

UNITED STATES DEPARTMENT OF AGRICULTURE

**Soil Survey**  
of  
**Hitchcock County, Nebraska**

By

**F. A. HAYES, in Charge**  
**W. J. MORAN, S. R. BACON, and R. L. GEMMELL**  
United States Department of Agriculture

and

**H. OTTE, B. J. ABASHKIN, and E. A. NIESCHMIDT**  
Nebraska Soil Survey



**Bureau of Chemistry and Soils**  
In cooperation with the  
**University of Nebraska State Soil Survey**  
**Department of the Conservation and Survey Division**

# BUREAU OF CHEMISTRY AND SOILS

HENRY G. KNIGHT, *Chief*  
A. G. MCCALL, *Chief, Soil Investigations*  
SYDNEY FRISSELL, *Editor in Chief*

## SOIL SURVEY

CURTIS F. MARBUT, *in Charge*  
T. D. RICE, *Inspector, District 8*  
J. W. MCKERRICHER, *in Charge Map Drafting*

---

## COOPERATION

UNIVERSITY OF NEBRASKA  
STATE SOIL SURVEY DEPARTMENT OF THE CONSERVATION  
AND SURVEY DIVISION

G. E. CONDRA, *Dean and Director*

---

## CONTENTS

	Page
County surveyed.....	1
Climate.....	4
Agriculture.....	5
Soils and crops.....	11
Well-drained upland and terrace soils.....	14
Keith silt loam.....	15
Keith silt loam, deep phase.....	16
Keith very fine sandy loam.....	16
Bridgeport very fine sandy loam.....	17
Bridgeport silt loam.....	18
Bridgeport loamy fine sand.....	18
Tripp silt loam.....	18
Excessively drained upland soils.....	19
Colby silt loam, broken phase.....	19
Colby silt loam.....	20
Colby very fine sandy loam.....	20
Colby loamy sand.....	21
Valentine sand.....	21
Valentine loamy sand.....	21
Dune sand.....	22
Poorly drained upland soils.....	22
Scott silty clay loam.....	22
Bottom-land soils.....	23
Sarpy loamy sand.....	24
Sarpy very fine sandy loam.....	25
Sarpy fine sandy loam.....	25
Sarpy sand.....	25
Laurel silt loam.....	25
Laurel very fine sandy loam.....	26
Soils and their interpretation.....	26
Summary.....	30

# SOIL SURVEY OF HITCHCOCK COUNTY, NEBRASKA

By F. A. HAYES, in Charge, W. J. MORAN, S. R. BACON, and R. L. GEMMELL,  
United States Department of Agriculture, and H. OTTE, B. J.  
ABASHKIN, and E. A. NIESCHMIDT, Nebraska  
Soil Survey

## COUNTY SURVEYED

Hitchcock County is in southwestern Nebraska, adjoining Kansas. (Fig. 1.) Trenton, the county seat, is 252 miles, by rail, southwest of Lincoln. The county is rectangular, its approximate dimensions being 30 miles east and west and 24 miles north and south. The area by planimeter measurement is 708 square miles, or 453,120 acres.

The county is in that part of Nebraska known by the State geographers as the "Nebraska plain" About 85 per cent of it is upland, and the remainder is alluvial land. Topographically, the county consists of several table-land areas traversed by steep-sided drainage ways and separated by the valleys of Republican River and Frenchman, Driftwood, and Blackwood Creeks. The upland is covered with loess to a depth of more than 25 feet. The loess is underlain by sands which are exposed in the stream valleys.

The largest area of uneroded or undissected upland is a triangular-shaped area between the Republican River and Frenchman Creek Valleys. The next largest area is south of Republican River extending east and west across the county. Smaller areas on the east and west sides of Blackwood Creek in the northeastern part of the county and south of Driftwood Creek in the southeastern part complete the upland area.

The most striking feature of the landscape throughout the uplands is the sudden change from the nearly level or gently undulating table-land divides to the eroded valley slopes along secondary drainage ways which extend back into the tables from the major streams. This feature prevails in all parts of the county except in a small area south of Republican River in the western part. Here erosion has removed the loessial mantle, exposing the underlying sands. The land surface ranges from strongly rolling to hummocky, and it slopes rather gradually from the higher-lying and nearly level loess-covered parts of the uplands to the alluvial lands.

The divides between the secondary drainage ways consist of unmodified or only slightly modified remnants of an old nearly level or gently undulating loess-mantled plain which still covers most of

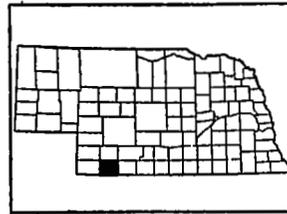


FIGURE 1—Sketch map showing location of Hitchcock County, Nebr

southern Nebraska. The largest and one of the least-modified remnants of this plain in Hitchcock County is in Eden Precinct. However, broad tabular divides and spurs of various sizes and shapes with dissected fringes occur in all parts of the uplands. About 40 per cent of the total area of the county lies near the level of the old loess plain.

The largest area of severely eroded land is south of Driftwood Creek. This area includes nearly all of Driftwood and the southeastern part of Cornell Precincts. Here the loessial material has been carved into a succession of deep steep-sided ravines separated by narrow crestlike divides. Soil slipping is common, and most of the steeper slopes are characterized by short contourlike shelves, known as "catsteps," which have been caused by the sliding action of the soil. In many places, especially in Cornell Precinct, the loess has been entirely removed, and very steeply sloping or precipitous rim-rock exposures of the underlying Tertiary sandstone occur on the valley sides. Remnants of the nearly level loess plain are confined to narrow elongated and tortuous spurs or small irregular-shaped bodies on the tops of the higher divides. Rather large areas of severely eroded land also occur along Bobtail, Boveau, and Thompson Canyons and between Muddy Creek and Republican River, and narrow strips extend along most of the smaller drainage ways in all parts of the uplands.

The alluvial lands occupy about 15 per cent of the county. They include the terraces and flood plains along the larger streams and occur as continuous strips ranging in width from one-eighth to about  $2\frac{1}{2}$  miles. The widest developments are along Republican River and Frenchman Creek. The terraces are the most extensive. They occur at different levels, depending on the depth to which the streams had cut prior to deposition of the terrace material, but none of them lies more than 25 or 30 feet above the stream channels. Their surfaces are nearly level except where intrenched by shallow steep-sided drainage ways issuing from the uplands. The transition between the different terrace levels and to the flood plains is marked, in most places, by short steep slopes.

The flood plains, or first bottoms, occupy the lowest land in the county, lying only a few feet above the normal flow of the streams. The largest developments are along Republican River where the width of the flood plain is more than three-fourths of a mile in places. Narrower continuous or broken strips lie along most of the larger streams. The surface of the flood plains as a whole is nearly level, but it is characterized in places by old and present stream channels, slight elevations, and shallow depressions.

The average elevation of the county is about 2,850 feet above sea level. The elevation ranges from approximately 2,535 feet where Republican River crosses the eastern boundary to about 3,000 feet throughout the uplands in the northwestern corner. The elevation<sup>1</sup> of Stratton is 2,796 feet; of Palisade, 2,765 feet; of Trenton, 2,680 feet; of Beverly, 2,662 feet; and of Culbertson, 2,568 feet above sea level. The general slope of the county is downward toward the east.

<sup>1</sup> GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bul. 274, Ed. 4, 1,072 p. 1906.

Drainage is effected through Republican River and its tributaries, the largest of which is Frenchman Creek. These streams and Driftwood Creek, near its mouth, flow permanently, but the remaining drainage ways are intermittent. The rivers, creeks, and their major and minor tributaries afford ample drainage over practically all parts of the county. The only poorly drained areas are in scattered and small basinlike depressions on the uplands and in a few local areas on the flood plains.

All the streams have rather steep gradients and are actively deepening their channels. Most of the smaller drainage ways are widening their valleys in their lower courses and extending their channels through headward erosion into the loessial uplands.

Well water of good quality is readily obtained in most parts of the county. However, in many places, especially in the southern part and on the slopes leading to the Republican River alluvial lands in the central part, it is difficult to obtain a sufficient supply of good water because of the comparatively slight depth to the underlying impervious Pierre shale which contains a negligible quantity of rather alkaline water. This formation underlies the entire county but is beneath Tertiary water-bearing sands and gravels. It prevents water loss from the Tertiary deposits but has no effect on the quality of the water, except in wells which extend into it. Well water in the uplands is obtained from the Tertiary sands, and the wells range from 100 to more than 300 feet in depth, but only a few exceed 250 feet. Water in the alluvial lands is obtained at a depth ranging from 10 to 30 feet. It is usually of good quality, but that along the outer edge of the flood plains near the Pierre shale slopes is in many places unsatisfactory.

Springs are numerous and supply much water for domestic purposes and livestock. Most of them are on the northern slopes of the Republican Valley and issue from the contact of the Pierre and Tertiary formations. A few springs occur along Driftwood Creek.

Native broad-leaved trees, principally willow, ash, elm, boxelder, and cottonwood, grow in narrow strips along most of the larger drainage ways.

The first permanent settlement in the area now included in Hitchcock County was made in the Blackwood Creek Valley in 1872, and the county was established and organized in 1873.

According to the 1930 census, the population of the county is 7,269, all of which is classed as rural. The density of the population is given as 10 persons to the square mile. The population is rather evenly distributed, although it is somewhat denser in the larger valleys and in the vicinity of towns.

Trenton, the county seat and largest town, located in the central part of the county, has a population of 865. Culbertson, with 820 inhabitants, ranks second in population, and Palisade, with 731 inhabitants, ranks third. These towns are the chief distributing points for farm implements, supplies, and produce. They receive the greater part of the surplus dairy and poultry products.

Hitchcock County has good transportation facilities. A main line of the Chicago, Burlington & Quincy Railroad extends east and west across the central part following Republican River Valley, and

a branch line of this railroad from Culbertson to Imperial follows Frenchman Creek Valley across the northeastern part.

Gravel-surfaced highways parallel the railroads, and the remaining public roads, although of earth construction, are kept in good repair. Most of the roads, except the highways, follow land lines. Cement or steel culverts and bridges are common on all roads. Telephones and rural mail delivery routes reach nearly all parts of the county.

