

SOIL SURVEY OF DAWSON COUNTY, NEBRASKA

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DESCRIPTION OF THE AREA

Dawson County is in south-central Nebraska, in the third tier of counties north of the Nebraska-Kansas line. Its northern edge is 27 miles south of the geographical center of the State. The county is rectangular in outline, 42 miles long and 24 miles wide, with the longer dimension extending east and west. Its total area is 985 square miles, or 630,400 acres.

Dawson County topographically is part of a broad plain upon which minor relief has been produced by stream erosion and wind action. The upland part of the county has been dissected throughout, though the dissection is not complete. Small areas of the original smooth-surfaced plain lie scattered over it between the valleys and ravines by which it is dissected.¹

The upland is divided into two parts, a northern and a southern, by the Platte River Valley, or Platte Plain.

This plain extends as a broad lowland belt diagonally across the county from west to east and comprises about 50 per cent of its total area. The general surface of this lowland belt is that of a flat to gently undulating plain, bounded on each side by high upland escarpments and modified along the western county boundary by a small area of rolling to hummocky relief, where a spur of the sand-hill region extends over the county line. This lowland belt is followed near its southern edge by the broad channel of the Platte River and includes the alluvial lands—i. e., the terraces and flood plains of that stream.

The terraces or second bottoms, which occupy about 70 per cent of the Platte Plain, occur on both sides of the Platte River as continuous strips varying in width from 1 to 8 miles between the river flood plains and the edge of the upland escarpments. The largest development is on the north side of the stream and occurs at several distinct levels, the highest lying about 120 feet below the adjoining uplands and from 80 to 100 feet above the present flood plains. It has been largely removed or modified by erosion, and only isolated flats, knolls, and gently undulating divides remain to mark its former level. The largest remnants lie adjacent to the uplands west of Walnut Grove Cemetery and in the extreme northwestern part of the county.

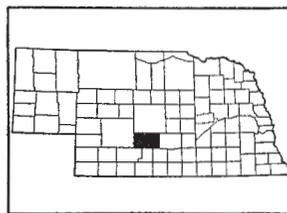


FIG. 11.—Sketch map showing location of the Dawson County area, Nebraska

¹ Soil Resources of Nebraska, by G. E. Condra.

The remaining terrace levels on the north side of the river vary in width from 1 to 3 miles. The slopes between the different levels are usually rather abrupt in the western part of the county and range in height from 15 to 35 feet. In the eastern part, however, the higher benches have been entirely removed and the slopes between the lower terrace levels are so gradual as to be almost imperceptible, the land sloping gradually from the flood plains to the edge of the upland, where it lies from 40 to 60 feet above the Platte River. The transition from the terraces to the flood plains is usually marked by a gradual slope, while that to the uplands is steep to blufflike.

Along the western county line, as previously mentioned, the surface of this terrace development has been buried to depths of 5 to 30 feet by wind-blown sand, producing a hummocky to rolling relief. This sandy material represents a spur of the vast sand-hill region of Nebraska and covers approximately 9 square miles of the terrace lands in Dawson County.

The terraces on the south side of the river are much narrower, ranging in width from 2 to about 3 miles. They here form a long, gradual slope between the flood plains and the base of the upland escarpment. The surface, which is flat to very gently undulating, lies about 150 feet below the adjoining uplands and from 20 to 50 feet above the flood plains. The slopes, both to the first bottoms and uplands, are rather abrupt, the latter being in many places precipitous.

The flood plains, or first bottoms, occupy the lowest and most poorly drained parts of the county. They appear as broken strips varying in width from one-eighth mile to about 4 miles. In the southeastern part of the county on the north side of the Platte River, the larger areas are often separated from the main channel by narrow strips of higher terrace land and exist as poorly drained depressions. Elsewhere the areas lie next the stream channel. The surface is prevailingly flat, though modified in places by old cut-offs and meanders of the Platte River and by drainage channels issuing from the uplands. In a few places wind-blown sand from the river channel has produced low, flat-topped knolls and ridges, seldom exceeding 2 feet in height.

The general slope of the county is to the southeast. The lowest altitude is in the southeastern corner, where the Platte River crosses the boundary, approximately 2,260 feet above sea level. The highest elevation, according to the United States Geological Survey, is 2,940 feet along the western county line in section 18, T. 10 N., R. 25 W. This gives a range in elevation of 680 feet. The most abrupt relief occurs between the Platte Plain and the uplands on the west side of West Smith Canyon. The average altitude of the southwestern upland division is about 2,700 feet and that of the northeastern division 2,650 feet above sea level. The elevation of Gothenburg is 2,561, Willow Island 2,522, Cozad 2,486, Darr 2,449, Lexington 2,389, Josselyn 2,347, Overton 2,320, Eddyville 2,448, Sumner 2,375, and Farnam 2,729 feet above sea level.

The drainage of Dawson County is effected through the Platte River, Plum Creek, Buffalo Creek, Elm Creek, Wood River, and minor tributaries to the South Loup River. All the drainage, with the exception of the South Loup tributaries, belongs to the Platte River system, though little enters the trunk stream within the county.

Dawson County was organized in 1871 by an act of the State Legislature. The first permanent settlement was made in April, 1872, by a colony from Philadelphia which settled in the vicinity of Plum Creek (now Lexington). Later settlers came chiefly from Iowa, Missouri, Illinois, and other eastern States. According to the 1920 census, the population of the county is 16,004, all classed as rural, as there are no cities having 2,500 or more inhabitants. The density is 16.2 persons per square mile. Settlement is thickest in the Platte Valley, along Wood River, and upon the more nearly level uplands in the southwestern part of the county. The rougher areas, both in the northeastern and southwestern upland divisions, are sparsely settled.

Lexington, the county seat and principal town, lies in the south-central part. According to the 1920 census, it has a population of 2,327. Gothenburg, with 1,754 inhabitants, is situated in the northwestern part, and Cozad, with a population of 1,293, in the west-central part. Overton lies in the southeastern part of the county. It has 515 inhabitants. Sumner and Eddyville, in the northeastern part, have 345 and 227 inhabitants, respectively. Farnam, in the extreme southwestern corner, has a population of 408. Willow Island, Darr, and Josselyn are small villages in the Platte River Valley in the west-central, south-central, and southeastern parts of the county, respectively. These towns and villages are important local distributing centers and markets for farm implements, supplies, and produce.

The transportation facilities of Dawson County are good. The main line of the Union Pacific Railroad follows the Platte Valley across the county. A branch of this road from Kearney to Stapleton follows the Wood River Valley across the northeastern corner of the area. The extreme southwestern corner is traversed by a branch line of the Chicago, Burlington & Quincy Railroad between Holdrege, Nebr., and Sterling, Colo. These lines give good connections with Omaha, Lincoln, and Denver.

The public roads in the Platte Valley and less eroded parts of the uplands, except the Lincoln Highway, which extends along or near the Union Pacific Railroad diagonally across the area, follow section lines. The roads in the more eroded uplands throughout the northern, northeastern, and southwestern parts of the county follow the valleys, canyons, and divides. All these roads, except the Lincoln Highway, which has been surfaced with gravel, are of ordinary earth construction. The more important roads are dragged as soon after each rain as the ground allows and are kept in good repair. Little attention is given the minor roads, beyond grading them when necessary. There are five bridges across the Platte River within the county and concrete culverts across the smaller drainage ways are quite common, even on the minor roads. Telephones and rural delivery routes reach most sections of the county.

The surplus products, consisting of grain, hay, sugar beets, cattle, and hogs, are usually marketed outside the county. The wheat, alfalfa, and livestock are shipped to Omaha. Sugar beets are shipped to the refinery in Grand Island. Most of the grain passes through the local elevators, where it may be sold at once or stored until the price is satisfactory. There are flour mills at Gothenburg, Lex-

ington, and Sumner which handle a part of the wheat, and a large alfalfa mill at Cozad which supplies the surrounding country with a ready market for that product.

CLIMATE

The climate of Dawson County is marked by rather wide seasonal variations. The winters are fairly long and the summers rather warm. The spring usually is cool, with considerable precipitation. The fall season is long, with moderate temperatures and occasional periods of rainy weather. The rainfall is moderate, the humidity relatively low, and the rate of evaporation rather high. There is not sufficient variation in surface characteristics to cause any appreciable difference in climate within the county.

The table below gives the normal monthly, seasonal, and annual temperature and precipitation at Lexington. This table is compiled from the records of the Weather Bureau station, covering a period of 31 years.

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

[Elevation, 2,385 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1912)	Total amount for the wettest year (1915)
	°F.	°F.	°F.	Inches	Inches	Inches
December	27.5	72	-26	0.80	0.30	0.60
January	24.7	70	-33	.51	.50	.50
February	26.4	79	-39	.89	.53	1.86
Winter	26.2	79	-39	2.20	1.33	2.96
March	37.0	96	-14	1.03	1.40	2.34
April	49.6	100	3	2.44	1.14	3.93
May	59.1	98	17	3.00	.68	5.28
Spring	48.6	100	-14	6.41	3.22	11.55
June	68.6	108	28	3.76	1.41	12.26
July	73.4	112	37	2.97	.90	5.24
August	72.6	113	36	3.05	1.18	4.93
Summer	71.5	113	28	9.78	3.49	22.43
September	64.0	102	21	1.92	1.42	1.72
October	52.0	95	2	1.66	.97	.90
November	37.9	85	-11	.61	.91	.46
Fall	51.3	102	-11	4.19	3.30	3.08
Year	49.4	113	-39	22.64	11.34	40.02

The mean annual precipitation is 22.64 inches. The precipitation is heaviest during May, June, July, and August. The mean annual precipitation for November, December, January, and February is less than 1 inch per month. The greater part of the rainfall in summer occurs as local thunderstorms. The rainfall in May and June is usually well distributed and periods of drought are very uncommon. In July the distribution is less favorable and during August and

September long periods of drought sometimes cause reduced yields of grain. Total crop failures, however, are rare, even in the poorer sections of the county, as most of the soils are retentive of moisture when properly managed. The precipitation in the wettest year on record (1915) was 40.02 inches, of which 22.78 inches fell during May, June, and July. In the driest year (1912) the precipitation was only 11.34 inches. The average annual snowfall is 29.7 inches.

The mean annual temperature is 49.4° F. The mean for the summer months is 71.5° F. July is the warmest month, with a mean of 73.4° F., and January the coldest, with a mean of 24.7° F. The average date of the last killing frost in the spring is May 8 and that of first in the fall September 26. This gives an average growing season of 140 days, which is ample for the maturing of corn and all other crops commonly grown. In the 20 years from 1895 to 1914 there were four seasons during which the time between killing frosts was 15 or more days shorter than the average. Killing frosts have been recorded as late in the spring as May 27 and as early in the fall as September 6.

During most of the year the prevailing winds are from the northwest, but in June, July, and August the winds are mainly from the south and southeast. The proportion of clear and sunshiny days is relatively high.

AGRICULTURE

Early in the sixties the area now included in Dawson County was inhabited chiefly by cattlemen. They confined themselves to cattle raising on the open range, where a great variety of nutritious grasses afforded good pasture. Winter losses were sometimes very heavy, but usually the profits on the animals that survived were large. Later, as settlement spread through the Platte Valley and uplands, the cattlemen were forced to move farther west. Sod corn was usually the first crop the settlers planted, which, together with game and beef, formed their chief food. As conditions became more stable, wheat, oats, barley, and rye, together with garden vegetables, were grown.

The early agricultural development was greatly retarded by the unfamiliarity of the farmers with local climatic and soil requirements, prevalence of insect pests, and lack of capital. In the early days the farming methods were crude and wasteful. Little attention was given to the preparation of the seed bed, to seed selection, crop rotation, and fertilization, and in consequence the yields were usually low. In 1874 the grasshoppers destroyed most of the crops, and the farmers were so impoverished that many were forced to leave the county. At present there is a tendency to improve the crops by careful seed selection and to increase the productiveness of the soil by crop rotation, manuring, and growing leguminous crops, such as clover and alfalfa. There is, however, much room for improvement in farming methods even now.

The agriculture of Dawson County at present consists of diversified farming, including the production of grain and hay and the raising of livestock. According to the last census reports, the principal farm crops are corn, wheat, oats, alfalfa, wild hay, rye, barley, and potatoes, ranking in acreage in the order named.

Acres and production of principal crops of Dawson County, 1879, 1889, 1899, 1909, and 1919

Crop	1879		1889		1899		1909		1919	
	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels
Corn	4,572	143,361	71,480	2,621,902	102,117	1,964,180	126,428	2,237,406	111,627	2,275,902
Oats	1,119	24,841	15,670	476,323	8,289	113,930	32,023	523,727	17,365	493,752
Wheat	3,827	37,269	31,098	493,292	100,736	505,720	49,820	737,420	96,491	1,421,528
Rye	154	1,882	1,452	26,386	10,664	70,810	686	8,014	11,862	139,836
Barley	1,173	14,157	1,553	40,313	2,839	23,540	1,012	12,807	6,125	123,462
Kafir							21	210		
Emmer and spelt							87	1,170	35	687
Mixed crops									117	3,185
Beans		314		327	2	27	7	17	1	3
Flaxseed		104	309	2,852	25	180				
Potatoes		20,343	1,102	111,674	1,152	104,874	1,309	70,625	937	38,435
All other vegetables					400	333			65	
Strawberries					6	175	2	31	7	145
Timothy		Tons		Tons		Tons	31	45	15	30
Timothy and clover							4	5		
Clover					14	18	179	382	48	80
Alfalfa					7,776	18,875	32,742	75,278	31,561	66,385
Millet and Hungarian grass					1,763	2,747	2,954	3,564		
Wild, salt, or prairie grasses	7,795	12,001	32,070	38,063	25,683	22,375	28,898	27,283	29,042	27,873
Coarse forage					405	1,099	5,798	12,331	20,784	47,208
Sugar beets							103	1,087	1,223	5,286
Apples		Trees		Trees		Trees		Trees		Trees
Peaches and nectarines			1,888	5	8,441	394	8,276	11,730	10,642	9,546
Pears			57		3,242	3	6,175	433	226	54
Plums							235	0	187	41
Cherries							5,063	534	1,020	88
Grapes		Vines		Pounds		Pounds		Pounds		Pounds
							928	2,186	374	4,235

The type of farming practiced is uniform throughout the county, although the relative importance of the various types differs with the sections. The proportion of land used for grazing and hay production is much larger in the rougher parts of the uplands and the poorly drained bottom lands than elsewhere in the county. A larger percentage of the better drained terrace soils is used for alfalfa on account of the irrigation facilities.

According to the Federal census, the value of all cereals produced in Dawson County was \$6,836,610 in 1919. The total value of all domestic animals was \$5,396,085. Dairy products were produced to the value of \$275,939 and poultry and eggs to the value of \$435,490.

