvial soil formation and with the general accumulation of organic matter will develop into Sarpy sand. Most of it supports a dense growth of seedling willow trees and is either used for pasture or is regarded as waste land.

SOILS AND THEIR INTERPRETATION

The soils of Stanton County have developed under climatic conditions which have favored the annual growth and decay of a luxuriant grass vegetation. All the soils, therefore, except those in the more eroded sections or on the more recently exposed or deposited sand, have received more or less black well-decomposed organic material from decaying grass roots and have dark-colored topsoils. The intensity of darkness and the depth to which the dark color has penetrated in a particular soil depends on topographic and drainage conditions and on the length of time the soil has been exposed to undisturbed weathering.

Those soils which have been formed under good but not excessive drainage, from parent materials most easily affected by weathering,

and which have lain in their present positions undisturbed by erosion for the longest periods have accumulated the largest amounts of organic matter and have the thickest and darkest topsoils. They have also developed well-defined layers, or horizons, lying parallel to the surface of the ground, occurring in a definite order or succession, and differing from one another in one or more easily discernible features, such as color, lime content, structure, and compaction. The characteristics of these soils have been produced by the fundamental soil-forming processes including leaching, oxidation, aeration, and the accumulation of organic matter, acting under the most favorable conditions for soil development afforded by the region. The soils, therefore, have received the full impress of their climatic and vegetative environment. They have reached a stage of development beyond which they can not attain under the existing climate and vegetation and may be regarded as fully developed.

Those soils which have been formed under poor drainage, excessive drainage, or from parent materials extremely resistant to weathering, have developed under the same climatic environment as the fully developed soils and have some of the features common to those soils. However, the fundamental soil-forming processes have acted under less favorable conditions for deep soil weathering and the accumulation of organic matter than they have in the fully developed soils. One or more of the soil horizons may be absent or poorly defined. The soils which have not received the full impress of their climatic and vegetative environment are regarded as imperfectly developed. There are, therefore, in Stanton County, two broad groups of soils, fully developed soils and imperfectly developed soils.

The fully developed soils are the least extensive and are confined largely to small uneroded remnants of the old constructional plain, which occur chiefly in the southwestern, east-central, and northeastern parts of the county, and to loessial terraces along the larger streams. Numerous small developments also occur in the more nearly level parts of the eroded loessial uplands, but the area occupied by fully developed soils in Stanton County probably does not exceed 10 per cent of the total area of the county.

The following is a description of a fully developed soil observed on an uneroded remnant of the old constructional plain in the southwestern part of the county. The profile described is that of the deep phase of Moody silt loam which, except for local variations in its lime content, is rather uniform throughout the area of its occurrence in Stanton County.

A_1, from 0 to 2 inches, dark grayish-brown single-grained silt loam. A_2, from 2 to 4 inches, almost black laminated silt loam in which the laminæ are very thin and fragile. A_3, from 4 to 18 inches, very dark grayish-brown granular silt loam. The granules are irregularly angular in shape and range from one-sixteenth to about one-fourth inch in diameter. The larger ones are in the lower part of the layer. B_1, from 18 to 25 inches, grayish-brown coarsely granular or cloddy silty clay loam. This is the layer of maximum density, but the compaction is barely noticeable and the material when dropped breaks into a heterogeneous mass of irregularly shaped granules and small lumps, which are easily crushed between the finger and thumb. The material is less compact than that of the corresponding layer in the Hastings soil of

central Nebraska. B_2, from 25 to 48 inches, light grayish-brown friable silt. The material is faintly columnar, the columns being from 4 to 6 inches in diameter and ranging in length from 10 to 14 inches. Their outlines are very indistinct, and they contain horizontal seams and cracks at irregular intervals. A lump of the material from this layer breaks easily into soft irregular-shaped clods of various sizes. The layer is transitional in most of its characteristics between the ones above and the ones below it. B_3, from 48 to 60 inches, very light grayish-brown structureless silt. This layer, commonly known as the lime zone, is the one of maximum carbonate enrichment. The lime occurs as hard, rounded concretions from one-eighth to one-fourth inch in diameter and in finely divided form mixed with the silt. C_1, the parent loess, consisting of grayish-yellow or buff-colored floury silt which is highly calcareous, but in which the lime occurs chiefly in finely divided form and uniformly distributed throughout the loessial deposit.