#### CLIMATE

The climate of Hitchcock County is characterized by a wide range in temperature and rather low precipitation, which is typical of the high plains country. The winters are cold and the summers short and hot. The spring usually is cool, and the fall season is long, with moderate temperatures.

The amount and distribution of rainfall are of vital importance, as the average precipitation is only a few inches more than the minimum required for profitable crop production. Grain and tame-hay yields are sometimes curtailed by drought, and occasional crop failures result from this cause. About 78 per cent of the mean annual precipitation falls during the principal part of the growing season, from April to September, inclusive. The precipitation is mainly in the form of local showers and is extremely variable in occurrence. The rainfall in May and June is usually well distributed, but in July and August the distribution is less favorable and short droughts often occur during these months. The annual snowfall ranges from a few inches to several feet, averaging 26.3 inches a year.

The average date of the last killing frost is May 3, and that of the first is October 4. This gives an average frost-free season of 154 days, which is ample for the maturing of all crops commonly grown in the region. Frost has been recorded as late as May 25 and as early as September 12.

Table 1, compiled from records of the Weather Bureau station at Culbertson, gives the normal monthly, seasonal, and annual temperature and precipitation at that station, which are fairly representative of the climatic conditions throughout the county.

TABLE 1—Normal monthly, seasonal, and annual temperature and precipitation at Culbertson, Neb.

[Elevation, 2,565 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1915)	Snow, average depth
	° F	° F	° F	Inches	Inches	Inches	Inches
December.....	26 9	74	-29	0 66	0 12	0 14	4 5
January.....	26 4	72	-30	36	10	25	3 5
February.....	29 7	80	-28	56	30	16	4 2
Winter.....	27 7	80	-30	1 58	52	55	12 2
March.....	39 9	91	-15	1 05	28	2 47	8 1
April.....	50 2	100	9	2 19	1 09	4 74	1 8
May.....	59 7	101	22	2 68	0	7 20	3
Spring.....	49 9	101	-15	5 92	1 37	14 47	10 2
June.....	70 8	108	32	3 33	1 92	8 51	0
July.....	76 3	112	42	2 91	1 75	5 13	0
August.....	73 9	107	36	2 89	70	6 33	0
Summer.....	73 7	112	32	9 13	4 37	19 97	0
September.....	65 5	102	20	1 53	13	86	( <sup>1</sup> )
October.....	52 0	96	3	1 16	40	1 56	1 6
November.....	39 5	83	-10	55	02	58	2 3
Fall.....	52 3	102	-10	3 24	55	3 00	3 9
Year.....	50 9	112	-30	19 87	6 81	37 99	26 3

<sup>1</sup> Trace

The low average rainfall of this region is the principal factor in controlling agricultural development. It restricts in various ways the varieties of crops grown and has a decided influence on the methods of farming. On account of the subhumid climate, drought-resistant, quick-maturing, and hardy varieties of crops give the highest net returns.

### AGRICULTURE

Roving cattlemen, who grazed their herds in the most favorable localities, were the first people to make use of the agricultural resources of Hitchcock County. The free open range supported a variety of nutritious grasses and supplied good summer and fair winter pasturage, and the canyonlike areas along the numerous drainage ways afforded shelter for the cattle during winter storms.

In 1872 and 1873 settlers entered the county and broke up much of the land for crop production, forcing the cattlemen to move farther west. Grasshoppers and drought practically ruined crops during the first three years and caused so much suffering that most of the settlers left the county. The cattlemen returned to the free open range and remained until 1879, when there was a second influx of settlers. The construction of the railroad in the Republican Valley to Culbertson in 1881 and its completion to Denver in 1883 gave the

first marked impetus to the development of farming and resulted in very rapid settlement from 1885 to 1887.

Following this period came a series of dry years, culminating in the disastrous droughts of 1893 and 1894. A marked decrease in population followed, but had the present dry-farming methods been understood at that time it is probable that agricultural development would not have been so seriously arrested. However, the settlers had the experiences of farmers in counties to the east to draw on and rapidly adjusted their farming practices to meet the requirements of the new region.

Corn was the leading crop until about 1905, when the strong demand for wheat, together with high yields of that crop, caused the farmers to increase the wheat acreage until it exceeded that of corn. Wheat maintained first position in point of acreage until about 1925, when low wheat prices caused an increase in the corn acreage, and corn is at present the leading crop.

Table 2, compiled from the reports of the Federal census and from the Nebraska agricultural statistics, shows the general trend of agriculture during the last 40 years.

TABLE 2—*Acreage and production of principal crops in Hitchcock County, Nebr., in 1889, 1899, 1909, 1919, and 1929*

Crop	1889		1899		1909		1919		1929 <sup>1</sup>	
	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels
Corn.....	39,655	697,754	32,156	225,740	35,960	259,549	38,818	545,178	99,340	2,384,160
Wheat.....	11,300	117,278	29,403	99,250	46,629	390,548	84,684	1,368,352	67,036	1,339,085
Barley.....	184	2,551	1,095	5,920	18,900	262,241	7,885	158,835	11,345	260,935
Oats.....	7,788	124,354	291	1,660	1,401	23,517	591	17,177	2,250	63,252
Rye.....	2,563	25,202	5,292	23,770	751	8,703	900	9,801	176	1,936
Potatoes.....	1,035	57,764	289	10,174	539	24,944	294	7,610	209	22,363
Tame hay.....	12,433	15,238	3,175	3,892	5,730	11,478	5,748	12,744	9,908	26,496
Alfalfa.....			1,345	2,127	3,721	9,210	3,830	9,928	6,225	19,298
Sweetclover.....							14	12	1,533	1,097
Wild hay.....			4,342	4,021	4,792	3,923	5,705	5,608	3,602	3,602
Coarse forage.....			2,582	3,842	13,476	20,474	18,617	33,764	9,520	28,578
Sugar beets.....					780	5,678	749	6,134	1,213	15,526

<sup>1</sup> Data from Nebraska agricultural statistics

<sup>2</sup> All hay

The returns derived from livestock are important sources of revenue in Hitchcock County. The value of livestock and their products was \$2,693,692 and the value of all crops was \$3,724,718 in 1929<sup>2</sup>

Dairy products, excluding those consumed on the farms, were produced to the value of \$214,360, and poultry and eggs produced in the county were valued at \$196,415 in 1929.

Table 3, compiled from the Federal census reports and the Nebraska agricultural statistics, gives the number and value of domestic animals in the county in 1900, 1910, 1920, and 1929.

<sup>2</sup> All 1920 data are from the Nebraska agricultural statistics

TABLE 3—Number and value of livestock in Hitchcock County, Nebr., in 1900, 1910, 1920, and 1929

Kind of livestock	1900		1910		1920		1929 <sup>1</sup>	
	Number	Value	Number	Value	Number	Value	Number	Value
Horses.....	5,547		7,300	\$665,046	8,500	\$508,834	7,150	\$433,604
Mules.....	304		680	63,410	766	66,148	881	67,203
Asses and burros.....	13		61	9,790	66	11,706		
Beef cattle.....	8,080		8,985	188,324	22,406	951,478	15,346	803,526
Dairy cattle.....	4,879		5,500	102,664	2,319	123,537	3,878	325,752
Sheep.....	257		15	106	530	5,472	1,914	18,147
Goats.....	5		17	41	37	276		
Swine.....	10,631		9,546	84,585	13,348	251,901	42,413	634,682
Poultry.....			56,986	24,066	70,473	51,365	89,808	84,420
Total.....		\$591,841		1,138,032		1,968,807		2,367,337

<sup>1</sup> Data from Nebraska agricultural statistics

In 1929, approximately 203,404 acres, or about 44 per cent of the land in the county, was used for cultivated crops, 13,750 acres of which were under irrigation. Fifty-three per cent of the county was in range and pasture land and less than 1 per cent was in woodland. Most of the remainder was occupied by building sites or was included in stream channels.

The farm buildings are, in general, well painted and kept in a good state of repair, and many of the houses are equipped with modern conveniences. In 1929, 81 of the farmhouses had electric-lighting systems, 159 had modern water systems, and 268 had radios. The farms are fenced, mainly with barbed wire, though some farms are inclosed with hog-tight woven-wire fencing. The work animals include heavy draft horses and mules, although much of the farm work is done by gas-driven power. There were 326 tractors, 234 trucks, and 846 automobiles on the farms in 1929. The farm machinery is of the most modern and labor-saving types. It includes gang plows, disks, harrows, drills, listers, cultivators, wagons, binders, headers, and complete equipment for harvesting hay. There were 125 grain threshers, 50 wheat combines, and 614 cream separators in the county in 1929. Many farms are equipped with corn binders, corn shuckers, hay balers, and silos. The more expensive farm machinery is kept under shelter on most farms.

The Federal census reports that 94.6 per cent of the land in the county was included in 942 farms in 1930. The average size of the farms was 465.4 acres. Most of them range in size from 320 to 640 acres, but there are numerous small holdings, and 75 large ranches contain more than 1,000 acres each.

Owners operated 58.6 per cent, tenants 41.3 per cent, and managers 0.1 per cent of the farms in 1930. Share and cash rental systems, as well as a combination of the two, are practiced. The share system is most popular, 91.3 per cent of the rented farms being rented on shares in 1930. Under this system the owner receives one-third of the grain delivered to the nearest elevator and from 50 cents to \$1.50 an acre for pasture land. Some of the valley farms are rented for three-fifths of the grain delivered. All seed, labor, and machinery is furnished by the tenant. When alfalfa land is rented on the share basis, the owner receives one-half of the hay stacked in the field. When land is rented for cash, the owner receives from

\$2 to \$6 an acre. The highest rent is received for irrigated land. During the last few years very little of the land used for the production of wheat has been rented for cash. Land suited only for pasture may be rented for a lump sum.

In general, farm laborers are plentiful, except during the small-grain harvest when good help is often scarce. Wages range from \$30 to \$50 a month with board and lodging. Day labor commands from \$2.50 to \$4, the higher wage being paid during the harvest season. The cost of harvesting wheat ranges from \$2.50 to \$5 an acre, depending on the amount of labor required. When a wheat combine is used the cost is usually less than when the crop is harvested with a header and thresher. The grain is threshed for 6 or 7 cents a bushel. Corn shuckers receive 6 or 8 cents a bushel. A few mechanical corn pickers are used.