Corn is the leading crop and the chief cash crop on farms where it is not fed to livestock. The census reports 111,627 acres in corn in 1919 and a production of 2,275,902 bushels. The Nebraska Department of Agriculture reports 110,728 acres in corn in 1922 and a total yield of 1,439,464 bushels, or an average of 13 bushels to the acre. This yield, however, is greatly exceeded upon the terrace lands where irrigation is practiced. Here 50 to 60 bushels per acre is commonly obtained. On farms operated by owners, most of the corn is fed to hogs, beef cattle, and work stock, but on tenant farms a considerable proportion is sold. There are 74 silos in the county, and on farms where these occur from 15 to 20 acres are cut each year for silage. It is common practice to husk the corn from the standing stalks in the fall and pasture the cattle and horses in the fields during the winter. Many farmers fence off a few acres of unhusked

corn for hog range and a few husk only enough to supply their work stock, allowing the cattle for market to feed in the fields until fattened. A small acreage is cut for forage. The less progressive farmers grow corn on the same land several consecutive years. Much better yields are obtained, however, where it is grown in rotation with small grains and alfalfa. In recent years some attention has been given to the improvement of the seed corn, but seed selection is not generally practiced. Practically all the corn is of the dent varieties, though little attention is given to keeping the strains pure. Reid Yellow Dent and Iowa Silvermine are probably the chief varieties. Corn is grown on all the soils of the county except the poorly drained flood plains, the rougher sections of the uplands, and the sandier members of the Valentine series. The well-drained terrace soils and the less eroded parts of the uplands are preferred on account of the higher yields.

Wheat ranks second in acreage. At present winter wheat is grown practically to the exclusion of spring wheat. The yield of the latter fluctuates less and there is less danger from smut and rust. The area devoted to both winter and spring wheat in 1919, according to the Federal census, was 96,491 acres and the production 1,421,528 bushels. The Nebraska Department of Agriculture, reporting the 1922 crop, gives 81,886 acres in winter wheat, with an average yield of 9 bushels per acre, and 1,405 in spring wheat, yielding an average of 7 bushels. Turkey continues to be the leading variety of winter wheat, although the acreage planted to Kanred is increasing yearly. The varieties are kept pure by the more progressive farmers, but on many tenant farms they have been mixed.

Wheat is sown upon the unirrigated parts of the terraces throughout the Platte and Wood River Valleys and upon the less eroded parts of the uplands. It is a "hard-land" crop and is seldom grown upon the more sandy soils. The crop is usually cut with a binder. In exceptionally dry seasons, when the stems are too short for binding, the grain is headed. The crop is shocked or stacked in the field for threshing. Most of the grain is sold direct from the threshing machine, but a few farmers store their grain for a higher market. Some of the wheat is sold to the flour mills at Lexington, Gothenburg, and Sumner.

The Federal census reports 17,365 acres devoted to oats in 1919 and a production of 493,752 bushels. In 1922, according to the Nebraska Department of Agriculture, there were 18,736 acres in oats, yielding 281,040 bushels, or an average of 15 bushels per acre. Kherson is the leading variety. Very little effort is made to control smut, although the disease sometimes lowers crop yields during wet seasons. The crop is usually cut with a binder and either shocked or stacked for threshing. The grain is used largely as feed for horses and other stock and some is sold. The straw is usually left in the field and stock given access to the stacks. A little of the straw is baled. Some farmers procure seed from other sections. Many, however, simply clean a sufficient quantity of the previous crop for seed. Oats are grown on all but the sandier, rougher, and more poorly drained soils of the county. The crop does best upon the more nearly level uplands and the heavier textured soils of the terraces. It is seldom irrigated.

The acreage of rye varies considerably, depending upon the market. According to the census, 11,862 acres were devoted to rye in 1919, with a production of 139,836 bushels. In 1922 the Nebraska Department of Agriculture reports 14,140 acres in this crop with a production of 98,980 bushels, or an average of 7 bushels per acre. The crop is grown chiefly upon the heavier upland and terrace soils, usually without irrigation. It is grown generally for the grain, but also to some extent for hay and pasture. It is more drought resistant than wheat, and will flourish on soils of a more impoverished nature. In cutting the crop either a binder or header is used, depending upon the length of the stems. The grain is threshed from the shocks or from stacks, the latter method being used when the crop is headed. Most of the rye is fed to stock on the farms, though some is sold. Many farmers plant a small patch of rye for pasture early in the fall.

Barley ranks next to rye in acreage among the grain crops. The census reports 6,125 acres in barley in 1919 and a yield of 123,462 bushels. In 1922, according to the Nebraska Department of Agriculture, the acreage had increased to 8,018 and the total yield was 104,234 bushels, or an average of 13 bushels per acre. This crop is grown locally upon the terraces, uplands, and first bottoms for feed. It does exceptionally well upon the moist bottom-land soils. The crop is cut with a binder and later threshed. The straw usually remains in the field as left by the thresher and stock is allowed to feed upon the stacks.

Potatoes are grown in a small way throughout the uplands and terraces. This crop gives promise of becoming an important source of income, as these soils are well adapted to its production, especially where conditions are favorable for irrigation. Much interest is being taken in the crop, and a potato growers' association recently has been organized for the development of the industry. The Federal census reports 937 acres devoted to potatoes in 1919, with a production of 38,435 bushels. The acreage has greatly increased in the last two years, and according to the Nebraska Department of Agriculture, 2,375 acres were harvested in 1922, with a total yield of 261,250 bushels, or an average of 110 bushels per acre.

Sugar beets are first reported in the United States census of 1910, which gives the area planted in 1909 as 103 acres. In 1919, 1,223 acres were harvested, producing 5,286 tons. The Nebraska Department of Agriculture reports 1,938 acres in sugar beets in 1922. The beets yield from 10 to 15 tons per acre, depending upon the soil and upon the care taken in handling the crop. Most of the terrace soils are well adapted to the production of this crop and the high percentage of clear sunshiny days insures a relatively high sugar content. The absence of local refineries, however, is a serious drawback to the development of the industry.

Alfalfa is the most important of the hay crops. It also ranks third in acreage among the crops of Dawson County. The Federal census reports 31,561 acres devoted to alfalfa in 1919 and a production of 66,385 tons. In 1922, according to the Nebraska Department of Agriculture, the area devoted to this crop had increased only 37 acres. The yield, however, was 94,794 tons, or an average of 3 tons per acre. Alfalfa does well on all the soils of the county, except those of the sandy Valentine series, in which soils the lime content

is insufficient for best results, and the more poorly drained or alkali soils of the first and second bottoms. It is especially adapted to the well-drained terraces, where most of the crop is under irrigation. Three cuttings usually are obtained during the season, and occasionally four are made. Alfalfa is generally stacked in the field and hauled to the feed lots as needed. It is used as feed for cattle and hogs. A few farmers bale a part of the hay for shipment and many sell their hay direct to the alfalfa mill at Cozad, where it is ground into meal, sacked, and sold throughout the surrounding country. Often hogs are allowed to run in the fields during the summer. Cattle, however, are seldom grazed on green alfalfa on account of the danger of bloating. The crop is an excellent one for building up depleted soils and is often used in rotations. It is not in favor for short rotations, however, as most farmers prefer to keep the stand for several seasons before changing to other crops.

Wild hay was cut from 29,042 acres in 1919, yielding 27,873 tons. In 1922 the acreage had decreased to 17,515, with a total production of 12,261 tons. Hay is cut chiefly upon the poorly drained bottom-land soils of the county and upon the well-drained narrow canyon floors throughout the rougher parts of the uplands. The higher yields are obtained from the poorly drained soils. The hay from the canyons, however, is much better. It grows less rank, is finer in texture, and has a higher feeding value. The hay is stacked in the field and either baled for market or hauled to the feed lots as needed. It is used as feed for work stock and cattle.

Among the minor crops sorghum, millet, Sudan grass, sweet clover, and kafir are the most important. These crops are grown chiefly for feed. Watermelons and cantaloupes are raised in a small way on the sandy terrace soils. They are sold mostly in the surrounding towns and to tourists on the Lincoln Highway.

There are several fruit orchards throughout the county. The demand for fruit, however, is not supplied and it would seem that fruit production, especially on the heavier terrace soils, could be profitably extended. Trees usually do not do so well upon the upland, on account of the lack of moisture, which is largely offset on the terraces by the nearness of the water table to the surface or by irrigation. Apples, cherries, plums, peaches, and pears are locally the most important of the tree fruits. Of the wild fruits, plums, grapes, chokecherries, and raspberries are abundant during favorable seasons. They grow chiefly along the larger streams and canyons throughout the county.

The income derived from the sale of livestock and livestock products in Dawson County is but slightly less than that from crops. Cattle raising is the leading branch of the industry. According to the census of 1910 there were 51,071 cattle in the county, valued at \$2,728,126; 43,000 of these were beef cattle. Most of the herds are of grade stock, headed by a purebred bull. The quality of the beef cattle in general is very good. The principal breeds are Hereford and Shorthorn, although there are a few herds of Aberdeen Angus. There are 273,124 acres of pasture land in the county, and many farmers purchase stock for summer grazing. Most of the cattle are shipped as feeders or stockers, though large numbers are fattened on corn after coming off the summer range. These are shipped to Omaha.

Dairying receives little attention. There are no farms devoted exclusively to the industry. Nearly every farmer, however, milks a few cows, chiefly of the beef breeds, and sells the surplus dairy products in the local markets.

Hog raising is an important branch of the livestock industry in Dawson County. It is followed most extensively on the irrigated terrace land, where there is an abundance of corn and alfalfa, although many farmers throughout the uplands fatten a small herd for market each year. The Federal census reports 55,851 hogs in the county in 1919, with a total value of \$1,184,013. Duroc-Jersey, Poland-China, and Hampshire are the leading breeds. A few farmers have purebred herds, but most of the animals are grades. It is common practice to fatten hogs on corn, either in feeding yards or by turning the stock into the fields in the fall and allowing them to "hog down" the corn. Alfalfa is usually added to the ration and during the summer months the pigs are often allowed to run in the alfalfa field until the third crop is ready. Many herds have been greatly reduced or entirely destroyed in the past by hog cholera. Much attention is now given to vaccination and sanitation in combating this disease, and losses due to it have been largely eliminated.

Horses are raised on nearly every farm and several of the ranches in the rougher parts of the uplands carry large herds. Most of the ranch stock has been improved from the western broncho, and is of medium draft type, ranging in weight from 1,100 to 1,300 pounds. The heaviest draft animals are raised in the irrigated sections of the Platte Valley. In this section the industry is confined largely to the breeding of work mares.

Most of the stallions in Dawson County are purebred, but the majority of the mares are grades. The Percheron is the most popular breed. Many mules are raised in the Platte Valley. According to the census, there were 17,741 horses with a value of \$1,204,012 and 1,245 mules, valued at \$129,310, in the county in 1919.

Sheep raising receives little attention. Increased interest is being displayed in small breeding flocks. Some farmers import a carload or two each fall, fatten the animals on corn and alfalfa, and ship them to Omaha when the market is favorable.

Poultry constitutes an important source of farm income. A small flock of chickens is raised on nearly every farm. The local demand for poultry products is usually good and the poultry industry is receiving increased attention. Leghorn, Barred Plymouth Rock, Rhode Island Red, and Orpington are the principal breeds. Ducks, geese, turkeys, and guinea fowls are raised to a small extent. The Federal census shows 184,201 chickens and 4,219 other poultry in the county in 1919. The total value of all poultry for that year is reported to be \$165,337.

The adaptation of certain soils to particular crops is observed to some extent by the farmers. It is recognized that alfalfa is not suited to the sandy Valentine soils, on account of their low lime content and unstable nature. It does exceptionally well, however, throughout the bench or terrace lands, where irrigation is practiced, and most of the crop is confined to these sections. Little wheat is grown on the irrigated lands, although much of the corn in the Platte Valley is irrigated. Sugar beets and potatoes are grown chiefly under

irrigation. As a rule, the heavier and deeper soils are recognized as better adapted to the production of general farm crops when moisture is plentiful. Under average prevailing conditions the "hard lands" are believed to be better suited to the small grains and forage crops, and the sandy lands to such crops as rye, corn, and potatoes. In a season of ample precipitation, however, the yields of cereal crops are larger on the heavy soils than on sandy soils. No farming is done on the eroded canyon slopes, which are suitable only for grazing. The wet bottom lands are used for pasture and hay production.

Systematic crop rotation is not practiced, although many farmers follow corn with small grain and small grain with alfalfa. When alfalfa sod is broken, the land is generally used for corn 2 years, oats 1 year, wheat 1 year, and back to corn. Corn is probably better adapted to recently broken alfalfa ground than small grain, on account of its deeper rooting system, but even this crop is subject to drought during dry seasons, as the alfalfa plant requires considerable moisture and leaves the ground in a comparatively dry condition. Corn is often grown on the same land from 2 to 4 years, followed by 1 year of oats and 1 or 2 years of wheat. A rotation which appears to have merit consists of 2 years of corn, 1 year of oats, rye, or barley, 1 or 2 years of wheat, and 4 to 6 years of alfalfa.

The importance of proper cultural methods and soil fertilization is not appreciated. Wheat stubble is frequently disked regardless of a rank growth of weeds and land is usually plowed late in the summer just before seeding, so that there is little time for proper aeration, mellowing, and settling of the soil. A few farmers take advantage of heavy rains to plow deep and mulch with a harrow to retain moisture, after which corn is listed in the spring or wheat is seeded in the fall. Small grain usually is planted with a press drill. Some wheat is drilled between the corn rows in the fall, but where small grain follows corn the land is more often plowed, disked, and harrowed before planting. Most of the corn is listed in, a 1-row lister commonly being used. The crop is cultivated three to five times. When corn follows a crop of corn that was not cut for fodder or ensilage, the stalks are broken down with a stalk cutter and the field disked before plowing.

Alfalfa requires a smooth, mellow seed bed and is usually planted after wheat. The seed is generally sown broadcast and harrowed in, though a few farmers prefer planting with a press drill in order to obtain a more uniform stand. Alfalfa does best when sown immediately after the first good rain in August, as the ground is then sufficiently moist to insure seed germination. Where irrigation is practiced the young stands are usually more uniform, as it is possible to control the soil moisture. From 12 to 15 pounds of seed per acre is considered sufficient.

Oats, rye, and barley are sown in the same manner as wheat, except that they are usually seeded in the early spring as soon as possible after the frost is out of the ground.

Potatoes are generally planted by hand, the cuttings being dropped about 3 feet apart in every third plow furrow. In the Platte River Valley, however, where irrigation is practiced, a few farmers grow potatoes commercially and have modern planting and harvesting machinery.

Sugar beets are planted between the first and the middle of May on ground that has been previously plowed and well pulverized. A drill is used in planting. From 15 to 20 pounds of seed is used to the acre in rows spaced 20 to 26 inches apart. As soon as the small plants show three or four leaves, they are bunched, that is, all plants are removed except small bunches 8 to 10 inches apart. From these bunches all the plants later are removed, except the most vigorous one. The crop is cultivated or hoed sufficiently to keep down weeds and to maintain a surface mulch. The number of irrigations depends entirely upon the soil and climatic conditions. Harvesting begins about October 1 and consists of lifting, pulling, topping, and piling the crop. From the piles the beets are loaded into wagons and hauled to the railroad for shipment to the refinery at Grand Island.

As a rule the farms are well improved. The houses and barns are usually painted and kept in good repair, and there is a general appearance of prosperity. The farms are fenced and cross fenced mostly with barbed wire. In the rougher sections, however, very few of the ranches are cross fenced, as the land is suitable only for grazing and is simply inclosed with barbed-wire fence.