The color and texture transitions between the different layers are gradual. The structure transition is also gradual, except on either side of the A_2 layer, where it is rather abrupt. The upper limit of lime concentration is sharply defined but the lower one is indefinite, and the lime zone grades almost imperceptibly into the parent loess.

The upper soil layers are rich in organic matter, which accounts for their dark color. This material is most abundant in the A_1 and A_2 layers. In the A_2 layer, however, it is more thoroughly decomposed and mixed with the mineral soil particles, making that layer the darkest. In the A_3 layer decomposition of the plant remains is complete, but the organic matter is not sufficiently abundant to thoroughly permeate the soil material and occurs largely as a film or coating on the surfaces of the granules. The film decreases in thickness with depth, and below 40 or 50 inches the soil material is practically devoid of organic matter.

The slight compaction in the B_1 layer is caused by the downward translocation of the finer-textured topsoil particles through the agency of percolating waters This agency, transporting carbonates, has also probably caused the high lime content of the B_2 layer in the particular profile to which this description applies.

It is advisable at this point to mention that a zone of lime enrichment is not present in all places in the soils occupying remnants of the old constructional plain in Stanton County. A well-developed lime zone is the rule, but in many places lime does not occur in sufficient quantities to noticeably react with acid to depths below 10 feet. Especially is this true on some of the remnants in the extreme southern part of the county.

The soil of the profile described contains a few casts and borings, most of which occur in the A_3 and B_1 layers. The casts are spherical, about one-sixteenth inch in diameter, and are usually grouped in rounded clusters including from 8 to 20 individuals. The borings are crooked rodlike forms about three-eighths inch in diameter and of various lengths. They appear to be fillings in old root, worm, or insect cavities. Most of the casts and borings are lighter or darker than the general color of the layer in which they occur, depending on whether the material composing them was derived from underlying or overlying layers.

Aside from textural differences occurring in the topsoils, which have been explained elsewhere in this report, all the fully developed soils in the county, including the Marshall, Hall, and Waukesha soils, are similar in their major characteristics to the soil described. In fact, the deep phase of Moody silt loam differs from the Hall soils chiefly in topographic position. It occurs in the uplands, whereas the Hall soils are on terraces or second bottoms along streams.

The Marshall and Waukesha soils differ from the deep phase of Moody silt loam chiefly in that they have no zone of lime enrichment in the solum. In fact they rarely contain sufficient lime to react with acid at any point within a depth of 8 feet. The Marshall soils occupy upland positions, and the Waukesha soils are developed on the terraces.

The absence of a lime zone throughout parts of the deep phase of Moody silt loam and in the Marshall and Waukesha soils is not clearly understood. The county is between two great soil regions in the United States, the one on the east, in which the normal precipitation is sufficient to leach the readily soluble salts from the entire solum in all fully developed soils, and the one on the west in which the precipitation is only sufficient to transfer the carbonates from an upper to a lower layer, producing a zone of pronounced lime enrichment in the lower part of the solum.

The irregular occurrence of the lime zone in the fully developed soils of Stanton County is probably due in part to the character of the precipitation in this area, which is transitional between regions of light and heavy rainfall, in part to local differences in the water permeability of the loessial material from which the soils have developed, and partly to differences in the microrelief.

The greater part of Stanton County has a youthful topography and is strongly rolling or moderately hilly; large areas are covered by sand composed chiefly of quartz particles; part of the county is covered by recently deposited alluvial sediments; and small areas are poorly drained. None of these conditions is favorable to the formation of fully developed soils, and the greater part of the soils belong to the imperfectly developed group. The factors most instrumental in preventing full development in the soils of this group have been insufficient time and the resistant character of the parent materials to weathering, poor drainage, and erosion. All the soils of the imperfectly developed group, however, have made some progress in development, the degree depending on the relative resistance of the factors mentioned.