As in southwestern Nebraska generally, grain growing is the principal industry in Hitchcock County, with corn and wheat the chief crops. On farms operated by owners most of the corn is fed to the cattle and hogs, but on tenant farms more of the crop is sold. Wheat is grown entirely as a cash crop. More than one-half the land in the county is used as native pasture and hay land in connection with the raising of cattle, which is the most important branch of the livestock industry. Most of the herds of cattle are of grade stock headed by a purebred bull. The quality of the beef cattle is in general very good. The principal breeds are Hereford and Short-horn. Many of the cattle are raised locally, but some farmers ship in cattle for summer grazing, and numerous feeders annually purchase animals for winter fattening. Most of the feeders operate farms in the valleys where alfalfa can be profitably grown. The animals are fed corn and alfalfa from 60 to 90 days and are then shipped to the Omaha or Kansas City markets.

Hog raising in Hitchcock County is almost as important an industry as cattle raising. Ordinarily, a farmer raises from 25 to 60 hogs a year, and a few maintain herds of several hundred. Most of the hogs are raised on corn and alfalfa or sweetclover, although young pigs usually receive some oats or barley. Some hogs are raised in connection with the feeding of beef cattle. All the hogs are of good breeding, and many purebred herds are in the county, Duroc-Jersey, Poland China, and Hampshire predominating. Practically all the hogs are fattened on the farms where raised, and most of them are sold in Omaha. Sanitary measures prevail in the hog-raising industry, and disease is usually kept well checked.

Dairy products are an important source of income on many farms. From 4 to 10 milk cows, chiefly of mixed beef and dairy breeding, are kept on the average farm. Most of the surplus dairy products are sold in local cream stations, from which they are shipped to creameries in the large cities.

From 50 to 75 chickens are raised on most farms, and many farmers maintain flocks of several hundred. The principal breeds are Plymouth Rock, Leghorn, Rhode Island Red, and Buff Orpington. Poultry products are either sold or exchanged for farm supplies in the local towns.

Only a few sheep are raised in the county, but a few thousand sheep are annually shipped in and fattened on corn and alfalfa.

Horse raising is confined chiefly to the breeding of work mares. Percheron blood predominates in most of the horses, and purebred stallions are kept on a few farms. Owing to the increasing use of tractors in the county, horse raising as a business is not profitable.

Farm-management practices and the methods used in growing and harvesting the crops in Hitchcock County are similar to those throughout southwestern and western Nebraska as a whole. The most modern machinery is used in nearly all farming operations.

Corn is planted in May, usually between the first and middle of the month. Practically all the corn on the upland and most of that on the alluvial land is planted with a lister. Listed corn requires no seed-bed preparation other than that furnished by the machine, and corn so planted is considered by most farmers to be more drought resistant than corn planted with a drill. The crop is cultivated at intervals of two or three weeks until early in July, when it is "laid by" and receives no further attention until harvest, except to remove the more injurious weeds by hoeing. The corn crop matures in September or early in October, depending on the season. The greater part is husked from the standing stalks, after which cattle and horses are pastured in the fields during the winter. On many farms part of the corn is used for winter roughage. On farms equipped with silos, from 15 to 20 acres of corn are cut each year for silage. Some farmers annually fence off a few acres of unhusked corn for fattening hogs and cattle, thereby saving part of the expense of husking the crop.

The chief varieties of corn grown are Reid Yellow Dent, Iowa Silvermine, and Calico. Careful seed selection is not generally practiced. Some seed corn is shipped into the county, although this is not advisable, as such seed usually yields less than a good type of well-adapted local seed.

Some farmers grow corn on the same ground for several successive years with but slightly lowered yields. However, the rotation in general use on the uplands consists of two years of corn followed by one year of wheat. On the alluvial lands the rotation usually consists of three or four years of corn followed by one year of small grain, three or four years of alfalfa, and on the irrigated areas a year or two of sugar beets.

Practically all the wheat grown in the county is of the winter varieties, chiefly Kanred, Turkey, and Nebraska No. 60, which is a selection of Turkey. The land to be used for wheat is usually plowed and harrowed in late summer, and the seed is planted with a press drill in late September. Some seed is drilled in between the corn rows early in the fall. The crop usually makes a good growth before killing frosts occur. It remains dormant during the winter, resumes growth in the spring, and usually matures early in July. Wheat is either headed and threshed from the stack or harvested with a combine.

Some farmers grow winter wheat on the same land many years in succession, but farmers who rotate their crops ordinarily receive the largest returns. The wheat yield is sometimes reduced by stinking smut, which distorts the kernels, stunts their normal growth, and gives the grain an offensive odor. This form of smut may be con-

trolled by mixing the seed before planting with copper carbonate powder at the rate of 2 ounces of the powder to a bushel of the grain.<sup>8</sup>

The farmers in Hitchcock County do not devote a large acreage to barley. However, the acreage of this crop is increasing. Barley ranks next to corn, measured in terms of feed produced an acre. The development of high-yielding smooth-bearded varieties of barley, such as Comfort and Glabron, has removed the disagreeable task of handling the rough-bearded varieties, which made the production of barley unpopular in the past. The crop is planted and harvested in the same manner as wheat, except that the land is prepared and the grain is sown in the spring instead of in the fall. Barley is a good substitute for corn, and a reasonable acreage is profitable in insuring feed should unfavorable weather materially reduce corn yields. Barley is equal, if not superior, to oats as a nurse crop for alfalfa and sweetclover seedings.

Oats and rye are grown on a few farms in Hitchcock County. Oats are planted in the spring and harvested in the same manner as wheat. Most of the crop is used for horse feed. Rye is planted in the fall or spring and is used as hog feed or for hay and pasture.

Sorgo is the chief forage crop. It is grown on nearly every farm in the uplands of the county. The yield ranges from 1 to 5 tons an acre. Sorgo belongs to a group of plants that become temporarily dormant during dry periods, and it is very drought resistant as well as extremely productive. The best quality of feed is produced if the crop is cut when the earliest heads begin to mature. Most of it is fed with corn and barley, and its feed value compares favorably with any of the wild hays. Black Amber, Sumac, and Early Orange are the most common varieties grown.

Alfalfa is the leading tame-hay crop in Hitchcock County. Most of it is produced on the alluvial soils or under irrigation. The varieties grown include Common, Grimm, and Cossack, all of which are resistant to winter killing. Alfalfa seed is usually sown in April or early in May. Thorough seed-bed preparation is important in obtaining a stand. Early plowing, followed by sufficient disking, harrowing, and possibly rolling to control weed growth and to compact the soil, is desirable in most places. The standard seeding rate is 15 pounds of good seed to the acre. Pure certified seed should be used. A stand of alfalfa is usually allowed to remain as long as it yields profitably. A field is rarely frozen out. The crop is generally cut three times during the summer, and occasionally a fourth cutting is obtained. The common practice is to stack the hay in the field and haul it to the feed lots as needed. Most of it is fed to cattle and hogs. Many farmers run hogs in the alfalfa fields during summer.

Wild hay is cut from the bottom lands, where drainage is insufficient for the production of cultivated crops or tame hay, and from the level canyon floors and the more gradual slopes in the uplands. The greater part of the hay cut in the bottom lands consists of water-loving grasses and sedges and is rather coarse in texture, but that

<sup>8</sup> STEWART, P. H., and GROSS, D. L. SMUT CONTROL IN CEREALS. Nebr. Agr. Col. Ext. Circ. 132, 13 p., illus. 1929.

cut in the uplands is of excellent quality. The hay is either stacked in the fields or stored in the barns for winter feeding. There is a shortage of native-hay land in the county.

Sweetclover is of minor importance in Hitchcock County. The crop is grown in the same manner as alfalfa, but it fits into shorter rotations and is more drought resistant than alfalfa. It is very valuable for soil improvement, being considered by many farmers to be better suited for this purpose than alfalfa. Sweetclover is used chiefly for pasture and hay, and some seed is produced. The plant is a biennial and dies at the end of the second year after producing seed.

Sugar beets are the most important crop in the irrigated sections of the county. The land to be used for this crop is prepared by plowing and harrowing early in the spring, and the seed is planted with a drill early in May. When two or three leaves appear on the young plants, the field is blocked and the plants are thinned with special knives. Sugar beets require almost constant attention. They are cultivated and the weeds are removed by hoeing from two to five times during June and July. The crop is irrigated whenever the leaves begin to curl. The beets are pulled, topped, and hauled to the nearest beet dump in October or November.

No commercial fertilizer is used in Hitchcock County. Considerable barnyard manure is produced, especially on the irrigated farms. The manure is hauled in the fall or spring and generally spread on the land to be used for sugar beets. On tenant farms little care is taken to apply the manure where it is most needed, and the greater part is spread on the land nearest the barnyard.

#### SOILS AND CROPS

Hitchcock County lies in a region where the mean annual precipitation is only a few inches in excess of the minimum required for profitable farming and where soil moisture is an important factor in determining crop yields and soil and crop adaptations. As previously mentioned, about 44 per cent of the land in the county is under cultivation, and the remainder is used for native pasture or hay land. The uncultivated land occurs chiefly on steep and severely eroded valley sides but also includes a few rolling or hilly areas of almost pure sand and several small areas which are poorly drained. Corn, wheat, and livestock are the chief sources of revenue, the importance of livestock being due in large measure to the high percentage of grazing land.

Corn is the leading cultivated crop, chiefly because it is needed as feed for livestock but partly because it can be used as a cash crop in years when cattle and hog fattening are unprofitable. It occupied about 49 per cent of the cultivated land in 1929. Much corn is sold, especially in seasons of unusually high precipitation when the corn yields exceed the requirements of this grain for feed. Wheat, however, is the chief cash crop and was grown on about 33 per cent of the farmed land in 1929. Of the remaining cultivated crops, barley occupies about 6 per cent of the cultivated land, sorgo and tame hay about 5 per cent each, oats about 1 per cent, and the remainder is used principally for sugar beets and potatoes. The relatively large

barley and the small oat acreages are partly because barley produces more pounds of feed an acre and is a better hog and cattle feed than oats, and partly because the work animals have been replaced by tractors to a large extent on many farms and less oats are needed for horse feed. Of the tame-hay acreage, about 63 per cent is used for alfalfa and most of the remainder for sweetclover, both of which are important cattle and hog feeds.