The Nebraska Department of Agriculture reports modern heating systems on 102 farms, modern lighting on 153, and modern water on 109 in 1922. According to the same report there are 671 gas engines, 144 tractors, 78 trucks, and 1,497 automobiles on the farms. The tractors are used on the more level lands. Modern labor-saving implements are in general use, most farms being equipped with grain drills, mowers, rakes, binders, riding cultivators, and disk harrows. A few also have corn binders and hay balers. The more expensive farm machinery is sheltered.

No commercial fertilizer is used. Barnyard manure is applied to the land when available, but the supply is usually insufficient to have much effect on crop yields. The land in the immediate vicinity of the barnyard usually receives the largest part of the manure, especially on the tenant farms. The need of fertilizer has not been noticed, as the land is new and in no immediate danger of becoming exhausted.

Farm laborers are not easily obtained, especially during harvest season. Wages range from \$35 to \$50 a month with board and room. Day laborers receive \$1.75 to \$2.50 a day. Harvest hands were paid as high as \$4 a day during the present season (1922). Corn shuckers receive from 3 to 5 cents a bushel. Most of the laborers are natives, although there are a few foreigners, including Mexicans, Russians, Danes, and Norwegians. A few farmers hire help by the year, in order to insure against lack of labor at critical periods.

According to the Federal census, the number of farms in the county was 511 in 1879; 1,513 in 1889; 1,728 in 1899; 2,093 in 1909; and 1,934 in 1919. The percentage of the county in farms increased from 14.2 in 1879 to 90.6 in 1919. The average size of the farms in 1919 is reported to be 295.2 acres. The proportion of improved land in farms was 19.1 per cent in 1879; in 1909 it was 71.6 per cent, and in 1919, 61.1 per cent. The farms vary greatly in size, but most of them contain between 160 and 320 acres. According to the Nebraska Department of Agriculture, 283,750 acres of the farm land was under cultivation in 1922.

The average value of all farm property, per farm, including land, buildings, machinery, and domestic animals, was \$1,842 in 1879; \$4,463 in 1889; \$5,573 in 1899; \$16,198 in 1909, and \$30,708 in 1919.

In the last 40 years the proportion of the farms operated by owners has greatly decreased. In 1879, 95.5 per cent of the total number of farms was operated by the owners; in 1919 this percentage had decreased to 53.6 per cent. The owners occupied 1,037 farms and tenants were on 874 farms during 1919.

The share rental system predominates in Dawson County. Under this system the tenant furnishes all equipment, labor, and seed, and receives from two-fifths to one-half of the crops. On many farms the renter is allowed the use of pasture land without charge.

The price of land ranges from \$20 to \$250 an acre. The higher price applies to the irrigated lands in the Platte Valley and the lower to the rougher parts of the uplands suitable only for grazing. The average price for the entire county is probably about \$70 an acre. The price for most of the uplands suitable for farming is between \$50 and \$100 an acre.

SOILS

Dawson County lies in the plains region of the United States where the topography and rainfall have favored a luxuriant grass vegetation. The absence of trees throughout the upland parts of the region is due to several influences. The most important, however, are thought to be the unfavorable moisture supply and the former prevalence of prairie fires, which destroyed the seedlings. The native timber of the county is confined to narrow belts along the streams and larger tributaries, where the moisture conditions are more favorable. All the soils of the county, therefore, with the exception of the more recent sand deposits and the severely eroded areas, show the influence of a grass vegetation and of weathering under the prevailing climatic conditions. The carbonaceous material accumulated from the seasonal growth and decay of plant life has become intimately intermixed with the weathered surface of the mantle rock, giving the soils a prevailing dark color in their surface horizons.

The rainfall of the region has been sufficient to leach the readily soluble salts, chiefly lime carbonate, from the soil and upper subsoil horizons, but has not removed them from the entire soil section as happens in the eastern part of Nebraska where the rainfall is considerably greater. The lime, therefore, has accumulated and occurs in concentrated form in the lower portion of the subsoils.

The mature soils also have more or less finely granular structure in their soil and upper subsoil horizons, cloddy to nutlike structures in their lower layers, and columnar structures in the substratum or parent material.

The above characteristics are quite common and pronounced in all the mature soils of the county. They have been produced by the fundamental soil-forming processes such as the accumulation of organic matter, leaching, and oxidation. The character of the parent material has also exerted its influence, but is believed to have been of minor importance in determining the broader characteristics of the soils. Especially is this conclusion favored, since each of the

parent materials, though fairly uniform in structure, texture, and chemical and physical composition, have given rise to soils differing more or less widely in these characteristics.

The soil-forming processes have been controlled in a general way by the prevailing climatic conditions, but have varied in the intensity of their action according to the local topography and drainage. These variations have produced local differences in the soils and given them certain group characteristics.

The most mature and oldest soil of the county occurs upon the loess plains in the southwestern part. It occupies the flatter areas, where deep soil weathering and the incorporation of organic matter has not been retarded by erosion. The surface layer is dark grayish brown to almost black and 12 to 15 inches deep. The upper subsoil is a friable, smooth silt loam of grayish-brown color and slightly more compact structure than the surface soil. The brownish shade of this layer is due in part to the downward leaching of organic matter from the surface soil and in part to the oxidation of its mineral constituents. The lower subsoil is a light grayish brown friable silt to silty clay having a smooth, floury feel. This layer grades at about 4 feet into the light-gray silt of the unweathered loess. Prolonged weathering has leached the carbonates from the surface soil and upper subsoil, although they occur abundantly in more or less concentrated form below 3 feet. In the soil group characterized by this profile may be placed the flat phase of the Holdrege silt loam.

Another group including soils of a less mature nature occur throughout the upland and terraces of the county. The typical surface soil differs little from that of the group already described. The upper subsoil, however, contains less organic material and is of a somewhat lighter color, and the lower subsoil, below 24 to 30 inches, has not been leached of its carbonates, but has accumulated much of the lime washed down from the overlying soil layers and consists largely of light-gray to yellow highly calcareous silt. The parent loess is encountered at depths of 3 to 4 feet. With this group are included the typical Holdrege soils of the uplands and the Hall soils of the terraces or bench lands.

Associated with the Holdrege soils throughout the uplands are extensive areas in which the weathering of the parent loess has been greatly retarded by erosion. The dark-colored surface layer has been removed almost as fast as formed, so that the upper layer is much thinner and lighter colored than that of either Holdrege or Hall soils. In many places it rests directly upon the light-gray material of the parent loess and locally has been entirely removed, exposing the highly calcareous loessial deposit. The soils having these characteristics have been included with the Colby series and represent the least mature stage of development of any soils derived from loess.

The soils developed from accumulations of wind-blown sand occupy but a small proportion of the county. They lie in the western part north of the Platte River. The sand deposit has become stable and is covered with grass, but is of such recent origin that the growth and decay of plant life has modified the material but slightly. The profile is immature, the surface soil consisting of sand slightly darkened by accumulated organic matter. The subsurface layer and

often the soil itself may have a slightly loamy character, owing to the presence of a small percentage of colloidal clay. This clay may have been produced by the weathering of the sand grains, particularly those of feldspathic composition. The lime content, even of the subsoil, is too low to give effervescence with acid. This is due, however, to the absence of carbonates in the original deposit and not to prolonged weathering and leaching since its deposition. The soils having the above-described characteristics have been included in the Valentine series.

The soils that occupy the river bottoms and depressions in the uplands and terraces have been developed under conditions of restricted drainage and present a variety of characteristics. The river-bottom soils represent recent alluvial material carried down by streams from the adjoining uplands and terraces and from the sand-hill region to the west. Their character is governed largely by the character of the sediment from which they were derived. Since the streams carry sediment of a variety of textures, the recent alluvial material is naturally complex. The coarser textures are deposited near the channel and the finer farther back, owing to the assorting power of currents of varying velocities. In places, however, fine material is found near the stream, this being due to a comparatively recent change in the position of the channel. The same cause sometimes results in a light-textured material overlying heavy-textured material. Strata of widely varying textures may thus overlie one another, dependent on the course of the stream during the time of deposition. Subsequent weathering and the accumulation of humus have changed the deposits into productive soils. The more sandy deposits have been included with the Cass and Sarpy soils. The former have accumulated large amounts of organic matter in the surface layer, but the latter are not so well supplied and have a lighter color. The heavier-textured deposits are classed with the Lamoure soils. They have black surface layers and the subsoils are mottled and highly calcareous.

Recent miscellaneous deposits of sand as bars, islands, and flats within and bordering the Platte River channel have been classed as Riverwash.

The depressions in the uplands and terraces are occupied by soils of the Scott series. These soils have been developed on materials washed from higher land into basinlike depressions, locally called "buffalo wallows." The soil and subsoil is dark colored, on account of large accumulations of organic matter. The subsoil is extremely heavy and compact, owing to the transportation of the finer soil particles from the surface layer to a lower layer.

The groups of soils previously described have been differentiated into series on a basis of similarity of color, subsoil, topography, drainage, and origin. A further separation of each series into types is made on the basis of texture of the surface soil. Eight soil series are represented in the county. Twenty types, some with phases, are mapped. In addition, Riverwash—a nonagricultural material—is shown. It is of a miscellaneous character and can not be grouped with any series. Brief descriptions of the several series follow.

The types of the Holdredge series are characterized by dark-brown to nearly black surface soils, having the typical granular structure

of virgin prairie soils of subhumid climates. The dark color fades gradually downward through a dark brown to a light brown. Below 24 to 30 inches the subsoil is a pale grayish yellow, the color of the parent material. The subsoil is slightly heavier than the soil but there is no suggestion of a claypan. The carbonates are leached to a depth of 24 to 30 inches. These soils occupy upland positions and are derived from the grayish-yellow, highly calcareous loess of the northern Great Plains. The topography ranges from level to rolling. In this county it is characterized by a rolling relief. The soils differ from those of the Colby series in the greater depth and darker color of the surface soils. The series is represented in this county by two types, the Holdrege silt loam with a flat phase, and very fine sandy loam.

The types included with the Colby series have brown to ashy-gray surface soils which grade abruptly into light-yellowish or whitish highly calcareous subsoils. They are derived from loess and have an open structure and a silty texture. The soils occupy upland positions and the topography varies from sharply rolling to rough and dissected. Drainage in most places is excessive and erosion severe. In this county the series is represented by the Colby silt loam and its broken phase, very fine sandy loam, and fine sandy loam.

The Valentine series consists of types with grayish-brown to light grayish brown surface soils. The subsoil is a light grayish brown to gray loose sand. Both soil and subsoil are low in lime. These soils are developed on wind-blown sands which have become stable. The topography varies from dunelike to almost level. The series usually occupies the lower situations, including the dry valleys within the sand-hill region. In this county, however, it is represented by a small area of wind-blown sand on terraces in the western part of the county. Drainage is typically excessive. Surface channels are not developed, but rain water seeps away through the loose porous subsoil. Two types, the Valentine sand and loamy sand, are recognized in Dawson County.

The Hall series consists of types with very dark grayish brown to black surface soils, underlain by a dark grayish brown, slightly compact upper subsoil which at a depth of 18 inches passes abruptly into a grayish-brown compact silty clay. Below depths of 24 to 30 inches the material is a gray or grayish-yellow silt or silty clay high in lime. The types in this county have not developed the extremely compact layer in the subsoil found elsewhere in Nebraska and their profile is very similar to that of the Holdrege soils, except that the subsoil is slightly more compact between 18 and 24 inches. The series occurs on high well-drained terraces. The topography is flat to very gently undulating. Five types and one phase are mapped in this county—the Hall silt loam, clay loam, loamy fine sand, fine sandy loam, and very fine sandy loam, with a colluvial phase.

The surface soils of the types of the Scott series are very dark grayish brown to almost black. The upper part of the subsoil is often an ashy-gray silt loam which passes into a dark olive drab, stiff, impervious clay. The types normally do not contain sufficient lime to effervesce with acid. In this county the ashy-gray subsurface layer is lacking. The soils occur in shallow basins scattered over the more level parts of the uplands and upon the terraces. As these

areas have no outlet, water stands over them after rains. One type, the Scott silty clay loam, has been mapped in Dawson County.

The surface soils of the types in the Lamoure series are very dark grayish brown to black. The subsoil varies from grayish brown to gray or mottled gray and brown, and, as a rule, is heavier in texture than the surface soil. The subsoil and often the surface soil is very calcareous. The types have poor drainage and are locally subject to overflow. They occupy flat stream bottoms and poorly drained areas on the lower terraces. In this county the soils contain more or less alkali. Three types—the Lamoure silt loam, silty clay loam, and very fine sandy loam—are mapped.

The Cass series includes types having dark-brown to black surface soils and a brown to gray lighter textured subsoil which passes within the 3-foot section into sand and gravel. Both surface and subsoil may be highly calcareous. The types occupy the lower stream bottoms and are, as a rule, poorly drained. The soils differ from those of the Lamoure series in the more sandy nature of their subsoils. Three types, the Cass sandy loam, fine sandy loam and loamy fine sand, are mapped in this area.

The types in the Sarpy series are similar to the Cass soils in every respect, except in the light color of the surface layer. Only one type, the Sarpy sand, is recognized in the present survey.

Riverwash includes small islands, bars, and flats composed of almost pure sand and gravel.

In the following pages the soils of Dawson County are described in detail and their relation to agriculture discussed. The accompanying map shows their distribution in the county. The table below gives the actual and relative extent of the soils mapped.

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Colby silt loam	115, 904	34. 7	Lamoure silt loam	5, 824	0. 9
Broken phase	102, 592		Hall clay loam	5, 696	. 9
Hall silt loam	121, 088	19. 2	Lamoure silty clay loam	5, 632	. 9
Hall very fine sandy loam	103, 872	16. 7	Valentine sand	5, 056	. 8
Colluvial phase	1, 536		Valentine loamy sand	3, 712	. 6
Holdrege silt loam	44, 352	8. 9	Hall loamy fine sand	3, 520	. 6
Flat phase	12, 096		Cass sandy loam	3, 392	. 5
Lamoure very fine sandy loam	31, 616	5. 0	Sarpy sand	2, 368	. 4
Colby very fine sandy loam	17, 280	2. 7	Colby fine sandy loam	1, 984	. 3
Cass fine sandy loam	14, 336	2. 3	Scott silty clay loam	960	. 2
Hall fine sandy loam	10, 112	1. 6	Riverwash	701	. 1
Cass loamy fine sand	9, 216	1. 5			
Holdrege very fine sandy loam	7, 552	1. 2	Total	630, 400	

HOLDREGE VERY FINE SANDY LOAM

The Holdrege very fine sandy loam consists of a dark grayish brown to black very fine sandy loam, loose and friable in structure and 8 to 12 inches deep. The surface layer, about 6 inches thick, contains large quantities of organic matter which give it the dark color. The upper subsoil is a grayish-brown very fine sandy loam which gradually becomes lighter in color with depth. Below about 24 inches the material grades into the loose, floury calcareous silt of the parent loess. Lime concretions are abundant in the lower subsoil.

The color and depth of the surface layer differs somewhat with its topographic position. On the more level areas and gradual slopes, where conditions have favored deep soil weathering and the accumulation of organic matter, the soil is in places almost black and 10 to 14 inches deep. Around the margins of the type, however, where it borders areas of the Colby soils, the depth and organic matter content of the surface layer is less and in places difficulty is experienced in separating the Holdrege and Colby soils.