For convenience in description, the soils of the imperfectly developed group may be separated into subgroups on the basis of the factor or group of factors chiefly instrumental in preventing full development.

In the first subgroup may be placed those soils in which full development has been prevented chiefly by water erosion. This subgroup comprises all Moody soils not included in the fully developed group and also the Knox soils. These soils have developed from silty loessial material under more or less erosion.

In the Moody soils erosion has not been so severe as to entirely prevent the accumulation of organic matter, and the topsoils in most places are very dark. However, they are only about half as thick as in soils of the well-developed group. They have not developed such pronounced laminated and granular layers as the well-developed soils,

being either structureless or somewhat mealy throughout. Owing to the uneven relief, much of the precipitation falling on the land has been carried away in surface run-off and less of it has percolated into the ground than in areas occupied by the fully developed soils. The easily soluble salts, therefore, have been carried down comparatively short distances. A zone of maximum lime enrichment generally begins at a depth ranging from 18 to 24 inches beneath the surface of the ground and continues to about 3 feet. The material in this zone is light-gray friable silt similar to that in the corresponding zone of the deep phase of Moody silt loam, except that its lime is more abundant, especially in the concretionary form. In most places there are from 1 to 3 rounded lime concretions from one-eighth to one-fourth inch in diameter in each cubic inch of the zone. Beneath the zone of maximum lime enrichment is yellowish-gray floury silt, resembling that under the Hall soils and the deep phase of Moody silt loam.

In the Knox soils water erosion has been very severe. The soils occupy steep slopes, sharp ridge crests, or rough and broken land areas. The rapid surface run-off has removed the weathered topsoil material almost as fast as it has formed and has not allowed leaching of the carbonates from the underlying layers faster than new material has been exposed at the surface. Constant erosion has prevented the accumulation of organic matter in quantities sufficient to more than slightly darken the topsoils, which in most places are grayish brown, and rest directly on yellowish-gray parent loess. The soils have no lime zone. In many places erosion has entirely removed all organic matter, exposing the highly calcareous loessial formation.

The second subgroup of imperfectly developed soils includes those soils in which full development has been prevented chiefly by the resistance to weathering of the parent geolgic formations. It includes the Dickinson, Shelby, O'Neill, and Valentine soils, all of which have developed from material composed of sand or gravel. This material, in addition to its resistance to weathering, is in some places unstable and subject to considerable wind erosion.

The Dickinson, O'Neill, and Valentine soils are composed almost entirely of gray fine or medium sand. The Shelby soils have weathered from glacial deposits and, in addition to sand, contain considerable gravel and some silt and clay. None of the soils of this subgroup has developed definite zones or layers of true soil character, and all of them have been thoroughly leached of their carbonates.

The Dickinson, O'Neill, and Shelby soils have been least affected by the wind and have accumulated considerable organic matter in their surface layers, the topsoils being very dark and from 8 to 15 inches thick The organic constituent is in few places sufficient to prevent the soils from drifting when the native sod is destroyed, and only the Shelby loam soil, which contains the largest amount of fine mineral particles, is stable under cultivation. The Valentine soils have been subjected to considerable wind erosion, which has prevented the accumulation of much organic matter, their topsoils being grayish brown and comparatively thin. The subsoils in all except the Shelby soils consist of gray incoherent sand.

The O'Neill soils occupy terrace or second-bottom positions chiefly in the Elkhorn River Valley. The remaining soils of the subgroup are in the sandy uplands south of Elkhorn River and in the northwestern part of the county.

Dune sand may also be included with those soils in which full development has been prevented largely by the resistant character of the parent materials to weathering. Dune sand, however, is simply incoherent gray shifting sand which has hardly begun the cycle of development leading toward a fully developed soil. It occupies upland positions chiefly south of the Elkhorn River Valley and in most places has been whipped by the wind into strongly rolling or hilly areas. Most of the dune sand is sparsely covered with grass and at the present time is fairly stable. The material, however, has accumulated practically no organic matter.