The grain and tame-hay crops are grown rather indiscriminately on all the cultivated soils in the county, but the proportional acreage devoted to the different crops differs somewhat in the different sections. Corn and alfalfa, both of which require an abundance of moisture for optimum growth, occupy larger percentages of the bottom lands than of the uplands or terraces; wheat, barley, and oats, which have a tendency to produce a rank vegetal growth at the expense of the grain yield when grown on the moist bottom lands, are produced chiefly on the well-drained uplands and terraces; and sorgo, which can adapt itself to prolonged droughts, is grown almost entirely in the uplands. Sugar beets are grown only on irrigated land.

Although corn exceeds wheat in acreage it is not so well adapted to the prevailing climate, particularly the precipitation, as wheat, and its yields are more variable. Were it not that corn is so necessary for feed, its acreage would probably be reduced to the advantage of that devoted to wheat.

The more extensive soils of the county have developed from the light-gray limy and silty loess formation which covers the greater part of the region and which is remarkably uniform in its physical and chemical properties. However, a few of the soils, most of which are in the uplands south of Republican River in Stratton and Pleasant View Precincts and in the Republican River and Frenchman Creek Valleys, have developed from sand or from mixtures of sand and silt.

The county is in the Great Plains area of the United States. All the soils that are not severely eroded or that have not been formed from unstable or recently deposited parent materials, have dark topsoils, owing to the accumulation of black organic matter derived from the decayed grass roots. The intensity of darkness in the topsoil is not so pronounced as in the corresponding layers of many soils in the central and eastern parts of the prairie area where, owing to the higher precipitation, the grass growth is more luxuriant, its decay is more rapid, and organic matter has accumulated in larger quantities than in the western part. However, the topsoils of all the soils in Hitchcock County, which have developed under conditions favorable for prolonged undisturbed weathering and the accumulation of organic matter, are much darker than the subsoils, in most places ranging from dark grayish brown to chestnut brown.

In addition to the dark color of their topsoils, most of the soils in the county are friable throughout, have high moisture-retaining powers, contain an abundance of lime at a slight depth, and are easily penetrated by air, moisture, and crop roots. However, these characteristics are not present in all the soils and are not everywhere equally developed in those soils which possess them. In fact, differences in the character of the parent soil materials, in the length

of time these materials have been exposed to weathering, and in the drainage conditions under which they have weathered, have resulted in the development of several different kinds of soils in Hitchcock County.

Throughout the more nearly level parts of the loessial uplands, more moisture enters the ground and the soils have been leached of their lime to a greater depth than in the rolling or hilly parts. Erosion has also been less severe and the soils have thicker and darker topsoils than in hilly areas. The soils on the loessial terraces, where the precipitation is supplemented by run-off from higher levels, have been leached of their lime to greater depths than those of similar surface relief in the loessial uplands. Local areas of poorly drained loess-derived soils occupying shallow upland basins, in which water accumulates after rains, have been entirely leached of their lime and in some places of much of their organic matter. In addition they have developed dense claypanlike subsoils which do not occur in any of the better-drained soils of the county.

In the sandy parts of the uplands, the lime, except in local areas, has been leached to a depth ranging from 8 to 10 feet, but it occurs at a slight depth in sandy soils occupying the long colluvial slopes between the uplands and alluvial lands. All the sandy upland soils are rather unstable and subject to more wind erosion than the loess-derived soils. They are also more droughty and most of them are lower in organic matter. They differ among themselves in texture, stability, and moisture-retaining power.

The bottom-land soils of the county differ from one another chiefly in texture, or the proportion of fine and coarse material which they contain, and in organic-matter content. Some of them are composed almost entirely of loose gray material, and others are finer textured and considerably darker. These soils also differ among themselves in lime content. These characteristics have a bearing on the agricultural value of any particular bottom-land soil and are recognized on the accompanying soil map.

The cultivated soils of the county, with the exception of a few light-colored sandy soils which are included in farmed fields, are well supplied with plant food. They produce high yields of all crops common to the region, providing good drainage is assured. Differences occur in the grain and tame-hay yields on the different cultivated soils, but these are due largely to differences in the soil moisture which is controlled by the surface features, particularly the slope of the land and its elevation with respect to surrounding soil areas or to the underlying water table. Differences in the soil moisture supply are also largely responsible for differences in the agricultural value of the uncultivated soils. Those occupying the steeper slopes and sharper ridge crests, where most of the precipitation is lost in the run-off, support a much sparser vegetal growth than those which have more even surfaces.

Although the soils of the county differ in their producing powers and crop adaptabilities they may be placed in groups, each of which includes soils that are fairly uniform in agricultural value and are used for some particular crop or crops more extensively than soils belonging to another group. In Hitchcock County four soil groups,

based on soil characteristics and other features that affect agriculture, are recognized, namely: Well-drained upland and terrace soils, excessively drained upland soils, poorly drained upland soils, and bottom-land soils.

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

In the following pages the individual soils of the different groups are described and their crop adaptations are discussed. The soil map accompanying this report shows the distribution of the soils in the county, and Table 4 gives their acreage and proportionate extent.

TABLE 4—Acreage and proportionate extent of soils mapped in Hitchcock County, Nebr.

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Keith silt loam.....	229, 120	50 6	Valentine loamy sand.....	3, 204	0 7
Keith silt loam, deep phase.....	3, 520	8	Dune sand.....	2, 048	5
Keith very fine sandy loam.....	7, 360	1 6	Scott silty clay loam.....	1, 536	3
Bridgeport very fine sandy loam.....	20, 544	4 5	Sarpy loamy sand.....	6, 144	1 4
Bridgeport silt loam.....	21, 120	4 7	Sarpy very fine sandy loam.....	3, 328	7
Bridgeport loamy fine sand.....	3, 968	9	Sarpy fine sandy loam.....	2, 304	5
Tripp silt loam.....	448	1	Sarpy sand.....	832	2
Colby silt loam, broken phase.....	112, 896	24 9	Laurel silt loam.....	3, 136	7
Colby silt loam.....	22, 144	4 9	Laurel very fine sandy loam.....	1, 536	3
Colby very fine sandy loam.....	5, 248	1 2			
Colby loamy sand.....	640	1			
Valentine sand.....	1, 984	4	Total.....	463, 120	100 0

#### WELL-DRAINED UPLAND AND TERRACE SOILS

The soils of this group occupy 63.2 per cent of the total area of the county and more than 90 per cent of the cultivated land. One or another of them occurs in nearly all the less-eroded parts of the county except in the bottom lands. Their surface relief ranges from nearly level to gently rolling, and all these soils have adequate surface and subsoil drainage. The group includes the Keith, Tripp, and Bridgeport soils. The Keith soils occupy upland positions, and the Tripp and Bridgeport soils are on terraces.

The Keith and Tripp soils have developed from the gray limy and floury loess formation which covers most of the county. Their topsoils range from 7 to 15 inches in thickness. They are fairly well supplied with organic matter and range in color from dark grayish brown to chestnut brown. Their subsoils range from grayish brown to grayish yellow and are composed largely of loose floury silt. The Bridgeport soils have developed from rather recently deposited mixtures of loess and sand and have lighter-colored topsoils than the Keith and Tripp soils.

All soils belonging to this group are friable throughout, contain an abundance of lime, and, with the exception of one of the Bridgeport soils, which is rather sandy, have high moisture-retaining pow-

ers. Practically all the land occupied by these soils is under cultivation.

The upland soils of the group, although much more extensive than the terrace soils, are not quite so productive because the precipitation received by them is not supplemented by run-off from higher levels as it is on the terraces. None of the soils of the group gives as high yields, especially of corn and alfalfa, as the best bottom-land soils, but all are adapted to a wider variety of crops than the bottom-land soils and produce higher yields of all crops than any upland soil not belonging to the group.

The proportional acreages devoted to the different crops on the soils of this group differ only slightly from those given for the cultivated land of the county as a whole. Corn is grown on about 45 per cent of the area occupied by these soils, wheat on about 35 per cent, barley on about 7 per cent, sorgo on about 6 per cent, oats on about 3 per cent, and alfalfa on about 2 per cent. The remainder of the area is included principally in small fields of rye, millet, sweetclover, Sudan grass, and potatoes.

**Keith silt loam.**—Keith silt loam occupies 50.6 per cent of the total area of Hitchcock County. It occurs in all parts of the more nearly level or gently rolling loess-covered uplands, except the scattered slightly depressed areas which are occupied by a deep phase of Keith silt loam or by Scott silty clay loam.

The 7 to 15 inch topsoil of Keith silt loam is dark grayish-brown or chestnut-brown friable silt loam well supplied with organic matter. The organic matter in virgin areas constitutes about 2.9 per cent by weight of the topmost 12 inches of the soil. This material is an important factor in producing the soft mellow character so desirable for tillage, and it has strong absorbing powers for both moisture and heat. It retains moisture well and is the chief source of nitrogen, an essential plant food. The subsoil, which extends to a depth of 4 or 5 feet, is friable silt loam, brown or light grayish brown in the upper part, where it has been stained by water solutions of organic matter from the surface soil, and very light grayish brown or almost white in the lower part. Lime is abundant below a depth ranging from 16 to 20 inches, occurring in finely divided form thoroughly mixed with the silt and as filmlike coatings on the surfaces of seams, cracks, and worm, root, or insect formed cavities in the soil. The subsoil is highly retentive of moisture. Beneath it is the light yellowish-brown floury and amy silt from which the soil has weathered. The light-colored silt is known geologically as loess, and it is exposed in all the deeper road and stream cuts. The soil throughout is sufficiently porous to allow good aeration, easy penetration, and free upward and downward movement of water.

Keith silt loam is remarkably uniform in its characteristics throughout the area of its occurrence in Hitchcock County. In the more rolling sections, however, especially in the vicinity of the Colby soils where the surface relief has allowed rather rapid run-off, erosion has somewhat thinned the topsoil and lime lies a little nearer the surface of the ground than in the more level areas.