The Holdrege very fine sandy loam occurs chiefly in a large irregularly shaped body along the southern county line. Small local areas lie in the uplands northwest of Walnut Grove Cemetery in the northwestern part of the county. The total area of the type does not exceed 12 square miles. The soil has been derived by weathering from sandy loessial material. It is in reality Holdrege silt loam, the surface soil of which has been so modified by wind-transported and water-transported sands that it has a very fine sandy loam texture.

The topography ranges from flat to gently rolling. The general surface is that of a flat to gently undulating plain modified in places by broad shallow swales or draws. The small bodies in the northwestern part of the county occupy long gradual slopes between the uplands and terraces or appear as low, rounded knolls upon the terraces. Drainage is everywhere good, though not excessive. There is usually sufficient slope even on the flatter areas to carry off the surplus moisture and the porous subsoil affords ample underdrainage.

On account of its small extent this type is not an important agricultural soil in Dawson County. It is naturally strong and fertile, however, and all crops common to the region produce well in favorable seasons. It can be tilled under a somewhat wider range of moisture conditions than the Holdrege silt loam, owing to the more sandy nature of its surface soil. The type is quite stable, organic matter being present in quantities sufficient to prevent excessive wind erosion even in the driest seasons. About 90 per cent of the Holdrege very fine sandy loam is under cultivation to corn, oats, wheat, and alfalfa, and the rest is included in farm sites and pasture land. A few farmers feed cattle during the winter, though this industry is not practiced so extensively as on the Holdrege silt loam. Hogs are raised for market on every farm.

Crop yields are about the same as those obtained on the heavier upland soils. The loose, porous soil lends itself admirably to the formation of a surface mulch and the type is quite retentive of moisture. During dry seasons the crops often withstand droughts better than on the silt loam type.

The land of this type is tilled in much the same manner as that of the Holdrege silt loam. It is somewhat easier to handle, however, and can be cultivated with less power and lighter machinery. The selling price ranges from \$100 to \$150 an acre.

HOLDREGE SILT LOAM

The surface soil of the Holdrege silt loam is a very dark grayish brown to black mellow silt loam, 8 to 12 inches deep. It is underlain by 12 to 14 inches of dark grayish brown silt loam of slightly more compact structure than the surface layer. Below an average depth of 24 inches the material changes rather abruptly to a light-

gray calcareous silt or silt loam which becomes gradually lighter in color and texture with depth. The loose, floury silt of the parent loess is encountered below an average depth of 30 inches.

Though it is on the whole remarkably uniform in texture and color throughout the areas of its occurrence, the type presents some variations. On ridges, on slopes, and near canyons the soil may be lighter in color than typical. In the flatter areas, however, where conditions have been most favorable for deep soil weathering and the accumulation of organic matter, the dark-colored surface layer frequently extends to a depth of 18 inches. Locally the surface soil contains such a large quantity of sandy material as to approach a very fine sandy loam in texture.

The Holdrege silt loam occupies a large total area in Dawson County. It occurs chiefly in the southern upland division in the southwestern part of the county, where the soil is typically developed throughout the Plum Creek drainage area. Smaller bodies are scattered throughout the uplands on the north side of the Platte River.

The type is derived from loess under conditions favorable to deep soil weathering and the accumulation of large quantities of organic matter. It occupies the highest positions in the county, and the topography varies from almost flat to gently rolling. The areas on the north side of the river occupy the broader and higher divides between drainage ways and have a gently rolling relief. The surface of the areas in the southern upland division is flat to very gently undulating and approaches the level of the original loess deposit which once covered the entire county. Drainage is good throughout the type, though seldom excessive. Surface drainage is not established in all sections, but there is usually sufficient slope to carry off the surplus moisture and the porous subsoil affords good underdrainage.

The Holdrege silt loam is one of the best upland soils of the State. In natural productiveness it equals the leading upland soils of the Mississippi Valley. Crop yields, however, are seldom more than half those obtained in more eastern States on account of the lower rainfall. In seasons of ample precipitation the yields of corn and alfalfa are twice those of normal years. About 90 per cent of the type is under cultivation. The rest is included in feeding lots, building sites, and pasture land. Corn, wheat, oats, alfalfa, rye, and barley are the leading crops. Many farmers grow small amounts of millet, Sudan grass, and sorghum for feed. Cattle raising is not practiced extensively, although the fattening of livestock is becoming a highly specialized industry. All the native cattle, except a few kept to supply the dairy needs, are fattened for market and in addition some feeders are brought in. The native cattle are chiefly grade Hereford and Shorthorn. Hogs are raised on every farm and a few farmers have large herds. The principal breeds are Poland-China and Duroc-Jersey.

The yield of corn varies widely from year to year. Good yields are obtained in normal years; in dry years the crop sometimes fails to produce grain and is cut for fodder. The average yield is about 20 bushels per acre. Wheat yields from 10 to 25 bushels, with an average of about 15 bushels per acre. Oats yield from 25 to 30 bushels. This crop is grown for feed on nearly every farm. Alfalfa yields 2 to 2½ tons from three cuttings. The average yield of rye is about 18 bushels, and of barley 20 bushels per acre.

Systematic crop rotation is not practiced, although a few farmers use a rotation consisting of corn 1 or 2 years, followed by oats or wheat 2 years, and alfalfa 3 to 5 years, or as long as the stand remains profitable. Many farmers grow the same grain crop for several successive years. The most improved modern machinery is used. Four-horse teams perform most of the farm work. Tractors are sometimes used on the more level areas.

Barnyard manure is the only fertilizer used on this land and the supply is usually inadequate for best results.

The soil of the Holdrege silt loam sells for \$100 to \$175 an acre, depending upon improvements, topography, and location with respect to markets.

Holdrege silt loam, flat phase.—The surface soil of the Holdrege silt loam, flat phase, is a very dark grayish brown to black silt loam, 8 to 12 inches deep. The silt content is very high and the material contains a relatively small proportion of particles coarser than very fine sand. The soil is rich in organic matter, has a smooth, velvety feel, and breaks down into a fine powder. The upper subsoil is a light grayish brown slightly compact silty clay, to an average depth of 20 inches. The material becomes gradually lighter in color with depth, but retains its slightly compact nature to depths below 3 feet. At an average depth of 40 inches the material grades into a highly calcareous very light gray silt which merges gradually with the loessial deposit from which the soil has weathered. The subsoil is not calcareous within 3 feet of the surface. A few inches below this depth, however, it usually effervesces with dilute hydrochloric acid. Although the clay content of the subsoil is sufficient to give it a slightly compact structure, the soil profile contains no indication of a hardpan and is porous throughout.

The phase occupies a considerable proportion of the more southern upland division. The largest developments appear in T. 9 N., Rs. 23 and 24 W. A small area lies northeast of Farnam, between Plum Creek and one of its tributaries. The type is decidedly uniform throughout the area of its occurrence and contains few soils of other types within its borders. It has been derived from loessial material under the most favorable conditions for deep soil weathering and the accumulation of organic matter. The topography is flat to very gently undulating. The largest area lies somewhat below the general level of the surrounding uplands and appears to represent an old shallow depression or saddle upon the broad divide between the Platte River and Plum Creek. The smaller areas all occupy the highest positions and represent remnants of the loess plain that once covered the entire county. Drainage is generally good. There is in most places sufficient slope to carry off the surplus moisture. Even on the flatter areas the subsoil readily absorbs the moderate rainfall of the region.

The phase has a comparatively small total area in Dawson County, and for this reason is not so important agriculturally as many of the other types. It is the best upland soil of the area, however, and well adapted to all crops common to the region. Practically all of it is under cultivation. The same crops are grown as on the typical Holdrege silt loam and yields usually average a trifle higher than on

that type. Cattle raising is not practiced extensively. A few farmers fatten a carload or two of beef animals each year and milk cows are kept on every farm to supply the dairy needs. Hogs are raised extensively on this soil.

The average yield per acre of corn is about 25 bushels, wheat 18 bushels, oats 25 bushels, rye 20 bushels, barley 25 bushels, and alfalfa 2 to 2½ tons, from three cuttings.

The land is handled in the same manner as that of the Holdrege silt loam.

The selling price ranges from \$125 to \$175 an acre, depending largely upon improvements.

COLBY FINE SANDY LOAM

The surface soil of the Colby fine sandy loam is a grayish-brown to dark grayish brown fine sandy loam, 8 to 10 inches deep. The upper subsoil, i. e., to a depth of about 16 inches, is prevailingly a light grayish brown very fine sandy loam. The lower subsoil consists of an ashy-gray to white calcareous silt much resembling the parent loess. In many places the light grayish brown intermediate layer and the ashy-gray subsoil is entirely absent, the surface soil resting directly upon the white highly calcareous loessial deposit. The surface soil is rich in organic matter, except upon the steeper slopes, where erosion has been especially severe. In these localities the surface horizon has been greatly thinned or entirely removed exposing the light-colored subsoil. Lime concretions are abundant below an average depth of 24 inches.

The total area of the type in Dawson County is slightly more than 3 square miles. It occurs only in the south-central parts of the area adjacent to bodies of Colby very fine sandy loam. The origin of this soil is difficult to determine. It evidently has weathered from loessial material, the surface of which has been greatly modified by sandy deposits. The sand may have been derived in part through wind action from the coarser textured terrace and first-bottom soils and in part by surface wash from sandy materials within the loessial deposit.

The topography varies from gently undulating to sharply rolling or hilly. The greater part has a rolling relief, broken by narrow V-shaped valleys along the larger drainage ways. The valley sides are less steep and the divides more rounded than those of the Colby silt loam type. Drainage is everywhere good and in the rougher areas excessive.

On account of its small extent, the type is of little agricultural importance. It is a fair farming soil, however, and when carefully managed produces moderate yields of all crops common to the region. About 50 per cent of it is under cultivation and the rest is used for grazing. The soil is subject to drifting when the native sod is broken and requires more careful management than either the Colby silt loam or very fine sandy loam types. Corn, wheat, oats, and alfalfa are the principal crops. The yields are somewhat lower than on the heavier types of the series, with the possible exception of corn. The methods of farming are the same as those practiced on the heavier soils.

The soil is easily maintained in good tilth and can be cultivated under any moisture conditions without injury, providing care is taken to prevent it from drifting. It is advisable to list corn deeply with the furrows running at right angles to the direction of the prevailing (northwest) winds if possible. Coarse manure and straw also are beneficial in keeping the soil stable. Alfalfa does fairly well on this type and is an excellent crop to prevent drifting.

The soil of this type sells for \$50 to \$75 an acre, depending upon topography and improvements.

COLBY VERY FINE SANDY LOAM

The surface soil of the Colby very fine sandy loam is a grayish-brown to dark grayish brown, loose, friable very fine sandy loam, with an average depth of 8 inches. The surface layer varies considerably in depth and color with the topography. On the less eroded areas it is dark grayish brown and locally extends to a depth of 10 inches. On the steeper slopes where erosion is more severe it is seldom over 6 inches deep and of light grayish brown to grayish-brown color. In a few places the surface soil has been entirely removed by erosion, exposing the subsoil. The upper subsoil is a grayish-brown loose very fine sandy loam to an average depth of 16 inches, below which the material gradually becomes lighter in color and finer in texture until at about 24 inches it grades into the loose nearly white calcareous silt of the parent loess. The subsoil and frequently the soil itself is highly calcareous. The lower strata contain numerous lime concretions.

This type occurs chiefly along the border between the loessial uplands and the Platte Plain in the southeastern and south-central parts of the county. The largest development lies south of Elm Creek in the southeastern part. This area, which is fairly uniform, comprises about 20 square miles. A smaller area occurs north of the creek. A large though not so uniform area borders the terrace lands south of the Darr Bridge, in the south-central part of the county.

The type has been formed by weathering from loess, the surface of which has been considerably modified by wind-blown sands from the surrounding types and by sandy materials within the loess itself. The topography is gently rolling to hilly. The greater part of the type occupies long gently rolling slopes between the uplands and the river valley. Drainage is everywhere good. In the more hilly sections the run-off is rapid and erosion is a serious factor.

This soil is of only moderate agricultural importance, on account of its comparatively small extent. It is a fair farming soil, however, and ranks with the Colby silt loam in crop yields. About 80 per cent of it is under cultivation. The rest, including the rougher areas, is used for pasture and hay land. The native vegetation consists of the grasses that thrive on the silt loam, and in addition sand grass and stipa, or needle grass. All crops suited to the region are successfully grown, with yields about the same as on the Colby silt loam. The soil is handled in the same manner as the silt loam.

The land sells for \$60 to \$100 an acre. The character of the topography and improvements are the governing factors in the sale price.

COLBY SILT LOAM

The surface soil of the Colby silt loam varies from dark grayish brown to very dark grayish brown and has an average depth of about 6 inches. In places it contains a relatively high percentage of very fine sand. The surface is ordinarily loose and friable but becomes moderately compact if worked when wet. The surface soil passes abruptly into a light-gray to grayish-yellow or white silt loam which continues to below 3 feet. The surface 6 inches usually contains considerable organic matter, but there is a gradual decrease in the material with depth and below 24 inches it is almost entirely absent. The subsoil below 12 inches is highly calcareous and lime concretions are thickly scattered throughout the lower part.

Many local variations occur. In a few places the surface and subsoil are separated by an intermediate layer, from 6 to 8 inches thick, of light-brown color, which is due to the downward leaching of small quantities of organic matter from the surface layers. In several parts of the county where areas of this type lie adjacent to bodies of Holdrege silt loam, the surface soil is considerably deeper than typical, extending in places to 8 or 10 inches. Throughout the rest of the type the depth of the surface soil depends upon the topography and the extent of erosion. The deeper and darker soil occurs upon the more gradual slopes where conditions have been most favorable for soil weathering and the accumulation of organic matter. Upon the steeper slopes, shoulders of hills, and crests of ridges the dark-colored surface soil has mostly been removed by erosion, exposing the white calcareous subsoil. Small areas were encountered in which the surface material contains so much sand as to approach a very fine sandy loam in texture. These variations are too small and too scattered to warrant separate mapping.

The Colby silt loam is one of the most extensive soils of the area. It occurs throughout the eroded loess plains, chiefly on the north side of the Platte River Valley. Some of the best developments occur on both sides of the Wood River Valley in the northeastern part of the county. The type is not extensively developed south of the Platte River. The topography is rolling to hilly. The soil occupies the smoother divides and slopes between stream channels. It is intermediate, both in topography and position, between the gently undulating to rolling areas of Holdrege silt loam, which cap the broader divides, and the badly eroded and dissected areas of Colby silt loam, broken phase. Drainage is good and upon many of the steeper slopes is excessive. In these localities erosion has become serious and the areas of Colby silt loam, broken phase, are gradually extending.

The Colby silt loam is an important agricultural soil in Dawson County. The topography is somewhat rougher than that of the Holdrege soils, but its large extent tends to make it one of the most important of the upland types. About 80 per cent of it is under cultivation; the rest, which comprises only the rougher parts, is used for grazing and hay production. The native vegetation consists of a luxuriant growth of grama grass, bunch grass, redtop, western wheat grass, bluestem, and many other nutritious grasses.