The third subgroup of imperfectly developed soils includes those in which full development has been prevented almost entirely by poor drainage, and in Stanton County it is represented by only one soil type, Fillmore silt loam. This soil occurs only in a few shallow basinlike depressions scattered throughout the more nearly level parts of the loessial uplands. The basins rarely occupy more than a few square rods, and their combined area does not exceed 130 acres. Surface drainage is not established, and in most of the basins water accumulates and remains on the ground until removed by seepage or evaporation, which in some of the basins requires several weeks. The basins are alternately wet and dry, and conditions have been favorable for rapid vegetative growth and decay.

The topsoil of Fillmore silt loam is from 6 to 8 inches thick and in most of the depressions consists of dark-colored structureless or faintly granular silt loam. It invariably contains more or less light-colored floury silt which has been leached of its organic matter by the excessive moisture. This silt, although scarcely noticeable in most places, is rather pronounced in some of the more poorly drained depressions and locally becomes so abundant that it forms a light-gray floury and, in most places, laminated layer from 1 to 3 inches thick in the lower part of the topsoil. Beneath the topsoil is a black, dense, and practically structureless claypanlike layer, from 18 to 25 inches thick, which is almost impenetrable to percolating waters. Its dark color and extreme density are undoubtedly due to the addition of organic matter and fine mineral particles leached from the topsoil. Below a depth of about 48 inches the black clay gives way abruptly to light-gray floury silt, rich in carbonates which are chiefly in the form of small hard lime concretions. The carbonates decrease with depth and in the unweathered loessial material, lying from 8 to 10 feet beneath the surface of the ground, are rarely sufficiently abundant to effervesce when acid is applied.

Fillmore silt loam has developed under more moisture than any other upland soil in the county, but the moisture has not been able to penetrate the claypan in sufficient quantities to leach the carbonates from the layer beneath, as is indicated by the presence of a zone of carbonate enrichment in this soil.

The soils of the fourth subgroup, which includes the Lamoure, Wabash, Cass, and Sarpy soils, occupy flood-plain positions along streams, and they owe their imperfect development both to poor drainage and to the recent origin of the sediments from which they are weathering.

The moist conditions prevailing in the flood plains have especially favored vegetative growth and decay, and all the soils except the most recent alluvial deposits have dark-colored topsoils. The parent

materials are so recently deposited that they have not developed into soils having definite zones or layers. Oxidation and aeration, in most places, have been greatly retarded by excessive moisture, and the topsoils rest on the unweathered or only slightly weathered parent alluvial sediments. The character of the sediments, therefore, is the controlling factor in determining the character of the soils.

The Wabash and Lamoure soils have weathered from fine-textured sediments, largely silts and clays. They have friable almost black topsoils from 14 to 18 inches thick. The subsoils are moderately compact, due to a rather high clay content. The Wabash subsoils are similar to, or only slightly darker in color than, the surface soils and are very low in lime. In the Lamoure soils the subsoils are light grayish brown, dark grayish brown, or mottled gray and white, and they contain an abundance of lime, both in concretionary and disseminated form. Both the Lamoure and Wabash soils have friable and more or less granular topsoils, but their subsoils are practically structureless.

The coarser-textured flood-plain sediments of Stanton County consist largely of sands and gravel and have weathered into the Cass and Sarpy soils. The Cass soils have accumulated considerable organic matter and have very dark grayish-brown or almost black topsoils from 6 to 12 inches thick. The Sarpy soils have weathered from the more recently deposited sands and gravels, and are poorly supplied with organic matter. Their surface soils are rather thin and are light in color. The subsoils of both the Cass and Sarpy soils are composed largely of loose gray sand and gravel, the gravel generally becoming more abundant with depth. The soils may or may not contain lime, but where carbonates are present they occur in finely divided form and are evenly distributed throughout the soil.

Associated with the flood-plain soils is river wash, a miscellaneous material occupying small islands, bars, and flats within and adjacent to the Elkhorn River Valley. It is composed of loose heterogeneous mixtures of gray sand and gravel of such recent deposition that they have not been noticeably affected by the soil-forming processes.