Practically all the land is under cultivation, and about 3,000 acres of it lying north of Culbertson is irrigated. About one-half the

cultivated acreage is used for corn, which yields an average of about 65 bushels an acre on the irrigated areas. On dry-land farms the yield ranges from about 60 bushels in years of unusually high rainfall to almost total crop failure in very dry years. The average yield is about 18 bushels an acre. Winter wheat is grown on about 34 per cent of the area occupied by the soil. Wheat yields are less variable than those of corn. The crop matures on moisture from spring and early summer rains and is not subjected to the frequent midsummer and late-summer droughts that so greatly reduce corn yields. The average yield of wheat over a period of years is about 13 bushels an acre. Sorgo, which is able to adapt itself to wide variations in moisture supply, usually does well except in the driest years. This crop occupies about 5 per cent of the soil. Its average yield is about 2.5 tons of forage an acre.

That part of the soil under irrigation, although used to some extent for corn, is used chiefly for alfalfa and sugar beets. The average yield of alfalfa hay is about 3½ tons an acre and of beets is about 12 tons. Practically no sugar beets and very little alfalfa are grown on Keith silt loam except under irrigation.

**Keith silt loam, deep phase.**—The deep phase of Keith silt loam occupies 3,520 acres in Hitchcock County. It occurs in small slightly depressed areas on the more nearly level upland divides, chiefly in the western part of the county. The topsoil closely resembles that of the typical soil but averages a few inches thicker, being in places from 20 to 25 inches thick. The upper subsoil layer is a trifle more compact than the corresponding layer in typical Keith silt loam, but it is very friable and easily penetrated by air, moisture, and roots. The lower part of the subsoil is very limy and similar in all characteristics to the corresponding layer of the typical soil.

Surface drainage is not well established, but the highly absorptive topsoil and subsoil rapidly remove all water from the surface of the ground.

Practically all this deeper soil is used for the production of corn and wheat, in about equal proportions. Yields of wheat are about the same as on typical Keith silt loam, but those of corn average about 5 per cent higher than on the typical soil, owing to slightly more favorable moisture conditions. Although it is very productive, soil of the deep phase is of little agricultural importance in Hitchcock County, on account of its small extent.

**Keith very fine sandy loam.**—Keith very fine sandy loam differs from Keith silt loam only in that it contains a little more very fine sand in the topsoil. Locally the topsoil contains sufficient fine sand or medium sand to be classed as fine sandy loam. However, the coarser-textured areas are too small and few to warrant their separation on the accompanying soil map. Owing to its higher sand content, this soil can be cultivated under a slightly wider range of moisture conditions than can Keith silt loam, but it has about the same producing power as that soil and is used for the same crops in about the same acreage ratios.

The soil occupies a comparatively small total area and is therefore of little agricultural importance in Hitchcock County. It occurs chiefly on long gentle slopes between the uplands and terraces on the south side of Republican River in the western part of the county, but

it is also locally developed on the uplands south of Frenchman Creek in the northern part.

**Bridgeport very fine sandy loam.**—Bridgeport very fine sandy loam occurs on terraces and on terracelike colluvial slopes between the uplands and alluvial lands. Its surface relief ranges from nearly level to gently undulating. Both surface drainage and underdrainage are well developed. The soil consists of grayish-brown friable very fine sandy loam which continues with little change in color or texture to a depth ranging from 4 to 5 feet or deeper. The topmost 3 or 4 inches is in most places a little darker than the remainder of the soil, owing to its higher organic-matter content. Lime is everywhere abundant below a depth of 12 inches and in many places occurs within 3 or 4 inches of the surface of the ground. It is in finely divided form, thoroughly mixed with the mineral soil particles.

This soil is developed on all the larger stream terraces but is most extensive on the Republican River and Frenchman Creek benches, where it lies from 10 to 25 feet above the stream channels. A few bodies south of Republican River in the western part of the county are on high benches from 50 to 60 feet above the stream.

Bridgeport very fine sandy loam is not so well supplied with organic matter as the Keith soils as is indicated by the lighter color of its topsoil. It occupies lower positions than the Keith soils and receives considerable moisture in the form of run-off and seepage from higher levels. This moisture tends to offset the rather low organic-matter content and gives the soil a slightly greater producing power than Keith silt loam, except in those areas on the higher-lying terraces.

About 90 per cent of Bridgeport very fine sandy loam is under cultivation, and about one-third of the cultivated area is irrigated. Corn is grown on about 70 per cent and alfalfa on about 20 per cent of the cultivated land, the remainder being used for wheat, sweet-clover, sugar beets, potatoes, and other crops grown for sustenance or feed. On the irrigated parts of the soil, corn yields about 60 bushels, potatoes about 120 bushels, alfalfa hay about  $3\frac{1}{2}$  tons, and sugar beets about 11 tons an acre. Under dry-land farming corn averages about 25 bushels, wheat about 14 bushels, potatoes 90 bushels, and alfalfa about 3 tons an acre.

The uncultivated areas of the soil, which occur chiefly on the higher terraces in the western part of the county, are used for pasture land or native-hay production. The native grasses will support about 25 head of cattle on each 160 acres during the summer grazing season, or when cut for hay will yield about 1 ton on each 2 acres.

A fine sandy loam which occupies a few small areas on the high terraces along Republican River southwest of Stratton and several small areas on lower terraces along this stream and Frenchman Creek has, on account of its small extent, been included with Bridgeport very fine sandy loam in mapping. Much of the soil along Frenchman Creek is under irrigation. This included soil, although similar in its major characteristics to typical Bridgeport very fine sandy loam, has a noticeably higher sand and lower organic-matter content than that soil. It does not produce quite so high yields as the finer-textured Bridgeport soils, except where irrigated, but it is used for

the same crops. The areas on the higher terraces are more subject to drought than any of the Keith soils and are used chiefly for corn. Practically all this included soil is under cultivation.

**Bridgeport silt loam.**—Bridgeport silt loam occurs on terraces and terracelike colluvial slopes similar to those occupied by Bridgeport very fine sandy loam, but it is a little more extensive than that soil. Most of it occurs on Republican River and Frenchman Creek terraces, but it is locally developed along Driftwood and Blackwood Creeks.

The soil resembles Bridgeport very fine sandy loam in its surface relief and drainage features and differs from that soil only in that it contains a higher percentage of silt throughout. It consists of friable grayish-brown silt loam to a depth ranging from 3 to 4 feet or deeper.

Practically all this soil is under cultivation, and about 30 per cent of it is irrigated. The land is used for the same crops as are grown on Bridgeport very fine sandy loam. It is a little more retentive of moisture than that soil, owing principally to its finer texture, and under dry-land farming it produces slightly higher yields. On irrigated land there is practically no difference in the producing power of the two soils.

**Bridgeport loamy fine sand.**—Bridgeport loamy fine sand consists of incoherent light grayish-brown fine sand or medium sand to a depth below 4 feet. The surface layer to a depth of 3 or 4 inches contains sufficient organic matter to give it a more loamy texture and slightly darker color than the remainder of the soil, but the organic content is nowhere sufficient to insure stability if the soil is brought under cultivation, and the sand drifts more or less even in virgin areas. Lime is abundant below a depth ranging from 16 to 20 inches.

This soil has much the same appearance as Valentine loamy sand but contains more lime, occupies lower topographic positions, and, as a rule, has a little more even surface. It occurs as small bodies on terraces or terracelike colluvial slopes, chiefly in the Republican River Valley. It lies from 8 to 15 feet above the stream channel, except in a few bodies south of Stratton where the soil occupies high terraces from 30 to 40 feet above Republican River.

Bridgeport loamy fine sand is rather droughty, and only about 40 per cent of the land is under cultivation. Corn is grown chiefly, although some sweetclover and sorgo are also produced. Yields of these crops average about 20 per cent lower than those obtained on Bridgeport very fine sandy loam.

The uncultivated part of the soil is used for pasture and hay land. It is covered with a fair growth of sand grass and needle grass, which will support about 20 head of cattle on each 160 acres or will produce about one-third ton of hay an acre.

**Tripp silt loam.**—Tripp silt loam occupies less than 1 square mile in Hitchcock County. It occurs in a few small bodies on the terraces along Driftwood Creek. The surface relief of the bodies, although nearly level, slopes gently down the valley and toward the stream, and all the land is well drained.

Tripp silt loam is identical with Keith silt loam in all soil characteristics, and differs from that soil only in its topographic position. The same crops are grown on it as on nonirrigated areas of the Keith

soils, but yields are about 10 per cent higher than on those soils, owing largely to a more favorable moisture supply. The soil receives water not only through precipitation but also through seepage and run-off from the uplands. It is a trifle more productive than any of the Bridgeport soils, owing to the higher organic-matter content of its topsoil. Practically all the land is under cultivation.

#### EXCESSIVELY DRAINED UPLAND SOILS

The soils belonging to this group occupy 32.7 per cent of the total area of the county. They include the Colby and Valentine soils and areas of dune sand, all of which occupy upland positions. The soils are prevailingly low in organic matter and light in color. The area occupied by them has a wide range of topographic and soil features. The Colby soils, which are by far the most extensive, have developed from the same light-gray floury and limy loess formation that underlies the Keith soils, but they have been subjected to severe erosion. They occur in nearly all parts of the loess-covered uplands wherever rapid run-off water has prevented or greatly restricted the accumulation of organic matter. The soils are composed largely of unweathered or only slightly weathered loessial silt, and they occupy the valley slopes along nearly all the drainage ways throughout the county.

The Valentine soils and dune sand are composed largely of fine sand or medium sand, the topmost few inches of which have been only slightly darkened by organic matter. They occur principally south of Republican River in the western part of the county, but some of the Valentine soils are also developed south of Frenchman Creek between Palisade and Beverly.

The material in the dune sand areas is very unstable, and the land surface is strongly rolling or hilly. The Valentine soils, although subject to considerable wind erosion, are fairly stable, providing they are not used for cultivated crops.

More than 90 per cent of the area occupied by the soils of this group is used for native pasture or hay land. The Colby soils as a whole are too rough to be used for cultivated crops, and the Valentine soils and dune sand are too unstable and droughty for tame-hay and grain production. The small percentage of cultivated land is confined to the more gradual slopes in the Colby areas and to the lower-lying positions in the Valentine soils, where moisture and organic matter have accumulated in the largest quantities. It is used almost entirely for corn, although some sweetclover is grown.