Of the cultivated crops, corn, wheat, alfalfa, oats, rye, and barley are the most important, ranking in acreage in the order named. Wheat is the chief cash crop, although on farms where little livestock is kept most of the corn is sold. Many farmers grow wheat on the same land continuously for periods of three to five years. Small patches of sorghum, millet, and Sudan grass are occasionally grown. Orchard fruits do well in favorable seasons. The crop yields are governed largely by moisture conditions, the condition of the soil, and the care used in cultivation. The general crop yields are a trifle lower than those obtained on the Holdrege soils. Corn yields range from 15 to 50 bushels per acre, depending on the season. The average yield is about 25 bushels per acre. The average yield of wheat over a period of years is about 12 bushels per acre. In favorable seasons 25 to 35 bushels are obtained. Alfalfa yields $2\frac{1}{2}$ to 3 tons per acre from three cuttings. This soil is exceptionally well adapted to alfalfa on account of its loose friable structure and high lime content. The crop is an excellent one for the soil as it prevents erosion, adds nitrogen, and increases the organic-matter content. The average yield of oats is about 20 bushels, rye 15 bushels, and barley 20 bushels per acre. Cattle are grazed on the rougher areas. Hereford is the principal breed. A few farmers feed stock for eastern markets.

The soil of this type is easily handled and can be cultivated under a rather wide range of moisture conditions without serious injury. It has a tendency to clod if plowed wet, but the lumps are easily reduced. Care should be taken to prevent soil washing on the steeper slopes. Commercial fertilizers have never been used in growing the staple crops. Barnyard manure is applied when available. No definite system of crop rotation is practiced, although most farmers change their crops with reasonable regularity and grow alfalfa frequently.

The selling price of land of this type ranges from \$50 to \$100 an acre, depending upon improvements, topography, and distance from markets.

It is advisable to use every possible means to conserve and increase the supply of organic matter and to prevent the erosion of the surface soil. In its virgin state the soil is naturally productive. Its topography, however, is unfavorable for the accumulation of organic matter when the soil is used for crops, and under the present system of management the areas of the broken phase of the type are gradually increasing at the expense of typical soil. Alfalfa is a valuable crop for this soil and should be used in the rotation as often as possible. Sweet clover is also very beneficial to the land. The straw from old stacks should be hauled out and spread over the land rather than burned or left to decay.

Colby silt loam, broken phase.—The Colby silt loam, broken phase, covers areas formerly occupied by the Holdrege silt loam or Colby silt loam. Stream erosion, however, has created a rough and canyon-like relief and has greatly thinned or entirely removed the dark-colored surface layers, leaving the ashy-gray calcareous silt of the unweathered or slightly weathered loess exposed in many places. A very small quantity of organic matter gives the shallow surface soil a somewhat darker color than that of the subsoil, but the difference

is not great. The material becomes gradually lighter in color with depth and at about 24 inches is an almost white, loose, floury, calcareous silt.

This phase is one of the most extensive soils of the county and occupies the greater part of the eroded loess plains on each side of the Platte River. It is developed wherever erosion has created a harsh relief and is most extensive in the northeastern, north-central, and southwestern parts of the county, where the drainage is the most intricate. The best developments appear along the bluff line between the uplands and Platte Plain in the southwestern corner of the county. Back of this escarpment erosion has been less severe and the phase gives way to soils of the Holdrege series.

The topography everywhere is rough and hilly, except along the narrow canyon floors, which have a flat, gently sloping surface. All parts of the phase are dissected by intermittent streams that have cut deep and in places almost perpendicular walled valleys. Soil slipping is common on the steeper slopes and they often present a succession of short vertical exposures locally known as "catsteps." The divides are sharp and crestlike. The surface consists of an intricate succession of steep ravines 75 to 125 feet deep. Drainage is excessive.

The greater part of the phase is used for grazing and hay land. Probably not over 10 per cent of it is under cultivation. The only tillable areas are the more gradual slopes, the narrow canyon floors, and remnants of other types too small to show on a map of the scale used in this survey. The canyon floors, however, are flooded after heavy rains and their value for crop production is limited.

Where erosion has been exceptionally severe the slopes are almost bare of vegetation or support but a sparse growth of pasture grasses, weeds, and shrubs. Over most of the phase, however, there is a good growth of nutritious pasture grasses, including grama grass, wheat grass, bluestem, and wire grass. These grasses will support 100 to 150 cattle per section during the summer grazing season. The canyon floors are used chiefly for hay land. Some dwarf ash, hackberry, elm, cottonwood, chokecherry, and raspberry grow along the canyons throughout the type.

All crops common to the Colby silt loam are grown on the broken phase. It is impossible to give representative yields of the various crops, however, as the fields are usually irregular and the phase rarely forms more than a small part of the farmed areas. In general the yields are considerably lower than those obtained on the surrounding soils.

The selling price of the land varies from \$20 to \$40 an acre, depending largely upon topography, improvements, and location with respect to markets. It is usually bought for grazing.

Alfalfa is a very valuable crop for this soil and does exceptionally well upon the canyon floors. The moisture conditions are less favorable upon the slopes and divides, although the crop gives larger returns than the native pasture grasses even in these localities.

VALENTINE SAND

The surface soil of the Valentine sand consists of a loose, incoherent grayish-brown sand, 10 to 14 inches deep. The upper 4 inches is usually somewhat darker than the subsurface on account of a higher content of organic matter. This material, however, is never present in sufficient quantities to prevent the soil from drifting when the protective vegetation is removed. The subsoil is a loose incoherent sand which extends below 3 feet. It is usually gray, although locally it may be tinted with light brown or pale reddish brown. The material is practically devoid of organic matter. Neither the soil nor subsoil is noticeably calcareous. The sand of which the type is so largely composed consists of the medium, fine, and very fine grades with the medium sand predominating. It is composed chiefly of quartz and feldspars.

The color and depth of the surface soil varies somewhat with its topographic position. In the shallow depressions, where conditions have been most favorable for the growth and decay of plant life, the soil is somewhat darker and deeper than elsewhere. On the crests of the low, rounded knolls and ridges, however, the organic matter has been largely removed by the wind, leaving the soil quite shallow and prevailing light in color.

The Valentine sand occurs along the western county line north of the Platte River and locally south of the river in the vicinity of the Darr Bridge. Its total area does not exceed 8 square miles. The type has been formed by the partial weathering of sand probably transported by the wind from the vast sand-hill region to the west. The original material has been reworked and reassorted to such an extent that it is difficult to make any positive classification in regard to its origin.

The topography of this type varies from almost flat to rolling. The greater part, however, presents a hummocky to billowy surface. The flatter areas are usually modified by scattering low, rounded knolls and ridges. Drainage is everywhere good and in many places excessive. There is very little surface run-off, but the loose porous sands absorb and carry off the moisture as fast as it accumulates.

The Valentine sand is of little value for crop production on account of its low humus content, low water-retaining capacity, and the danger of drifting when the native sod is destroyed. Probably not over 25 per cent of it is under cultivation. Corn and alfalfa are grown in the lower depressions where moisture conditions are most favorable. Small grain is seldom grown on account of the loose nature of the seed bed. Alfalfa does fairly well under the most favorable conditions. It is extremely difficult, however, to obtain a good stand and the crop seldom lasts more than three or four years, on account of the low lime content of the soil. Yields of all crops are low, except in the most favorable seasons.

Most of the land remains with its original covering of grasses and is used for grazing cattle and hay production. The native vegetation consists of sand grass, stipa, big and little bluestem, and small quantities of grama grass. These grasses will support 100 to 150 head of cattle per square mile during the grazing season or when cut for hay will yield about one-half ton per acre.

Land of the Valentine sand type sells for \$40 to \$60 an acre. The price depends chiefly upon the topography and improvements.

The type is very unstable and blows badly when not protected by vegetation. Coarse manure and straw spread over the land have proved beneficial in preventing excessive drifting. Corn usually is deeply listed.

VALENTINE LOAMY SAND

The surface soil of the Valentine loamy sand is a brown to dark-brown loamy sand, 8 to 12 inches deep, containing sufficient organic matter to give it a loamy texture. The subsoil, appearing at an average depth of 10 inches, is a gray to yellowish-brown, loose, incoherent sand, locally tinged with red. It in most places contains barely enough silt and clay to give it a slightly sticky nature when wet. Neither the soil nor subsoil has sufficient lime to effervesce with dilute hydrochloric acid. The type differs from the Valentine sand only in the larger humus content of its surface soil and consequently darker color.

The Valentine loamy sand is of small extent in Dawson County. It occupies small areas within the Valentine sand body in the northwestern part of the county and occurs locally on the terraces about 2 miles northeast of Darr and also north of Josselyn. Its total area does not exceed 6 square miles.

The origin of the soil is difficult to determine. The sand of which it is so largely composed probably represents material derived originally from the Arikaree sandstone of Tertiary age. It has, however, been shifted by wind and water, and so modified, redeposited, and subsequently weathered, that it is not possible to make any definite statement as to the history of the material.

The surface is flat to gently undulating, but broken by low knolls and ridges composed of almost pure sand. The type lies somewhat below the general level of the Valentine sand and has a more even topography. Surface drainage has not been established, as the rainfall rapidly sinks into the porous sand and there is practically no run-off.

The type is of little agricultural importance in Dawson County on account of its small extent. It is, however, a better farming soil than the Valentine sand, and about 70 per cent of it is under cultivation. Corn and alfalfa are the chief crops. The corn is deeply listed to prevent soil drifting and to give the seedlings the most favorable moisture conditions possible. Alfalfa is not well adapted to the soil on account of the lack of lime, which greatly shortens the life of the crop. The yields of both corn and alfalfa, however, are somewhat higher than on the Valentine sand, on account of the higher humus content and more favorable moisture conditions in these loamy areas. The average yield of corn is about 18 bushels per acre and of alfalfa $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre, depending upon the rainfall. The latter crop is usually cut twice. Most of the land not in corn or alfalfa remains with its native covering of grasses and is either pastured or used for hay production.

The selling price of land of the Valentine loamy sand type averages about \$75 an acre. The price varies with the topography and improvements.

The soil of this type is slightly more stable than that of the Valentine sand on account of its higher content of organic matter. It drifts badly, however, when the protective covering of grasses is removed, unless care is taken to protect it at all times. Large quantities of barnyard manure should prove beneficial. It is advisable not to disturb the soil until ready to plant, as it should not be left unprotected longer than necessary.

SCOTT SILTY CLAY LOAM

The soil of this type is a dark grayish brown to ashy-gray heavy silty clay loam, 8 to 12 inches deep. The subsoil, which usually continues to below the 3-foot depth, is a black heavy and compact clay to silty clay. Rusty-brown mottlings are encountered below 30 inches in many areas. The material is not usually calcareous within the 3-foot depth.

A few local variations occur. In places the subsoil below 30 inches becomes less compact and lighter in color. It consists of a gray silty clay which is highly calcareous. Locally a layer of ashy-gray silt, 2 to 4 inches thick, is encountered between the surface layer and the heavy clay of the subsoil.

This type occupies small basinlike depressions, locally known as "buffalo wallows," scattered throughout the heavier textured upland and terrace soils. Most of the areas vary in size from a few square rods to about 3 acres and none exceed 200 acres. The largest development, comprising an area of about 175 acres, occurs 3 miles north-east of the Ringgold School in the south-central part of the county. This area is not typical, having a calcareous lower subsoil. A smaller though very typical area occurs in the uplands in the north-east corner of section 23, T. 9 N., R. 23 W.

The type has poor drainage, and in the spring after heavy rains water stands on the surface for periods of a few days to several weeks. This explains its origin, for it has been formed by wash from the surrounding higher land deposited over older material that now constitutes the subsoil. The lower subsoil which is high in organic matter apparently is a still older soil formed by the deposition of clay and silt in standing water.

Owing to its small extent and poor drainage, the type is of little agricultural importance. The greater part, however, lies within cultivated fields and is generally used for crop production. In normal years fair yields are obtained. During wet seasons the ground remains too moist for cultivation and in dry years the soil cracks badly causing crops to suffer from lack of moisture. A few farmers do not cultivate across this type but allow it to stand as waste land in the fields.

No definite value can be placed on the Scott silty clay loam, as it forms but a small part of the farms on which it occurs.

The greatest need of this soil is adequate drainage. It is doubtful, however, if the increased production would compensate the expense involved in draining such small areas. Although the soil is practically worthless for crop production, it ordinarily is associated with the best land in the county and may be used as a fair indication of good farming soil. The bodies are usually too small to cause any appreciable decrease in production.

HALL LOAMY FINE SAND

The surface layer of the Hall loamy fine sand is very dark brown to dark grayish brown fine sand, the shade depending upon the content of organic matter. The depth of this layer ranges from 6 to about 8 inches. The material is composed mainly of a mixture of the fine and very fine grades of sand, with which there is mixed sufficient organic matter to give a loamy texture. The upper subsoil, which extends to an average depth of about 12 inches, is a grayish-brown to dark grayish brown friable very fine sandy loam containing, in many areas, more organic matter than the immediate surface. This material is underlain by a more compact very fine sandy loam. It is of a light grayish brown to gray color and continues to about 30 inches, where there appears a light-gray to almost white loose floury silt. This also forms the substratum to great depths. This type differs from the Hall fine sandy loam chiefly in the lower organic-matter content of its surface layer. The lower subsoil is highly calcareous.

A few variations occur. In places the slightly compact subsoil layer is entirely absent. In these places the surface soil consists of a dark grayish brown loamy fine sand to an average depth of 10 inches. It is underlain by a lighter colored friable very fine sandy loam which gradually becomes lighter in color and more silty in texture until the light-gray or almost white calcareous silt of the lower subsoil and substratum is encountered. Around the margins of the type the surface soils merge gradually into those of other types and it is often necessary to draw arbitrary lines separating the different textures, especially in the loamy fine sand and fine sandy loam types.

The Hall loamy fine sand, as developed in Dawson County, occurs in small scattered bodies on the Platte River terraces, chiefly north of the river. The total area does not exceed 6 square miles. The largest development, comprising an area of about 2 square miles, lies north of the Darr Bridge in T. 10 N., R. 22 W. A quite uniform though smaller body occurs northwest of Lake Helen in T. 11 N., R. 25 W. A small area borders the south side of the Platte River channel southeast of the Darr Bridge.

The type has been formed in the same manner as the other members of the Hall series, except that it has received a larger proportion of wind and water deposited sand in its surface layer and is consequently of a slightly less stable nature. Conditions have not been so favorable for the accumulation of large amounts of organic matter as in the heavier Hall types and the surface soil is somewhat lighter in color.

The surface is flat to very gently undulating, locally modified by low sandy ridges and knolls resulting from wind action. Drainage is everywhere good. None of the soil is subject to active erosion.

Owing to its small extent the type is of little agricultural importance. It is a good farming soil, however, and about 90 per cent of it is under cultivation. The principal crops are corn and alfalfa. About 50 per cent of the cultivated land is irrigated. When artificially watered this soil is very stable and yields as well as the heavier types. Under dry-farming conditions, however, the or-

ganic-matter content is in places insufficient to keep the soil from drifting during dry windy seasons.

Under dry-farming conditions the average yield of corn is about 20 bushels and of alfalfa 2 to 2½ tons per acre. On the irrigated areas the yields of all crops are about the same as on the heavier members of the Hall series.