SUMMARY

Stanton County is in northeastern Nebraska. It is rectangular in shape and comprises 428 square miles. The county was originally covered with a smooth plainlike mantle of loess which has been considerably modified by erosion and in places entirely removed, exposing the underlying sand. Small flat-topped remnants of the old constructional plain occur locally throughout the uplands, but the greater part of the county consists of a sharply rolling or hilly loess-covered plain modified by undulating or hummocky sandy areas and intersected by numerous strips of nearly level alluvial lands.

The average elevation of the county is about 1,500 feet above sea level, and the total range in elevation probably does not exceed 200 feet. There is a general downward slope to the east. The county is drained by Elkhorn River and its tributaries.

Stanton County was established in 1862; the first permanent settlement was made in 1865; and the county was organized in 1867. According to preliminary census reports for 1930 the population is 7,809. Stanton, the county seat and largest town, has 1,479 inhabitants.

The climate is favorable for grain and hay production and the raising of livestock. The average frost-free season is 150 days.

Corn and oats are the most important crops, corn occupying about 19 per cent of the total area of the county in average years. These crops are followed in acreage by wild hay, alfalfa, and winter wheat, ranking in about the order named. Most of the crops are fed to cattle and hogs, which are the chief sources of income.

The farm improvements are good, and most of the farms are equipped with modern labor-saving machinery.

The soils of the county are naturally productive. They have developed under a prairie-grass vegetation, and except where severely eroded or composed of unstable sands have dark-colored topsoils due to accumulations of black well-decomposed organic matter derived from decayed grass roots.

On the basis of their most pronounced characteristics and agricultural values, the soils may be divided into four broad groups, namely, well-drained upland and terrace soils, excessively drained upland and terrace soils, poorly drained upland soils, and bottom-land soils. The well-drained upland and terrace soils occupy about 60 per cent of the county. They occur throughout all parts of the well-drained loess-covered uplands wherever erosion is not severe and include all but one of the terrace soils. The Moody, Marshall, Hall, and Waukesha soils belong to this group.

Moody silt loam is the most extensive soil in the county. It occupies the strongly rolling parts of the uplands and has been subjected to considerable erosion. Its topsoil is dark but is only about half as thick as that of Moody silt loam, deep phase, and the typical soil is a little less productive than the deep phase. It is, however, well adapted to corn, oats, and alfalfa, and its crop adaptation, together with its large extent, makes it the most important general-farming soil in the county.

The deep phases of Moody silt loam and Marshall fine sandy loam occur in nearly level or gently sloping upland positions. They have dark-colored topsoils 18 or 20 inches thick and are the most productive upland soils in the region. However, these soils are comparatively inextensive and are of only local importance in Stanton County.

The Waukesha and Hall soils occupy well-drained terrace positions. They are similar in general characteristics to the more nearly level loessial upland soils, but they receive surface run-off from higher-lying areas and have a more favorable moisture supply than those soils. They are adapted to all crops common to the region and give slightly higher yields than the best upland soils in the county. The subsoils in the Hall soils are rich in lime; those in the Waukesha are low in this constituent.

The excessively drained upland and terrace soil group occupies about 23 per cent of the county. It includes the Knox, Shelby, Dickinson, Valentine, and O'Neill soils. All except the Knox soils are composed largely of sands, and none of them is able to retain for crop use as much of the moisture which falls on it as is retained by the well-drained upland and terrace soils.

The Knox soils occupy the most severely eroded parts of the loessial uplands, and rapid run-off has practically prevented the accumulation of organic matter. The topsoils are light in color and

rather thin. Owing to the relief, the land is unsuited to cultivation, and most of the areas occupied by these soils are used for pasture.

The Shelby and Dickinson soils have accumulated considerable organic matter and have dark-colored topsoils. Their subsoils are composed of gray sand or grayish-brown mixtures of sand and gravel and are rather droughty. These soils occupy upland positions. The Dickinson soils as a rule are poorly adapted to small-grain crops but produce favorable yields of corn in wet seasons. Shelby loam is used for all crops common to the region.

O'Neill loamy fine sand is the only sandy terrace soil in Stanton County. It is rather droughty and is used chiefly for corn. Yields are low except in years of abundant precipitation.

The Valentine soils differ from the Dickinson soils in that they are not so well supplied with organic matter and are less stable. They are sandy throughout and practically all the area occupied by them is used for pasture or hay land.