**Colby silt loam, broken phase.**—Colby silt loam, broken phase, is the most extensive soil in this group. It occurs in all parts of the uplands, wherever erosion has carved the gray loess into a rugged surface relief, and it is developed on the steeper valley slopes along nearly all the drainage ways. Narrow nearly level canyon floors are included with the broken phase. Soil slipping is common, and most of the slopes are characterized by a succession of short vertical exposures locally known as catsteps.

The broken phase of Colby silt loam, although developed from loess identical with that underlying the Keith soils, has been subject to such severe erosion that it has been unable to accumulate much organic matter. The topsoil, even in the less eroded areas, in few places

exceeds 6 inches in thickness, and in most places soil of the broken phase consists of gray loess, the topmost 2 or 3 inches of which have been but slightly darkened by organic matter. Most areas of this soil are very limy throughout.

Colby silt loam, broken phase, is topographically unsuited to cultivation, but it supports a good growth of prairie grasses and, owing to its large extent, is the leading grazing soil in the county. The principal grasses are grama and little bluestem, although big bluestem is common on many of the narrow canyon floors and lower valley slopes. The native grasses will support about 30 head of cattle on each 160 acres during the summer grazing season, from May to October, inclusive. Some hay is cut on the canyon floors, and it yields about one-half ton an acre in seasons of normal rainfall.

**Colby silt loam.**—Colby silt loam differs from its broken phase in that its surface is less rugged and its topsoil is thicker. It occupies numerous though usually small bodies within or adjoining areas of the broken phase, and, although the bodies have been subjected to considerable erosion, they are not so steeply sloping or rough and gullied as areas of the broken phase. The topsoil over most of the areas ranges from grayish-brown to chestnut-brown friable silt loam to a rather uniform depth between 5 and 7 inches. It rests directly on the unweathered limy and floury loess.

Practically all the land could be farmed, providing care were taken to prevent erosion, but only about 40 per cent of it is under cultivation. Corn and sorgo are the leading crops grown. Yields during the first few years of cultivation are only about 10 per cent less than those obtained on Keith silt loam, but unless the Colby soil is carefully managed erosion rapidly removes the loosened topsoil, forms gullies, and renders the land uncultivable.

The uncultivated areas are used for pasture land. They support a more luxuriant grass growth than occurs on the broken phase of the soil and have a slightly higher grazing value.

**Colby very fine sandy loam.**—Colby very fine sandy loam occupies numerous small bodies and narrow strips on the valley slopes south of Republican River and Frenchman Creek. The soil differs from Colby silt loam chiefly in the slightly higher sand content of its surface layer. Much of it, however, is more severely eroded than Colby silt loam and resembles the broken phase of that soil in all features except texture of the surface soil. It has developed from gray upland loess similar to that underlying the other Colby soils of the county but has received sufficient wind-blown sand to give its surface layer a very fine sandy loam or fine sandy loam texture.

All this soil occurs in close association with areas of Colby silt loam or the broken phase of that soil. About 20 per cent of the land is under cultivation, but most of the remainder is too rough and broken for the use of cultivating machinery and is included in pasture land. The same crops are grown on the cultivated areas as on corresponding areas of Colby silt loam, and the two soils are about equally productive. In fact, the farmers recognize no differences in the crop-producing or grazing value of Colby silt loam, its broken phase, and Colby very fine sandy loam, provided comparisons are made on areas having similar surface relief.

**Colby loamy sand.**—Colby loamy sand occupies small bodies, all of which occur in close association with areas of dune sand or the Valentine soils. The largest body, comprising about 300 acres, is in the upland south of Frenchman Creek in Beverly Precinct. A slightly smaller body is south of Republican River in Pleasant View Precinct. The remaining bodies are few and much smaller.

This soil is similar to the other Colby soils, except that its surface layer to a depth ranging from 4 to 10 inches is composed of incoherent gray sand and its surface features are less harsh and angular. The sand, which has been blown on the soil from near-by sandy areas, has rounded most of the irregularities and produced a strongly rolling or hummocky relief.

Most of the soil is topographically suited to cultivation, but the sand is very unstable when the native sod is destroyed, and practically all the land is used as pasture land. The sand absorbs practically all the precipitation and acts as a mulch in preventing rapid evaporation, thereby making moisture conditions especially favorable for grass growth. This soil has a higher grazing value than any other upland soil.

The material beneath the sand is light-gray limy silt similar to that underlying all the Keith and Colby soils. It is highly retentive of moisture.

**Valentine sand.**—Valentine sand occupies a few bodies in the sandy uplands south of Republican River in the western part of the county. The largest area, comprising about 800 acres, is 2 miles south of Stratton. The remaining bodies are much smaller.

The soil consists of grayish-brown loose incoherent sand to a depth of more than 6 feet. The topmost 4 or 5 inches have accumulated a little organic matter and in most places are slightly darker than the remainder of the soil. The organic content, however, is not sufficient to prevent drifting when the native sod is destroyed.

The surface relief over the greater part of this soil is strongly undulating or rolling, but numerous areas are included in which wind action has produced a pronounced hummocky relief. There is no surface run-off, as the precipitation percolates rapidly into and through the porous sand, and as a result the soil has been entirely leached of its lime.

Valentine sand is of little value for crop production on account of its unstable character, low organic-matter content, and low water-retaining capacity. About 20 per cent of it is farmed, corn being grown chiefly, and the remainder is included in grazing land. Corn yields average about 12 bushels an acre, and the grazing land will support about 20 cattle on 160 acres during the summer grazing season.

**Valentine loamy sand.**—Valentine loamy sand differs from Valentine sand only in that its topsoil is better supplied with organic matter and is a trifle thicker. The soil occurs in close association with Valentine sand and is somewhat more extensive. The largest area comprising about 700 acres is 4 miles south of Stratton and a few small areas are southeast of Palisade. The surface features and drainage conditions are about the same as those on Valentine sand.

The higher organic-matter content causes this soil to produce somewhat higher yields than Valentine sand, especially during the first

two or three years after the land is broken, and for this reason about 40 per cent of the soil is used for crops, chiefly corn. The organic matter, which is not sufficiently abundant to prevent the sand from drifting when the native sod is destroyed, decreases rapidly under cultivation, and the Valentine sand areas annually are becoming larger at the expense of Valentine loamy sand.

The average yield of the first two or three crops of corn planted is about 18 bushels an acre, after which the yield is much lower except during seasons of unusually high precipitation. The uncultivated parts of the soil support fairly heavy growths of sand grass, stipa or needle grass, and big bluestem, and they have a somewhat higher grazing value than Valentine sand. During normal years about 25 head of cattle can be grazed on each 160 acres, or when the grasses are cut for hay about one-third ton an acre is obtained.

**Dune sand.**—Dune sand, although not a soil, is very loose and porous and for this reason is included with the excessively drained upland soils. It occupies a few bodies south of Republican River in Pleasant View and Stratton Precincts.

Dune sand is incoherent gray sand which has been whipped by the wind into a succession of irregularly distributed hills and ridges, the tops of which are from 15 to 30 feet above the intervening valleys and pockets. Surface-drainage channels are not established, as all moisture is rapidly absorbed by the loose porous sand. The material in most places supports a fair growth of sand grass, stipa, and big bluestem, but bare spots, locally called blow-outs, occupy a square rod or two on many of the hills, especially on the northwest side.

All the dune sand is used as pasture land, except a few of the lower-lying and more stable areas which are used for the production of hay. The native grasses on this material support from 15 to 18 head of cattle on each 160 acres. The hay on the more stable parts yields one-fourth ton or slightly more an acre, depending on the rainfall.

#### POORLY DRAINED UPLAND SOILS

The poorly drained upland soils occupy only 2.4 square miles in Hitchcock County. They occur in numerous basinlike depressions, locally known as "buffalo wallows" or "lagoons," throughout the more nearly level parts of the loess-covered uplands. Only a few of the basins include more than a few square rods. They have no natural drainage outlets, and water collects in them after rains, disappearing slowly through evaporation and seepage.

The topsoils in few places exceed 8 inches in thickness. They are usually very dark in the upper part, but the excessive moisture has noticeably leached the lower part which in the deeper basins is very light in color. The subsoils everywhere include a dense claypanlike layer which is penetrated with difficulty by air, moisture, and crop roots. Even if drainage conditions allowed cultivation, the soils would remain poorly adapted to grain and tame-hay crops, because the topsoils are too thin to store much moisture and the dense clay in the subsoil is too poorly aerated and releases its moisture too slowly for these crops.

**Scott silty clay loam.**—Scott silty clay loam is the only soil classed with the poorly drained upland soils in Hitchcock County. Its

topsoil, although friable, is only 5 or 6 inches thick. The upper part is well supplied with organic matter and is very dark. The lower part may or may not be dark, but in the deeper and more poorly drained basins it usually contains sufficient leached silt to give it a grayish-brown or almost white color.

The subsoil, which extends to a depth ranging from 5 to 6 feet, consists of dark-gray or slate-colored stiff clay which is impervious to water and extremely difficult to penetrate with digging tools. Beneath this claypanlike layer is light grayish-brown silty material similar to that underlying the Keith and Colby soils, except that it has been leached of its lime to a depth exceeding 7 feet.

Scott silty clay loam is not used for grain and tame-hay crops, on account of its poor drainage and claypanlike subsoil. Some wild hay of rather low quality is cut from the larger areas, and it generally includes much coarse vegetable material, such as rushes, sedges, cattails, and other water-loving plants. Most of this soil is included in pasture land, although it does not have a high value, even for grazing purposes. Some of the smaller bodies occur in cultivated fields and are regarded as waste land. During prolonged droughts the soil becomes extremely dry and hard, and it cracks badly, causing the natural vegetation to wither and die.

#### BOTTOM-LAND SOILS

Bottom-land soils occupy 3.8 per cent of Hitchcock County. They include the Sarpy and Laurel soils, all of which have developed from sediments recently deposited by the streams on their flood plains during periods of high water. These soils occur principally along Republican River and Frenchman Creek where they occupy narrow elongated and in most places broken strips on each side of the stream channels. They are also locally developed along Driftwood Creek, but they occur in very few places along the secondary drainage ways throughout the county.