The soil is easily handled and can be cultivated under any moisture conditions without injury. Lighter machinery and less power is required to till this soil than the silt loam and very fine sandy loam types. No commercial fertilizer is used, although barnyard manure is applied when available.

It is difficult to obtain land values for this type as it usually occupies but a part of the farms on which it occurs. From \$75 to \$125 an acre probably represents the range in price under present conditions.

HALL FINE SANDY LOAM

The surface material of the Hall fine sandy loam is a grayish-brown to very dark grayish brown fine sandy loam, 8 to 10 inches deep. The soil is rich in organic matter and the darker color predominates. The sand constituents include little material coarser than the fine grade. The upper subsoil is a lighter brown very fine sandy loam containing sufficient silt and clay to give it a slightly compact nature. The material gradually becomes lighter in color and heavier in texture to an average depth of 30 inches, where it normally changes rather abruptly to a light-gray or almost white loose floury silt. The lower part of the upper subsoil contains a larger quantity of silt and clay and is moderately compact. The material, however, nowhere approaches a hardpan in physical characteristics. The lower subsoil is highly calcareous.

In a few places the heavy subsoil layer is absent. In these localities the upper subsoil is a light-brown friable very fine sandy loam which gradually becomes lighter in color and finer in texture until the light-gray to white calcareous material of the lower strata is encountered. Around the margins of the type the soil merges gradually with that of the Hall very fine sandy loam, and it is often necessary to draw arbitrary lines separating the two.

The Hall fine sandy loam is not very extensively developed in Dawson County. It occurs in small, irregular-shaped areas on the terraces throughout the Platte River Valley. The areas in many places are surrounded by or closely associated with areas of Hall very fine sandy loam. They range in size from about 10 to 640 acres. One of the largest lies south of the Platte River between the Darr and Lexington wagon bridges. Smaller though quite typical areas occur on the terraces northeast of Darr.

This type has been derived in much the same manner as the other members of the Hall series. Its larger sand content is due in part to a deposition of coarser material and in part to sands blown from the surrounding types. The topography is flat to very gently undulating. Locally the type occupies low, rounded ridges and knolls, although the greater part occurs at about the same level as the other members of the Hall series. Drainage is everywhere good. There is ordinarily sufficient slope, even on the flatter areas, to carry off the excess moisture.

Owing to its rather small extent the Hall fine sandy loam is not an important farming soil in Dawson County. It is well adapted to all the common crops, however, and yields as well as any of the terrace soils. About 90 per cent of it is under cultivation and the rest is in pasture and hay land. Over half of the cultivated land is irrigated. Corn, alfalfa, and oats are the leading crops. Yields depend upon the rainfall and irrigation facilities, and under the same moisture conditions all crops produce as well as upon the Hall silt loam or very fine sandy loam types.

The soil has a loose, mellow structure and is easy to work and maintain in good tilth. It is not injured by plowing or cultivating immediately after rains.

The selling price of land of the Hall fine sandy loam type ranges from \$150 to \$200 an acre, depending upon location, improvements, and irrigation facilities.

HALL VERY FINE SANDY LOAM

The surface soil of the Hall very fine sandy loam consists of a dark grayish brown material, composed largely of very fine sand and silt, with an average depth of about 10 inches. Only a small percentage of clay is present and scarcely any material coarser than fine sand. The soil has a high organic-matter content and appears black when wet. The upper subsoil is a light grayish brown very fine sandy loam containing large amounts of silt and clay. It is considerably heavier than the surface layer, owing to its high clay content. This layer extends to an average depth of 20 inches and is underlain by a light-gray very fine sandy loam to silt loam of but slightly more compact nature than the surface soil. Below 30 inches the subsoil consists of an almost white floury very fine sandy loam or silt containing sufficient lime to effervesce freely with acid. In a few poorly drained spots the lower subsoil is a yellowish-gray, compact waxy clay. The change in color and structure through the different layers is very gradual.

In local patches scattered throughout the type the subsoil is not noticeably calcareous within 3 feet of the surface, and had these areas been of sufficient size to warrant mapping they would have been included with the Waukesha series. In a few places the slightly compact subsoil layers are entirely absent and the upper subsoil is a brown to light-brown friable very fine sandy loam, which becomes gradually lighter in color and finer in texture to the level where the light-gray to almost white floury silt of the lower subsoil is encountered. In many localities the division line between the Hall silt loam and very fine sandy loam is arbitrary, as the two types gradually merge into each other.

The type is one of the most extensive soils in the valley of the Platte River. It ranks next to the Hall silt loam in total area and occurs on both sides of Platte River. It is most extensively developed in the eastern part of the valley, while the silt loam member occurs chiefly in the western half. The types intermingle, however, and large areas of both appear throughout the valley. Narrow strips extend along the larger streams in the loessial uplands. The soil is not uniform throughout the areas of its occurrence, but includes numerous bodies of other types. It often occupies positions adjacent

to the first-bottom or flood-plain soils, while the heavier textured member occurs nearer the uplands. The type has weathered from alluvial material of loessial origin in the same manner as that of the Hall silt loam. The surface of this type, however, has received considerably more sand than that of the heavier member.

The topography is flat to very gently undulating. The type occurs at several different terrace levels but is everywhere above overflow. Drainage is generally good, as there is usually sufficient slope toward the stream channels and down the valleys to carry off the surplus moisture. There are a few local depressions where drainage is poorly established, but these in most places are of such small extent that they do not interfere with farming. The soil is nowhere subject to erosion.

The type is an important agricultural soil in Dawson County. It is naturally fertile and ranks with the Hall silt loam in productivity. About 90 per cent of it is under cultivation and the rest is included in farmsteads and pastures. About one-half of the cultivated land is irrigated. Corn and alfalfa are the principal crops, followed by wheat, oats, and rye, ranking in acreage in the order named. Sugar beets are grown on a few farms. This crop does exceptionally well on all members of the Hall series. The absence of local refineries, however, has greatly checked the development of the sugar-beet industry. Cattle raising is not practiced extensively on account of the small acreage of pasture land. Many farmers, however, feed cattle for the Omaha markets. Hogs are raised on every farm. A few farmers have purebred herds and specialize in this industry. The cattle and hogs are fattened on corn and alfalfa.

Crop yields are about the same as those obtained on the Hall silt loam and the soil is handled in the same manner.

The land sells for about \$150 to \$200 an acre, depending upon irrigation, improvements, and location with respect to markets.

Hall very fine sandy loam, colluvial phase.—The surface soil of the Hall very fine sandy loam, colluvial phase, is a dark grayish brown to very dark grayish brown friable very fine sandy loam, 8 to 12 inches deep. The upper subsoil, to an average depth of 20 inches, ordinarily differs little from the surface layer either in color or texture, though it is in places slightly darker. Below this depth the silt and clay content gradually increases and the material between 20 and 30 inches is usually slightly more compact than the surface layer. At the lower depth an abrupt change takes place, the material below being a friable silt to silty clay loam of light-gray color. Both the soil and upper subsoil are rich in organic matter. The phase is not usually sufficiently calcareous within 3 feet of the surface to effervesce with dilute hydrochloric acid.

A few variations occur. Locally the light-colored subsoil layer is not developed within the 3-foot profile and there is little change either in color or texture throughout the soil section, except that the sand content gradually decreases with depth. In these localities the lower subsoil consists of a brown, friable silt loam. In marginal parts of the phase, where it borders areas of the typical Hall types, the subsoil below 30 inches is much lighter in color and highly calcareous. In a few places the surface soil contains so much fine sand

as to approach a fine sandy loam in texture. These variations were of such small extent and local occurrence as not to warrant mapping.

The total area of the phase does not exceed $2\frac{1}{2}$ square miles. It occurs as narrow broken strips of gradually sloping land between the base of the upland escarpment and the more nearly level terrace soils. The areas vary in length from one-half to about 4 miles and have an average width of about 80 rods. The largest area lies between Hiles and Midway Canyons, in the southwestern part of the county. A smaller though quite typical body lies west of French Creek in the north-central part of the county. Small areas occupy the slopes to terraces both north and south of the Platte River.

The soil owes its position mainly to colluvial action, although in many places it has been considerably modified by alluvial deposits and resembles terrace or bench land. It is of comparatively recent origin and sufficient time has not elapsed for the development of the light-colored, compact, and highly calcareous subsoil of the typical Hall soils. The topography is smooth, with a decided slope toward the center of the valley. It lies far above the normal flow of the river and is well drained. No part of it is subject to rapid erosion.

Owing to its small extent the phase is not important in the agriculture of the county. Its high organic-matter content and friable structure tend to make it drought resistant, and where it occurs more extensively it is regarded as a very valuable farming soil. It is equal to the best upland and terrace soils in natural productiveness. Nearly all of it is under cultivation. None of the phase is irrigated. Corn, alfalfa, wheat, and oats are the principal crops. Potatoes and other vegetables are grown to supply the home demand.

Corn gives an average yield of about 25 bushels per acre, wheat 18 bushels, oats 25 bushels, and alfalfa 2 to $2\frac{1}{2}$ tons from three cuttings. The land is handled in the same manner as the heavier textured upland and terrace soils.

The selling price of this land ranges from \$100 to \$150 an acre, depending upon location and improvements.

HALL SILT LOAM

The surface soil of the Hall silt loam is a very dark grayish brown to almost black friable silt loam, 8 to 10 inches deep. There is usually present a relatively high percentage of very fine sand, but little material of a coarser nature. The soil is rich in organic matter. The upper subsoil is a light grayish brown to grayish-brown rather compact silty clay loam which continues to an average depth of 24 inches. This material passes abruptly into a friable silty clay of yellowish-gray color which extends below 3 feet. The change between the soil and upper subsoil is very gradual. The material below 30 inches is highly calcareous. The lime content apparently is not high in the surface material, although there is no evidence of a deficiency.

A few local variations occur. Scattered throughout the type, and especially upon the higher terraces, are many small bodies in which the lime has been leached to below the 3-foot depth, and the soil profile resembles that of the Waukesha silt loam of eastern Nebraska. The surface soil is a dark-brown silt loam, 8 to 10 inches

deep, underlain by a brown slightly compact silt to silty clay loam which usually continues to below 3 feet before encountering the yellowish-gray calcareous substratum.

In local areas north of Gothenburg the heavy subsoil layer is almost absent and the surface horizon rests upon a loose mellow silt to silt loam of light-brown color and from 8 to 12 inches thick. This material changes rather abruptly at an average depth of 30 inches into the yellowish-gray calcareous silt of the typical subsoil.

Where the type borders areas of sandy soils the surface layer contains so much very fine sand as to approach a very fine sandy loam in texture, and it is often difficult to separate accurately this type from the Hall very fine sandy loam. These variations, while distinct over local areas, are so scattered and of such small extent as not to warrant mapping.

The Hall silt loam is extensively developed in Dawson County. It is the principal soil on the terraces along the Platte River and occupies large areas on both sides of this stream. The type is most typically developed in the western part of the county north of the river. Narrow strips lie along all the larger creeks throughout the uplands.

The type represents alluvial material of loessial origin deposited when the streams were flowing at higher levels. It occupies alluvial terraces of different ages and elevations. The topography is flat to gently undulating, with a gradual slope toward the streams and down valleys. The surface lies 10 to 50 feet above the first bottoms and is well drained. The slight slope is sufficient to afford ample outlet for surface waters. The soil is nowhere subject to stream erosion.

The Hall silt loam is probably the leading agricultural soil in Dawson County. A large part of it is under irrigation. Its large extent, favorable topography, fertile nature, and good irrigation facilities tend to make it a highly-prized farming soil. Practically all of it is under cultivation. Corn, alfalfa, wheat, and oats are the leading crops, ranking in acreage in the order named. Barley, rye, millet, cane, potatoes, and sugar beets are raised on many farms. The latter crop is gradually increasing in acreage, on account of the favorable soil and climatic conditions. There are no local sugar refineries, however, and the sugar beet industry can not become so extensively developed as in the western counties of Nebraska until local refineries are established. The raising of hogs is an important industry on this type, and every farmer fattens a few head for market. Cattle raising is not practiced extensively, on account of the very small acreage of pasture on the average farm. Some farmers, however, are engaged in cattle feeding. They use the surplus grain and alfalfa produced in the neighborhood. No strictly dairy herds are maintained, although milk cows are kept on every farm to supply the home dairy needs. The surplus cream and butter is sold locally.

The average yield of dry-farmed corn on this type is about 25 bushels per acre. Under irrigation yields of 50 to 60 bushels are common. Irrigated alfalfa yields $3\frac{1}{2}$ to $4\frac{1}{2}$ tons per acre; where the crop is not artificially watered the yields are seldom over half as much. The corn and alfalfa is used chiefly for fattening cattle and hogs. Wheat is usually grown throughout the dry-farmed part of the type, lying between the canals and the uplands. The crop yields

from 15 to 20 bushels per acre, depending upon the rainfall. Most of the grain is sold in local elevators. The average yield of oats is about 25 bushels per acre. Rye averages 20 bushels and barley about the same as oats. Small grain is seldom irrigated, as the crops mature before the dry, hot winds occur in July and August, and there is usually sufficient moisture in the soil to insure fair yields. The average yield of dry-farmed potatoes is about 75 bushels per acre; under irrigation this crop yields 175 to 250 bushels. Sugar beets yield 12 to 15 tons per acre.

The land of this type, when handled under favorable moisture conditions, is easily worked and maintained in good tilth. If plowed wet it has a tendency to clod, but the lumps are easily reduced. Four-horse teams and gang plows are commonly used. Owing to the level character of the surface, tractors can be easily used in fall plowing.

Barnyard manure is applied to the land when available, although the supply is seldom sufficient for best results. The need of fertilizers has not been noticed on this type as the land is new and in no immediate danger of becoming exhausted. Systematic crop rotation is not practiced. The more progressive farmers, however, change their crops with reasonable regularity and grow considerable alfalfa each year. This crop probably gives better results than on any other soil in the county. The stands are usually maintained from 5 to 7 years, or as long as the yields remain profitable.

The greater part of the irrigated Hall silt loam has a selling price of \$175 to \$200 an acre. The unirrigated land sells for a little less. The difference in price is usually not sufficient to warrant purchasing the dry-farming areas.

HALL CLAY LOAM

The surface soil of the Hall clay loam is a dark grayish brown to almost black clay loam, 6 to 8 inches deep. The material consists chiefly of silt and clay, together with large quantities of finely divided organic matter which give it the dark color. It is sticky and plastic when wet but becomes hard and brittle upon drying. The upper subsoil is a gray or grayish-drab, heavy, compact clay to clay loam which continues to an average depth of about 20 inches. The substratum is a yellowish-gray, loose, floury silt containing considerable very fine sand. It extends to depths below 3 feet. A layer of coarse sand is often encountered at about 40 inches. The material is highly calcareous below an average depth of 24 inches.

Small alkali spots ranging in size from a few square rods to about one-half acre occur locally. In a few places the surface soil contains such a large percentage of silt as to approach a heavy silt loam or silty clay loam in texture. These, the only notable variations, are not of sufficient importance to justify separate mapping.

The Hall clay loam occurs in small isolated areas throughout the terrace lands on both sides of the Platte River. Its total extent does not exceed 9 square miles. The largest body, comprising an area of about 1,200 acres, lies southwest of Cozad. A smaller though very typical area lies 1 mile east of the Ringgold School

in T. 9 N., R. 23 W. Other areas are mapped northeast of Cozad, south of the Gothenburg Bridge, and in the vicinity of the Banner School.