The poorly drained upland soil, Fillmore silt loam, occupies a few small basinlike depressions locally known as buffalo wallows, most of which are within areas of the deep phase of Moody silt loam. This soil is characterized by a rather thin dark-colored topsoil and a very dense and claypanlike upper subsoil layer. The land is too poorly drained for cultivation.

The bottom-land group of soils occupies about 17 per cent of the county. This group includes the Wabash, Lamoure, Cass, and Sarpy soils, all of which have developed from recently deposited stream sediments. The Wabash and Lamoure soils are from the finer-textured sediments and are silty throughout, and the Cass and Sarpy soils are from sandy sediments. All the bottom-land soils except the Sarpy have deep dark-colored topsoils well supplied with organic matter. The Wabash, Lamoure, and Cass soils are the most productive corn and alfalfa soils in the county but are not well adapted to small-grain crops on account of their high moisture supply. The Sarpy soil is composed almost entirely of loose gray sand and is of little value except for grazing land.

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[PUBLIC RESOLUTION—No. 9]

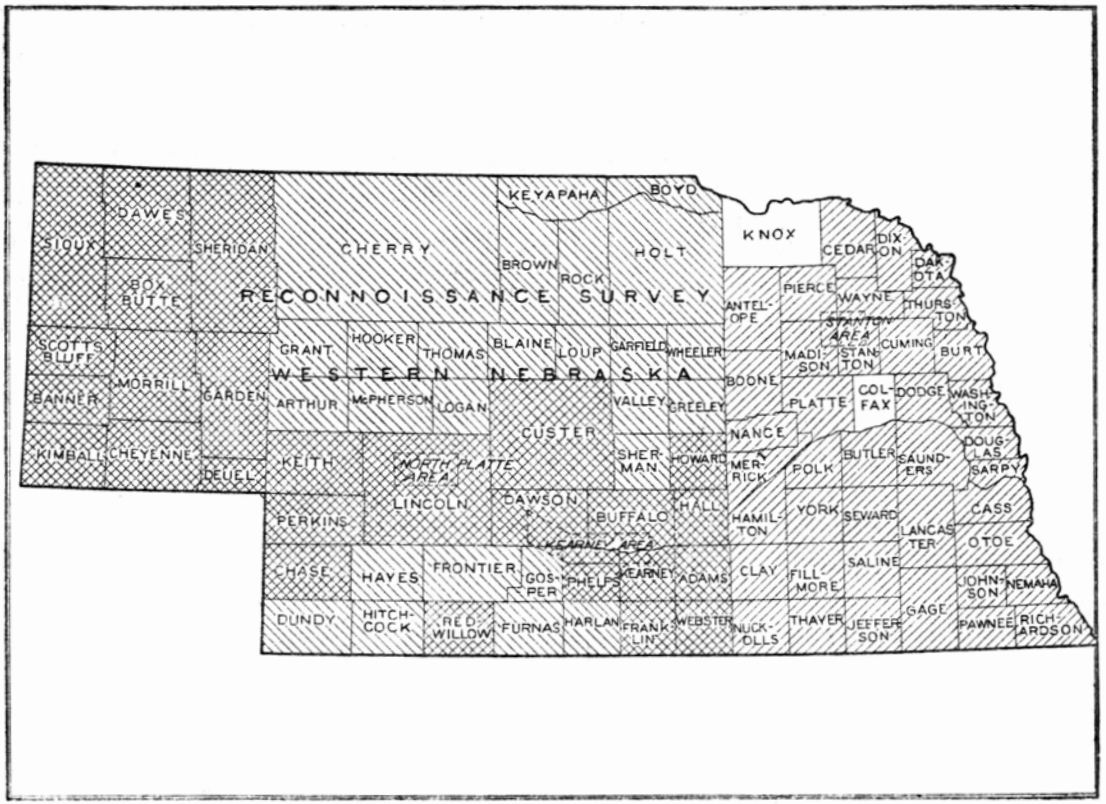
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Nebraska, shown by shading

U. S. GOVERNMENT PRINTING OFFICE: 1932

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(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

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