The surface of the bottom land slopes almost imperceptibly down the valley and toward the stream. The relief is remarkably even, except where traversed by old and present channels or where modified by slight elevations and shallow depressions. Surface drainage is rather slow and much of the land is subject to overflow during high stages of the streams, but most of it lies from 3 to 5 feet above the stream channels, and the water drains off in a few hours after the streams subside. About 70 per cent of the area occupied by the soils of this group is well drained the greater part of each year. The water table is everywhere within 10 feet of the surface of the ground, in many places much nearer, and the lower parts of the subsoils are kept well supplied with moisture even in the drier years.

The sediments from which the bottom-land soils have developed are of such recent origin that none of them has been greatly altered by weathering and their character is the dominant factor in determining the character of the soils. As most of the sediments came from light-colored geologic formations, all the bottom-land soils are rather light in color and low in organic matter. Those soils that have developed from the finer-textured sediments, chiefly silt which was washed into the larger stream valleys from the near-by loessial up-

lands, are classed with the Laurel soils; and those which have been formed from sandy sediments are classed with the Sarpy soils.

About 70 per cent of the area occupied by the bottom-land soils is under cultivation. The cultivated parts include the most productive corn and alfalfa soils in the county, and more than 90 per cent of the area occupied by them is used for these crops, in the proportion of about 10 acres of corn to 1 acre of alfalfa. Alfalfa can be grown as continuously as desired without decreasing the subsoil moisture to the point where yields decline as they do on the unirrigated parts of the uplands and terraces under continued alfalfa production.

Small-grain crops grow well on the cultivated bottom-land soils, but they have a tendency to produce rank stalk growth accompanied by rather low grain yields, and, with the exception of barley and oats which occupy a few fields, are seldom grown on these soils.

The uncultivated parts of the bottom lands are used for native-hay and pasture land. They occupy the more poorly drained areas; those which are extremely sandy and unstable and those which are covered with native trees

**Sarpy loamy sand.**—Sarpy loamy sand is the most extensive bottom-land soil in Hitchcock County, occupying nearly half of the flood plains along Republican River and Frenchman Creek. Most of the soil occurs as narrow strips adjacent to the stream channels and only a few feet above the normal flow of the streams. It is subject to overflow during flood stages, but about 70 per cent of it is adequately drained and under cultivation.

The soil consists of gray incoherent fine sand or medium sand to a depth exceeding 3 feet. The topmost 4 or 5 inches contains sufficient organic matter to give the soil a dark grayish-brown color and loamy texture but not enough to prevent the sand from drifting when the protective covering of grasses is destroyed. The subsoil and the surface soil, in many places, are limy.

The surface relief in most places is nearly level, but numerous areas occur in which the sand has been whipped by the wind into low mounds and ridges with intervening shallow depressions. However, even in these localities, the range in relief in few places exceeds 2 feet. The sand on the tops of the ridges is usually practically devoid of organic matter and is gray in color, but that in the depressions is much darker and most of it is a trifle finer in texture.

Corn is the principal crop grown on the cultivated parts of this soil. Some alfalfa is grown and does well providing a good stand is obtained, but much of the seed fails to germinate in the loose unstable sand. Alfalfa does not occupy more than 20 per cent of the cultivated area of this soil.

Although the soil is very low in organic matter, and therefore in nitrogen, its unusually favorable moisture supply enables it to produce almost as high yields of corn as are obtained on the unirrigated parts of Keith silt loam. Alfalfa from a good stand yields from 3 to 3 $\frac{1}{4}$  tons of hay an acre or about as much as that grown on the irrigated upland and terrace soils.

The uncultivated parts of the soil, including the more poorly drained areas and those covered with native trees, are used for pasture or hay land. They produce a rather rank growth of water-loving grasses which will support a cow or horse on each acre during

the summer grazing season or will produce about 1 ton of hay an acre.

**Sarpy very fine sandy loam.**—Sarpy very fine sandy loam is similar to Sarpy loamy sand, except that it contains a higher percentage of very fine sand and silt to a depth of 6 or 8 inches than occurs at corresponding depths in the loamy sand. The topsoil, which averages about 7 inches in thickness, contains only a small quantity of organic matter, but it is very stable, owing to its rather high content of fine-textured material.

This soil occurs in small irregular-shaped bodies and strips throughout the flood plains of Republican River and Frenchman Creek. Its total area in Hitchcock County is 5.2 square miles.

About 80 per cent of the land is under cultivation. This is one of the most productive corn and alfalfa soils in the county, owing largely to its bottom-land position and consequent high moisture supply. The average yield of corn over a period of years is about 25 bushels an acre and of alfalfa is about 3½ tons of hay.

The uncultivated areas, as on all the bottom-land soils of the county, are used as pasture and hay land. Their value for these purposes is about 10 per cent above that of corresponding areas of Sarpy loamy sand.

**Sarpy fine sandy loam.**—Sarpy fine sandy loam occupies a total area of 3.6 square miles. It occurs in numerous small bodies on the bottom lands in close association with the other Sarpy soils, from which it differs only in the texture of its topsoil layer. This layer, which is about 7 inches thick, is finer in texture than the corresponding layer in the loamy sand but slightly coarser than the topsoil of Sarpy very fine sandy loam. It consists of grayish-brown or dark grayish-brown friable fine sandy loam containing only a moderate supply of organic matter. The subsoil is incoherent gray sand to a depth below 4 feet.

Practically all the land is under cultivation. Corn and alfalfa are grown chiefly in the proportion of about 10 acres of corn to 2 of alfalfa. Some potatoes, sweetclover, and barley are also grown, but the total area devoted to these crops is small. Corn and alfalfa yields average a trifle higher than on Sarpy loamy sand but are a little lower than on Sarpy very fine sandy loam.

**Sarpy sand.**—Sarpy sand occupies 1.3 square miles in Hitchcock County. It occurs in several small bodies, most of which are adjacent to the channel of Republican River.

This soil consists of a gray heterogeneous mixture of medium fine sand and very fine sand to a depth below 3 feet. It has accumulated a little organic matter in its upper 3 or 4 inch layer but not enough to more than slightly darken this layer or to prevent the sand from drifting during windy weather.

Owing to its low organic-matter content, unstable character, and proximity to the river, all the Sarpy sand is included in pasture land. It supports only a sparse grass cover and does not have a high value even for grazing. Some of it is covered with scrub-willow and cottonwood trees.

**Laurel silt loam.**—The outstanding characteristic of Laurel silt loam is the fine texture of the entire soil in contrast to the coarse sandy texture of the Sarpy soils. It occurs as numerous small bodies

along Driftwood Creek and occupies a few bodies in the Republican River and Frenchman Creek bottom lands. Its total area in Hitchcock County is 4.9 square miles.

The topsoil is grayish-brown or light grayish-brown friable silt loam 8 or 10 inches thick. In most places it is underlain by a layer of slightly lighter colored silty clay loam, about 12 inches thick, which rests on light-gray or almost white loose floury silt similar to the parent loess underlying the well-drained upland soils. The soil in some places consists of light grayish-brown mellow silt loam which is uniform in color, texture, and consistence to a depth below 3 feet, and in local spots the material below 4 feet contains much coarse sand and fine gravel. These variations are of such small extent that they are not shown on the soil map.

Lime, in powderlike form, thoroughly mixed with the mineral soil particles, occurs in abundance throughout the soil. The soil is rather low in organic matter as indicated by its light color. In addition, it lies only 2 or 3 feet above the normal level of the stream channels, and most of it is subject to frequent overflow. Much of this soil is poorly drained, and part of it is alkaline.

Only about 20 per cent of the land is used for cultivated crops, chiefly corn and alfalfa. Where good drainage is assured and the soil does not contain injurious quantities of alkali, corn and alfalfa yields equal, or are slightly greater than, those obtained on Sarpy very fine sandy loam. The uncultivated parts of the soil, including the more poorly drained and more alkaline areas and those which are covered with native trees, are used for pasture or hay land, for which they are well suited.

**Laurel very fine sandy loam.**—Laurel very fine sandy loam resembles Laurel silt loam, except that it contains a little more very fine sand and fine sand in its surface layer which extends to a depth of 6 or 8 inches. The subsoil is similar in all characteristics to that of the silt loam and subject to the same variations, but these are not sufficiently extensive to be indicated on a map of the scale used in this survey.

This soil occupies only a few small bodies, with a combined area of 2.4 square miles, in Hitchcock County. Most of them lie along Republican River. Although all the soil is in the bottom lands, it occurs on slightly higher levels than Laurel silt loam. Most of it is sufficiently well drained for grain and tame-hay production, and about 90 per cent of it is under cultivation. As on all the bottom-land soils, corn and alfalfa are the leading crops.

This soil is one of the most productive corn and alfalfa soils in the region, and yields of these crops are usually a trifle higher than on any other bottom-land soils. However, Laurel very fine sandy loam is not sufficiently extensive to be of much agricultural importance in Hitchcock County. The uncultivated areas are used for native pasture and hay land, for which they are as well suited as any soil in the region.

#### SOILS AND THEIR INTERPRETATION

The most general characteristics, or those which are common to the greatest number of soils in Hitchcock County, are the structureless character of the topsoils and the slight depth to lime. Another

characteristic which, although not so general as the two mentioned, is the dark color of the topsoils. This color persists except where the soils have been subjected to severe wind or water erosion or have developed from recently deposited parent materials. These characteristics are the result of the prevailing climate and vegetation.

The county is in the western part of the prairie region. The mean annual precipitation, 19.87 inches, has not been sufficient for the growth of tall-grass species, and short grasses, principally grama and buffalo grass, predominate. Black carbonaceous material derived through decay of the grass roots accounts for the dark color of the topsoils. The carbonaceous material is not so abundant as in the eastern or tall-grass part of the prairie region, and the topsoils range from dark grayish brown to chestnut brown in contrast to the very dark grayish brown or almost black color of the soils farther east.

The slight depth to lime in most of the soils is owing to the rather low precipitation. The moisture entering the ground has not been sufficient to deeply leach the readily soluble salts, chiefly lime carbonate, except in the more sandy soils and in those occupying poorly drained depressions. Throughout most of the well-drained upland, lime is abundant at a depth ranging from 18 to 24 inches. Although the general characteristics of the soils in the county are the result of the climate and vegetation, soil differences, as well as the distribution of the soils, are owing to the character of the parent materials, the length of time these materials have lain in their present positions exposed to weathering, and the moisture conditions under which they have weathered.