The type has been formed in the same manner as the Hall silt loam. The heavier texture of its surface and upper subsoil layers is due largely to the addition of fine silt and clay washed from adjoining higher lying soils. The topography is flat and drainage variable, but there is usually sufficient slope to carry off the surplus moisture in average seasons. During years of abnormal precipitation, however, the soil is too moist for successful farming unless artificially drained.

The Hall clay loam is an unimportant agricultural soil in Dawson County, owing to its small extent and uncertain drainage. It is naturally fertile, however, and all crops do well in normal seasons. In dry years the soil cracks, causing crops to suffer from lack of moisture. About 50 per cent of the type is under cultivation and the rest is used for pasture and hay land. Corn, wheat, oats, and alfalfa are the leading crops. Yields depend largely upon the rainfall. During average seasons corn yields 18 to 25 bushels per acre, wheat 12 to 15 bushels, oats 15 to 30 bushels, and alfalfa 2 to 2½ tons from three cuttings. About 40 per cent of the cultivated land is irrigated. In these sections the yields compare very favorably with those obtained on the irrigated silt loam or very fine sandy loam types, except during seasons of heavy rainfall when the crops on this soil are greatly injured on account of inadequate drainage.

Land of the Hall clay loam sells for \$50 to \$150 an acre, depending largely upon improvements, drainage, and irrigation facilities.

LAMOURE VERY FINE SANDY LOAM

The surface soil of the Lamoure very fine sandy loam is a black very fine sandy loam, 8 to 12 inches deep. It contains a relatively large percentage of silt and very little material coarser than fine sand, and there is an abundance of organic matter which gives the soil its dark color. The upper subsoil is a slightly compact, mottled gray and dark-gray very fine sandy loam containing a large proportion of silt and clay. This material extends to an average depth of 24 inches, where it grades into a lighter colored, mottled gray and white, compact material consisting chiefly of very fine sand, clay, and lime which continues to below 3 feet. Both subsoil layers are sticky and plastic when wet, and become hard and brittle upon drying. The surface soil is usually slightly calcareous, and the subsoil has a high lime content. Small angular lime concretions from one-sixteenth to one-eighth inch in diameter are very abundant in the lower stratum. Alkali spots, in places, of large extent, are numerous throughout the type. They are especially noticeable in the spring, when the white efflorescence of soluble salts appear at the surface over considerable areas.

Included with this type are two small areas in which the surface material contains such a high percentage of coarse sand and fine gravel that it has a sandy loam or coarse sandy loam texture. The largest, comprising an area of about 320 acres, occurs as a narrow strip in sections 25, 30, and 29, T. 9 N., Rs. 20 and 21 W. An area, including about 180 acres, borders Lexington on the east side. These

areas differ from the typical soil chiefly in the coarser texture of their surface soils. The upper subsoil is also locally darker in color than that of the Lamoure very fine sandy loam on account of the more extensive downward leaching of organic matter from the porous surface material.

The Lamoure very fine sandy loam occupies a large total area in Dawson County. It is not so extensive as many of the terrace and upland soils but leads in acreage among the bottom-land types. It occurs only in the valley of the Platte River and chiefly on the north side of the stream. The areas are large, though not uniform throughout the area of their occurrence, and contain types of both the terrace and bottom-land soils within their borders. The most extensive developments are between Darr and Overton. A large area lies west of Cozad. The type is poorly developed south of the river and is confined to a few scattered bodies, with a total area of about 320 acres.

The type has weathered from recent alluvium composed mostly of loessial material which has been deposited upon the flood plains and low terraces along the Platte River. The topography is in general flat but modified in places by shallow depressions and old stream channels. Drainage is poor. The greater part occupies low terrace positions within areas of Hall very fine sandy loam and lies well above present stream overflow. The underlying water table, however, is so near the surface as to keep the soil too moist for most crops. The compact subsoil layers prevent adequate underdrainage, and in seasons of heavy rainfall water stands on the surface of the lower lying areas for considerable time.

Owing to the poor drainage and the presence of alkali the type is not an important agricultural soil in this county. About 80 per cent of it remains in pasture and hay land, and the rest, including the better drained areas and those containing the least alkali, is used for crop production. The native vegetation consists of a large variety of water-loving grasses and sedges, of which salt grass occupies the largest acreage. Of the cultivated crops, corn, oats, alfalfa, and barley are the most important. Sweet clover, timothy, sorghum, and sugar beets are grown to a small extent. The last crop is valued because of its ability to resist alkali, and for this reason it is probably better adapted to this soil than either cereals or alfalfa. It yields well during most seasons. The grazing of beef cattle is practiced extensively throughout the type. Most of the cattle are Herefords and Shorthorns. A few hogs are raised on every farm.

The average yield per acre of corn is about 20 bushels, oats 20 to 25 bushels, barley about 25 bushels, and alfalfa $2\frac{1}{2}$ to 3 tons from three cuttings. It is often quite difficult to obtain a good stand of alfalfa, as the young plants are susceptible to injury by alkali. After a stand is established, however, it does as well as upon the better drained terrace lands, providing the alkali content is not excessive. Sugar beets yield 12 to 15 tons per acre. The native grasses on this type will support a cow or steer per acre during the summer grazing season, or when cut for hay will yield 1 to $1\frac{1}{2}$ tons per acre.

The soil of the Lamoure very fine sandy loam is not difficult to handle, providing adequate drainage is established. Clods are formed if the land is plowed wet, but the lumps are easily reduced by harrowing or disking. Corn is usually listed in, although many farmers

prefer to plant the grain in checkrows, as the crop can be more easily kept free of weeds. Small grain is planted with a press drill on plowed or double-disked corn or stubble land. Alfalfa is usually sown broadcast on a well-prepared seed bed.

Most of the corn and alfalfa is fed on the farms where produced. Sugar beets are shipped to the refinery at Grand Island.

The selling price of the Lamoure very fine sandy loam ranges from \$70 to \$125 an acre, according to the drainage conditions.

The primary need of this soil is artificial drainage. It is naturally strong and fertile, and where drainage is well established the soil yields as well as any in the county. Deep drainage ditches or tile drains also would tend to remove the excess of alkali salts present in some areas.

LAMOURE SILT LOAM

The surface soil of the Lamoure silt loam is a very dark grayish brown to almost black mellow silt loam, 8 to 12 inches deep. It contains a small percentage of very fine sand but practically no material of coarser grades. The soil is high in organic matter and appears black when wet. The upper subsoil is slightly more compact than the surface soil and consists of a grayish-brown or light grayish brown heavy silt loam to silty clay loam. It is underlain at about 30 inches by a light-gray or almost white material consisting chiefly of silt and very fine sand which continues to depths below 3 feet. The subsoil layers are stiff and plastic when wet and hard and brittle when dry. The surface soil and upper subsoil are slightly calcareous, and lime is abundant below 24 inches, where it occurs in both the powdered form and as angular concretions one-sixteenth to one-eighth inch in diameter. The subsoil is frequently mottled with dark-gray splotches and rusty iron stains. The organic content gradually decreases with depth. A loose, porous medium sand is sometimes encountered below 32 or 34 inches.

The Lamoure silt loam occurs in a few irregular shaped areas on the lower terraces and flood plains on the north side of the Platte River. The areas vary in size from about 80 acres to approximately 2 square miles. They are few in number and the total area is approximately 9 square miles. One of the larger areas lies east, southeast, and northeast of Overton in T. 9 N., R. 19 W. A small though quite typical area lies south of Darr in the south-central part of the county. Other areas are scattered along the Lincoln Highway across the county. The type has been derived through weathering from alluvial loessial material deposited upon the low terraces and flood plains of the Platte River.

The topography is prevailingly flat and drainage is poorly established. Much of the type occupies depressions in areas of the Hall silt loam and very fine sandy loam and is in most places too wet for successful cultivation. The greater part is used for pasture and for hay production. The type is naturally fertile, however, and where adequately drained is well adapted to all crops common to the region, including corn, wheat, oats, rye, barley, and alfalfa. The grazing of beef cattle is the chief industry. The cattle are chiefly grades of the Hereford and Shorthorn breeds. Hogs are raised on most farms, but the hog industry is of minor importance on this type of soil.

The native grasses on the Lamoure silt loam will support a cow or steer per acre during the summer grazing season, or when cut for hay will yield 1 to 1½ tons per acre. Corn yields 20 to 30 bushels, wheat 15 to 20 bushels, oats 20 to 25 bushels, rye about the same as wheat, barley 20 to 25 bushels, and alfalfa 2½ to 3 tons per acre, from three cuttings.

The land can be cultivated under a somewhat wider range of moisture conditions than that of the Lamoure silty clay loam. It clods badly when plowed wet, but the lumps are easily reduced.

The selling price of this type ranges from \$80 to \$150 an acre, depending largely upon drainage.

LAMOURE SILTY CLAY LOAM

The surface soil of the Lamoure silty clay loam is a black silty clay loam, with an average depth of 10 inches. There is normally present a considerable quantity of very fine sand, but little material of coarser grade. The upper subsoil is a dark-gray heavy and compact clay or clay loam to about 20 inches, below which there is an abrupt change to a light-gray compact sandy clay mottled with white and rusty-brown splotches. Coarse sand, fine gravel, and lime concretions are abundant below 24 inches. The change between the soil and upper subsoil is very gradual. Both are rich in organic matter, which imparts the dark color. The type has a high lime content throughout the 3-foot section. The soil and upper subsoil are sticky and plastic when wet. The lower subsoil, however, though plastic has a gritty feel. The material of both soil and subsoil becomes hard and brittle upon drying. Local spots containing sufficient alkali to be injurious, even to the native grass vegetation, occur throughout this type.

Around the margins of the areas bordering soils of a sandy texture the surface layers merge gradually into one another, and this type probably includes small patches of Lamoure fine and very fine sandy loams. In a few places the light-gray mottled material of the lower subsoil lies much nearer the surface, and there is an abrupt change in color between the surface soil and upper subsoil. These are the only notable variations.

This type is confined to numerous small bodies upon the low terraces and flood plains north of the Platte River. Its total area does not exceed 9 square miles. One of the larger areas, comprising about 420 acres, lies in the vicinity of Willow Island. A smaller though very typical body occurs northwest of the Country Club in T. 9 N., R. 21 W. Small areas are mapped in the vicinity of Lexington, Cozad, northeast of Overton, southeast of Darr, and elsewhere throughout the valley.

The type is derived through weathering, under conditions of poor drainage, from alluvial loessial material deposited by the Platte River and its tributaries. The topography is flat. Most of the type occupies poorly drained positions upon the lower terraces, where it is closely associated with the Lamoure very fine sandy loam. The underlying water table is everywhere near the surface and during wet seasons keeps the subsoil too moist for crop production.

Owing to its small extent and poor drainage the type is of little agricultural importance. Most of it is used for pasture and hay

land. It is durable and productive, however, and where adequately drained yields as well as any of the terrace types. The soil requires moderate moisture conditions for successful tilling. It clods badly when plowed wet and the lumps are difficult to reduce. It is almost impossible to plow the land when dry on account of its hard compact structure.

The selling price of the Lamoure silty clay loam ranges from \$75 to \$100 an acre, depending chiefly upon drainage.

As with the other members of this series, the chief need is artificial drainage.

CASS LOAMY FINE SAND

The soil of the Cass loamy fine sand is a dark grayish brown to almost black, loose, rather incoherent fine sand, 6 to 8 inches deep. It contains a relatively large quantity of organic matter, which gives it the dark color and loamy character. The material is not sufficient, however, to prevent the soil drifting when not protected by vegetation. The sand of which the soil is so largely composed consists of about equal parts of the fine and very fine grades, together with a considerable percentage of the medium grade. The upper subsoil is a loose sandy loam of somewhat lighter color than the surface layer. It continues to an average depth of 20 inches and is underlain by a light-brown to gray, loose, incoherent material composed largely of fine and medium sand mixed with small quantities of fine gravel. Both subsoil layers contain sufficient silt and clay to bind the sand particles together rather firmly when dry. The surface soil and upper subsoil are usually calcareous. The lower subsoil seldom contains sufficient lime to effervesce with dilute hydrochloric acid.

A few variations occur. In places a bed of coarse sand and gravel is encountered below 24 inches. In the more poorly drained areas rusty-brown mottlings appear throughout the subsoil, and in these localities the material is often slightly more compact than usual, owing to the admixture of a larger quantity of clay with the sand. The most important variation in the surface soil is toward a fine sandy loam. This appears especially in the lower lying areas where conditions have been more favorable for the growth and decay of plant life. An almost pure sand surface soil is encountered in many places adjacent to the stream channel, where the soil is of such recent origin that sufficient organic matter has not accumulated to give it a loamy structure. The above variations are of such small extent and local occurrence as not to warrant locating on the soil map.

The Cass loamy fine sand is confined chiefly to narrow strips bordering the channel of the Platte River and to small areas on the larger islands in the stream. Although quite numerous, the individual areas are of small extent, seldom exceeding 640 acres and ranging for the most part between 80 and 200 acres in size. One of the larger developments appears about 3½ miles south of Josselyn. Another large body lies south of the Lexington Bridge. This area, however, is not uniform and includes considerable Cass very fine sandy loam within its borders.

The type has been derived from recent sandy alluvium deposited by the Platte River. Wind-blown sand has also aided considerably

in its formation. The growth and decay of plants has caused the dark color and loamy character of the surface soil.

The topography is in general flat, but is modified in places by numerous depressions, dry channels, and slight elevations. Drainage is quite variable. The greater part of the type has adequate underdrainage. There are considerable areas, however, where the water table lies very near the surface, and crops can not be profitably grown in these localities. During extremely dry years the underdrainage is excessive and crops suffer from lack of moisture.

On account of its small extent and uncertain drainage, the type is an unimportant agricultural soil. About 35 per cent of it is under cultivation and the rest, including the poorly drained areas, is used for pasture and hay land. Corn and alfalfa are the leading cultivated crops.

The yields during normal years compare very favorably with those obtained upon the Cass fine sandy loam. In dry seasons, however, the yields are less on account of the lower organic-matter content and consequently lower water-retaining power of this soil.

The soil of this type should be carefully managed to increase and maintain the supply of organic matter. Heavy applications of barnyard manure and the planting of leguminous crops, such as clover and alfalfa, would greatly increase the productive power of the land. The poorly drained areas should be ditched or tilled. The sowing of clover among the native pasture grasses would increase the cattle-carrying capacity of the land and improve the quality of the hay.

The selling price ranges from \$40 to \$80 an acre, depending upon improvements, drainage, and location.

CASS SANDY LOAM

The surface soil of the Cass sandy loam is a dark grayish brown material composed largely of coarse and medium sand, with which is mixed sufficient organic matter to give it a loamy character. It ranges in depth from 6 to 8 inches. The upper subsoil is a porous gravelly sandy loam, differing little in color from the surface layer, though locally it is slightly darker owing to a larger organic-matter content. This material continues to an average depth of about 15 inches, and is underlain by a loose incoherent mass of coarse sand and gravel. The organic content of the soil and upper subsoil is usually sufficient to prevent drifting even in the driest weather. The material gradually decreases below 12 inches, however, and is practically absent in the lower strata. Both the surface and upper subsoil layers are highly calcareous; the lower subsoil seldom contains sufficient lime to effervesce with dilute hydrochloric acid. Small pebbles from one-eighth to one-half inch in diameter are scattered over the surface of this type.

Local variations occur. In a few places the dark-colored upper subsoil layer extends to 30 inches before the gray gravelly sand of the lower strata is encountered. In these localities the material is prevailingly calcareous to depths below 40 inches. Over small areas the surface layer contains so much fine gravel that it approaches a loamy gravelly sand in texture.

This type occupies a few areas on the Platte River flood plains in the southeastern part of the county. The largest area, including

about 900 acres, lies $2\frac{1}{2}$ miles southeast of Lexington. A smaller though very typical area is mapped along the Gosper County line, southeast of the Lexington Bridge. A fairly uniform body lies about 3 miles southeast of Overton. The type has been formed in the same manner as the other members of the Cass series. Its coarser texture is due to the nature of the deposit from which the soil has weathered.

The topography is flat and drainage uncertain. The type lies well above stream overflow. During wet seasons, however, the water table over considerable areas is too near the surface for most crops. In exceptionally dry years the underdrainage is excessive on account of the porous nature of the subsoil and crops suffer from lack of moisture.

On account of its small extent and variable drainage the type is used chiefly for pasture and hay land. Only about 20 per cent of it, including the better-drained areas, is under cultivation. Corn and alfalfa are the leading crops. The grazing of beef cattle is the most important industry. Hogs are raised on those farms where corn and alfalfa are produced.

During average seasons the yields compare very favorably with those obtained on the Cass fine sandy loam. The soil is easily handled and can be cultivated under almost any moisture conditions without injury.

The land sells for \$40 to \$70 an acre, depending upon drainage and location.

The soil of this type needs artificial drainage. It could probably be made as productive as any soil in the county by thoroughly draining the land and increasing the content of organic matter. The sowing of clover on those parts used for pasture and hay would greatly increase the grazing capacity of the land and improve the quality of the hay.

CASS FINE SANDY LOAM

The surface soil of the Cass fine sandy loam is a dark brown or dark grayish brown loose fine sandy loam, 8 to 12 inches deep, containing a relatively large percentage of coarse and medium sand. The upper subsoil is a grayish-brown loamy fine sand to an average depth of 20 inches, where it grades into a light-gray coarse to medium sand containing scattered gravel. Rusty-brown stains are often encountered below 24 inches. The surface 6 inches is generally well supplied with organic matter. This decreases with depth, and is low or practically absent below 24 inches. The subsoil is loose and quite incoherent in its natural condition, but contains sufficient silt and clay to bind the sand particles rather firmly together when dry. The surface soil is but slightly calcareous. The lower layers, however, have a high lime content. The principal variation is toward a very fine sandy loam, although local areas contain so little organic matter in their surface soils as to approach a loamy fine sand in texture. The different types merge gradually into one another and it is possible that numerous small patches of Cass very fine sandy loam and loamy fine sand are included with this soil.

The type does not occupy a very large total area, although it is one of the more extensive of the bottom-land soils of the county. It occurs as broken, usually elongated strips, scattered throughout

the Platte River flood plains on both sides of the stream. The largest body occupies the greater part of Willow Island in the west-central part of the county. Another large body lies south of Cozad. A small though quite typical development occurs about $1\frac{1}{2}$ miles south of Lexington. The type is not so extensively developed on the south side of the river, although a few bodies exceed 640 acres in size.

The soil has weathered from sandy flood-plain material deposited by the Platte River during comparatively recent times. The growth and decay of vegetation has added sufficient organic matter to modify the surface layer of the deposit, but weathering has not yet produced the changes occurring in the older soils of the uplands.

The topography is generally flat but modified in places by slight depressions, old stream channels, or low rounded mounds of almost pure sand. The areas lie from 8 to 10 feet above the normal flow of the river and are seldom subject to inundation. During normal years drainage is sufficient for crop production over the greater part of the type. In wet seasons, however, the water table is too near the surface for profitable farming, and even in normal years small areas remain too moist for the best results. In very dry seasons the underdrainage is excessive and most crops do not do as well as upon types with heavier subsoils.

The Cass fine sandy loam does not hold a prominent place in the agriculture of the county, chiefly on account of its uncertain drainage. About 40 per cent of it is under cultivation and the rest is used as pasture and for hay production. The native grasses will support 80 to 100 head of cattle per quarter section during the summer grazing season or when cut for hay will yield three-fourths to $1\frac{1}{2}$ tons per acre depending upon the rainfall.

Of the cultivated crops corn leads in acreage, followed by alfalfa and oats. Cattle and hogs are fed on many farms, and the grain and hay crops are largely consumed on the land where produced. The average yield of corn is about 25 bushels per acre; oats yield about the same as corn. From $2\frac{1}{2}$ to $3\frac{1}{2}$ tons of alfalfa hay per acre are obtained each year from three cuttings. The land is handled in the same manner as the heavier textured soils of the terraces. Less power and lighter machinery, however, can be used in tilling this type on account of its friable sandy texture. The land can be cultivated under almost any moisture conditions without injury.

The selling price of land of the Cass fine sandy loam ranges from \$50 to \$80 an acre.

SARPY SAND

The surface soil of the Sarpy sand consists of 8 to 10 inches of gray to light grayish brown loose incoherent sand. It is underlain by material of the same texture and structure to depths below 3 feet. The sand, of which the type is so largely composed, consists chiefly of the medium and fine grades. The surface layer is slightly darker than the rest of the soil section, owing to an admixture of organic matter, a small quantity of which is present in the upper layer. Neither the soil nor subsoil is noticeably calcareous.

The material below 30 inches is occasionally mottled with rusty iron stains, owing to poor drainage. In a few places the lower subsoil is

almost white and below 24 inches is composed of a loose incoherent mixture of coarse sand and fine gravel. The type differs from the Cass loamy fine sand chiefly in the lower organic-matter content and lighter color of its surface soil.

The Sarpy sand occurs in a few narrow broken strips bordering the channel of the Platte River and on the more sandy parts of the small islands in the stream. The areas seldom contain more than 160 acres and in most cases only 10 to 30 acres. The soil is typically developed at the eastern and western extremities of many of the small islands throughout the Platte River channel.

The type is composed of sandy alluvium recently deposited in the river flood plains. It has not yet developed the dark-colored surface soil characteristic of the Cass series, as sufficient time has not elapsed for the growth, decay, and accumulation of large quantities of organic matter. In many places the material greatly resembles Riverwash, as mapped in this county. It is more stable than that type, however, is usually covered with grass or willows, and is not so much influenced by each slight rise of the stream.

The topography is in general flat, but in detail modified in places by old cut-off depressions and slight elevations. The latter are caused by wind which, in the more exposed situations, whips the loose incoherent sand into low rounded knolls and ridges. The surface of the type lies 4 to 6 feet above the normal flow of the river and is seldom flooded. The water table, however, is everywhere near the surface, and in wet years rises sufficiently to cover small areas in the lower depressions. In dry years underdrainage is excessive and vegetation suffers from lack of moisture.

Owing to its small extent, low organic-matter content, and incoherent structure the type is not used for crop production. All of it has some value as pasture land. The vegetation is often quite sparse, and the soil does not have a high value even for grazing. A dense growth of cottonwood and willow covers much of the land. In dry years the soil drifts badly where the native grasses are destroyed. It is difficult to obtain prices for this land. It forms only small parts of the farms bordering the river. It has a tendency, however, to lower the value of the farms on which it occurs.

It is doubtful if any of the type should be used for crop production. The planting of tame grasses, such as alsike and timothy, in the poorly drained areas and sand grasses upon the more exposed situations should increase the grazing capacity of the land.

RIVERWASH

Small areas of Riverwash are mapped along the Platte River in the vicinity of the Lexington and Overton wagon bridges. The bodies of this type are disused portions of the old river channel left when the flood plain was greatly narrowed by the construction of earth embankments leading to the bridges. Local patches of Riverwash, too small to show on the map, also occur upon sand bars, islands, and sand flats adjacent to or within the channel of the river. The material differs from the Sarpy sand in its less stable nature and the almost total absence of organic matter. It 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 under undisturbed conditions of weathering will develop into Sarpy sand.

IRRIGATION

The greater part of the terrace and bottom lands, or about 40 per cent of the area of Dawson County, is topographically suited to irrigation. There are five canals now operating in the county, all which obtain their water from the Platte River. The largest are on the north side of the stream and include the Gothenburg, Cozad, and Farmers and Merchants Canals. The Sixmile and the Orchard and Alfalfa Canals lie south of the river. Most of the canals are owned by associations of landowners.

At present about 250 square miles or 24 per cent of the county lies between the operating canals and the river. Less than one-third of the area, however, is irrigated on account of a scarcity of water during the time it is most needed. The Platte River frequently becomes so low during July and August that water will barely flow in the head gates of the several canals, and in very dry seasons it dries up completely, furnishing no water for irrigation.

The farmers on the irrigable lands in Dawson County have long realized the necessity of acquiring a larger and more dependable water supply. The consolidation of the several ditch companies and the construction of large storage reservoirs is being contemplated. Federal irrigation engineers have been employed to locate reservoir sites. Their report favors increasing the available water supply.

By storing the flood waters of the Platte River during the early spring a much larger and more uniform supply could be obtained at reasonable expense and the area under irrigation could be greatly increased.

The following table, compiled from the records of the Nebraska State Board of Irrigation and from information gathered in the course of the survey, gives the date of construction of the principal canals, the approximate length of each in Dawson County, and the area watered:

Date of construction, approximate length, and area watered by irrigation canals in Dawson County

Canal	Period of construction	Approximate length in Dawson County	Area watered in Dawson County in 1922
		<i>Miles</i>	<i>Acres</i>
Gothenburg.....	1889 to 1891	21.5	25,040
Cozad.....	1895 to 1896	18.0	7,870
Farmers and merchants.....	1894 to 1896	22.5	8,815
Sixmile.....	1894 to 1899	5.5	943
Orchard and alfalfa.....	1895 to 1899	12.0	12,365

¹ Area watered in 1921.

SUMMARY

Dawson County is situated in south-central Nebraska. It contains 985 square miles, or 630,400 acres. It lies in the loess region of the State and includes about equal parts of the small loess plains and canyon area and the Platte Plain area. The former comprises the upland parts of the county and the latter the Platte River alluvial lands or terraces and flood plains. The topography of the uplands ranges from rough and hilly to almost flat; that of the alluvial lands is flat to gently undulating.

The elevation of the county ranges from 2,260 to about 2,940 feet above sea level. The general slope is to the southeast. The drainage is effected chiefly through the Platte River and its tributaries.

A small area drains to the South Loup River. The county as a whole is well drained. The county was organized in 1871 and the first permanent settlement made in 1872. According to the 1920 census, the population is 16,004, all which is classed as rural. Lexington, the county seat, has a population of 2,327.

The transportation facilities of Dawson County are good. The main line of the Union Pacific Railroad follows the Platte River across the area. Public roads reach all farming communities. Omaha is the chief market for grain and livestock.

The climate of the county is favorable to the production of the common staple crops, such as corn, wheat, oats, rye, barley, potatoes, and alfalfa. The mean annual precipitation is 22.64 inches and the mean annual temperature 49.4° F. The average growing season is 140 days.

The agriculture of the county consists of diversified farming, including the production of grain and hay and the raising of livestock. The chief crops are corn, wheat, oats, alfalfa, wild hay, rye, barley, and potatoes, ranking in acreage in the order named. Cattle and hogs are raised on most farms, and constitute an important source of farm income.

Systematic crop rotation is not practiced, although many farmers have evolved systems which they use on their land, and crops are changed with reasonable regularity. No commercial fertilizers are used. Barnyard manure is applied when available.

Most farms are well improved and modern labor-saving machinery is in general use.

The soils of Dawson County have been developed under a grass vegetation and under climatic conditions that were favorable for the accumulation of large quantities of organic matter. All the soils, therefore, with the exception of the more recent sand deposits, show a decided influence of plant life. Weathering under the prevailing climatic conditions has also left its impress on the soil material. The character of the mantle rock or parent material from which the soils have developed has also been an important factor in their formation. The parent material over the greater part of the county consists very largely of a loose, floury silty substance having a high lime content; it is known as loess. In a small area the soils have weathered from recent sandy deposits laid down upon the eroded loessial material.

The heavier textured soils of the uplands and terraces have been derived from calcareous loessial material. The oldest and most

mature of these has been formed under conditions especially favorable for deep soil weathering and the accumulation of organic matter and the lime has largely been leached to depths below 3 feet. Where weathering conditions have been slightly less favorable a less mature or younger group of soils is developed and lime carbonate is present in the material of the lower part of the 3-foot section. Where erosion has been especially severe the dark-colored surface material has been removed in places, exposing the white calcareous substance of the parent formation.

The soils developed from accumulations of wind-blown sand are immature and have not developed the dark-colored surface layers so characteristic of the loessial soils.

The soils developed under conditions of poor drainage include those that have weathered either from fine-textured loessial material or from sandy deposits. They occupy flood-plain positions along the streams and depressed areas on the terraces and in the uplands. These soils are of recent origin and naturally of a complex nature, their character depending on the material from which they are derived and the extent of weathering to which they have been subjected.

The different soils of Dawson County have been separated into 8 soil series, including 20 types and 3 phases of types. In addition to which there is mapped a nonagricultural type, Riverwash.

The Colby silt loam, together with its broken phase, is the most extensive soil of the county. It occupies the greater part of the uplands north and south of the Platte River. The typical soil is adapted to all crops common to the region. The broken phase of this soil is used chiefly for grazing.

The Holdrege silt loam occupies the broader divides within areas of Colby soils throughout the uplands. It represents a somewhat more advanced stage of weathering and has developed a darker and deeper surface soil than the types of the Colby series. Corn, oats, alfalfa, and wheat are the principal crops.

The Valentine soils are inextensive in Dawson County. They occur chiefly in the northwestern part, north of the Platte River. The types are rather unstable and drift during dry windy seasons. Most of the land is used for pasture or for the production of wild hay.

The Scott silty clay loam occurs in small circular depressions locally known as buffalo wallows throughout the uplands and heavier textured terrace soils. The type is not used for crop production on account of its poor drainage.

The Hall silt loam and very fine sandy loam occupy the terrace lands throughout the county. The types are most extensively developed on the Platte River terraces, although narrow strips extend up the larger tributaries. Practically all of the land is under cultivation. A large proportion is irrigated. All crops commonly grown do well. Alfalfa and corn are the leading crops.

The Lamoure very fine sandy loam is the most extensive bottomland soil of the county. It is poorly drained and contains considerable alkali. The greater part remains in native grasses and is used for pasture and hay.

The Cass soils occupy the first bottoms or flood plains along the Platte River. They differ from the Lamoure soils in the sandy, porous nature of their subsoils. The topography is flat and drainage variable, depending upon the rainfall.

The Sarpy sand occurs in narrow areas adjacent to the channel of the Platte River and also occupies parts of the small islands within the stream. The soil is low in organic matter and drifts badly when plowed. It is used for pasture land.

Riverwash includes dry areas of the Platte River channel and small sand bars and sand flats throughout the stream.

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