The parent material from which most of the upland soils have developed is light-gray floury and limy silt, known geologically as Peorian loess. It is presumably uniform in its physical and chemical properties and has developed into soils which, although prevalingly fine in texture, differ markedly from one another in many of their characteristics in accordance with differences in the moisture conditions. Those loess-derived upland soils occupying poorly drained depressions in which water accumulates after rains show certain well-marked characteristics, among which are advanced stages of leaching and concentrations of clay in the subsoils; those in well-drained but not severely eroded situations show less leaching and concentration of clay; and those on steeply sloping areas, where surface run-off is rapid, show neither of these characteristics.

The loessial material covers all the upland, except a rather large area south of Republican River in the western part of the county and a few small areas south of Frenchman Creek in the northern part, which are covered by loose fine sand or medium sand. The sandy material in these areas is underlain by loess at a depth ranging from 8 to more than 50 feet and appears to have been blown onto the upland from the river valleys. It probably came originally from sandy areas to the west. All the soils which have weathered from it have light-colored topsoils, are coarse textured throughout, and have been leached of most of their readily soluble salts. They differ from one another chiefly in their content of organic matter and in their ability to resist wind erosion, both of which are controlled in any particular locality by the moisture supply in the soil.

The parent materials from which the alluvial soils have developed consist of loess and sand derived partly from the local upland and partly from regions to the west and deposited as sediment in the stream valleys. The silty and sandy sediments have been mixed in many places by the streams, and in most localities they have been rather recently deposited. Differences in the soils developed from them are owing largely to differences in the character of the sediments from place to place but partly to differences in the drainage conditions and in the length of time the sediments have weathered subsequent to their deposition. Most of the alluvial soils are low in organic matter and light in color.

In this report, the different soils of the county have been arranged in eight soil series, namely, Keith, Colby, Scott, Valentine, Tripp, Bridgeport, Sarpy, and Laurel. In addition, dune sand, which is not regarded as a soil, is recognized. The first four named and dune sand occupy upland positions; the Tripp and Bridgeport soils are on terraces; and the Sarpy and Laurel are in the bottom lands.

The Keith and Tripp soils have been formed under conditions especially favorable for deep soil weathering and the accumulation of organic matter. They occupy nearly level or undulating loessial areas, have developed under good surface drainage and underdrainage, and have lain in their present positions practically undisturbed by erosion for a long time. These soils are very similar in all their characteristics and have reached a stage of development beyond that of any other well-drained soil in the county.

Following is a profile description of Keith silt loam which occupies nearly all of the less eroded loess-covered upland and is the most extensive soil in the county. This profile, which is regarded as typical of the Keith and Tripp soils, was observed on a smooth upland divide near the center of sec. 2, T. 2 N., R. 35 W.

- 1 From 0 to 2 inches, a grayish-brown floury silt loam mulch
- 2 From 2 to 5 inches, dark grayish-brown friable silt loam, the upper part of which has a very faintly developed laminated structure, and the remainder is structureless
- 3 From 5 to 19 inches, dark grayish-brown mealy or structureless silt loam. This is the layer of maximum density, but its increased compaction is not noticeable except through comparison with that of other layers in the profile
- 4 From 19 to 34 inches, grayish-brown friable structureless silt loam with a high lime content. The lime occurs in disseminated form and as soft coatings on the surfaces of clods, cracks, and seams
- 5 From 34 to 50 inches, very light grayish-brown floury and lmy silt. Most of the lime in this layer is disseminated
- 6 From 50 to 84 inches, raw loess consisting of pale grayish-yellow lmy silt. The material resembles that in the layer above, except that it is slightly lighter in color and all the lime is in disseminated form

All color transitions between the different layers are very gradual and, with the exception of the layer of maximum compaction, which apparently contains a little more clay than the other layers, are very similar in texture. The lower part of the second layer contains numerous worm casts, and the layers beneath it, to and including the fifth, contain root, worm, or insect holes which have become filled with soil material of a slightly darker or lighter shade than the remainder of the matrix. The fillings are most numerous in the third layer. The upper three layers have been leached of their lime

and no noticeable swelling or effervescence occurs when hydrochloric acid is applied. The remainder of the soil profile contains an abundance of lime, but the most vigorous reaction with acid occurs in the fourth layer which is apparently the one of maximum carbonate enrichment.

The Colby soils have developed from the same geologic formation from which Keith silt loam was formed. They occupy steep valley slopes and sharp ridge crests and have been subjected to excessive erosion. The rapid surface run-off has prevented the accumulation of much organic matter and has not allowed leaching of the carbonates as fast as new material has been exposed at the surface. Lime, therefore, is abundant and evenly distributed from the surface downward. The soils are very light in color and have not developed definite horizons, or layers, such as occur in the Keith soils. In most places they consist of Peorian-loess exposures, the topmost few inches of which have been only slightly modified by weathering.

The Scott soils are the most poorly drained of the loess-derived soils in Hitchcock County. They occupy numerous though small basinlike depressions throughout areas of Keith silt loam. Water collects in the basins after heavy rains and remains on the surface of the ground until removed by absorption and evaporation. Downward moisture percolation has been more continuous and its results are more pronounced in Scott silty clay loam than in any other soil in the county. The topsoil in few places exceeds 8 inches in thickness. It ranges in texture from silt loam to silty clay loam and most of it is moderately compact. This layer also varies considerably in structure but in most places is structureless or laminated and in few places contains any granular material. The color in the upper part of the layer is nearly black. The lower part of the layer may or may not be dark, but in all areas of the soil it is more or less leached and in many of them is gray or almost white. The subsoil, which continues to a depth ranging from 4 to 5 feet, is a true claypan, being composed of heavy structureless clay or silty clay. It ranges in color from dark grayish brown to gray or lead colored, the darker shades being confined to the upper part, and it contains many ferruginous stains, streaks, and splotches. Beneath the claypan is the light-gray floury Peorian loess from which the soil has weathered. The excessive moisture has removed all traces of lime below 10 feet.

The development of the claypan layer in this soil is probably owing, in part at least, to the translocation of clay from the overlying layers through the agency of percolating water. Sodium or potassium salts may also have contributed to the density of the claypan, or may even have been the chief factor in determining its density, but no analytical data are available on the Scott soils in Hitchcock County and no definite statement can be made in regard to the origin of the dense layer in them.

The Valentine soils and dune sand are composed almost entirely of loose gray sand which has been blown from the valley of Republican River and deposited on the uplands in the western part of the county. The porous sand has been entirely leached of its lime, except in a few places where it borders areas of higher-lying loessial soils and is continually receiving some lime through water draining from those

areas. It is composed largely of quartz particles and is extremely resistant to weathering. In addition, it is rather unstable and the soils developed from it are light colored throughout, owing to a scarcity of organic matter. The Valentine soils are developed in the less wind whipped localities and have gently rolling or hummocky surfaces, whereas the dune-sand areas are hilly.

The Bridgeport soils are developed on terraces similar to those occupied by the Tripp soils but have weathered from more recently deposited and slightly sandier materials. Their outstanding characteristics are the low organic-matter content and the uniformity of the entire soil profile. Sufficient time has not elapsed for the development of horizons, or layers, of true soils character. The surface layer to a depth ranging from 6 to 10 inches is usually slightly darker than the remainder of the soil, but it is not so dark as the topsoil in the Tripp and Keith soils. The underlying material to a depth below 4 feet is light grayish brown and is loose, structureless, and friable throughout. The texture of the soil material throughout the profile, although nearly uniform in any particular spot, varies considerably from place to place, depending on the relative proportions of sand and silt in the parent material. The soil is highly calcareous below a depth of 10 or 12 inches, but the carbonates are evenly distributed and no zone of unusual concentration or segregation of the lime occurs, as in the Keith and Tripp soils.

The Laurel and Sarpy soils of the bottom lands have developed from such recently deposited stream sediments that they have not yet accumulated much organic matter and are grayish brown or light grayish brown throughout. The Laurel soils have developed from the more silty sediments and are fine textured, but the Sarpy soils have developed from sand and gravel and are coarse textured. None of the bottom-land soils has developed true soil horizons, although most of them contain a few thin sedimentary strata.

#### SUMMARY

Hitchcock County is in southwestern Nebraska, adjoining Kansas. It is rectangular in shape and comprises 708 square miles, or 453,120 acres.

The county is in that part of Nebraska known by the State geographers as the "Nebraska plain." Topographically, it consists of several nearly level table-land areas, separated by the valleys of Republican River and Frenchman, Driftwood, and Blackwood Creeks and traversed by numerous steep-sided drainage ways. All the larger streams flow in a general easterly direction, except Blackwood Creek which flows southeast across the northeastern corner of the county. The large stream valleys include nearly level or gently undulating strips of alluvial land, ranging in width from one-fourth mile to more than 2 miles. The strips along Republican River and Frenchman Creek are the broadest. The largest area of severely eroded land is south of Driftwood Creek in the southeastern part of the county.

The average elevation of the county is about 2,850 feet above sea level, and the range in elevation is about 465 feet.

All the drainage of the county is effected by Republican River and its tributaries. The only poorly drained land is in scattered small basinlike depressions on the more nearly level uplands and in local areas on the flood plains.

The first permanent settlement was made in 1872, and the county was established and organized in 1873. The population, according to the 1930 Federal census, is 7,269, all of which is classed as rural.

The county has good transportation facilities, and telephones and rural mail delivery routes reach nearly all sections.

The climate is characterized by a wide range in temperature and rather low precipitation. The mean annual temperature is 50.9° F., and the mean annual precipitation is 19.87 inches. The rainfall in early summer is usually well distributed, but in July and August the distribution is less favorable and short droughts often occur during these months.

About 44 per cent of the total land area is under cultivation, and most of the remainder is used for grazing cattle. The principal cultivated crops are corn, wheat, barley, sorgo, and alfalfa, ranking in acreage in the order named. Other crops include oats, sweetclover, potatoes, and sugar beets, the last named being grown only on irrigated land. Wheat is the chief cash crop. Sugar beets also are sold for cash, but they occupy only a small total acreage. Most of the remaining crops are fed to livestock, especially cattle and hogs, which are among the most important sources of revenue.

The cultivated soils of the county as a whole are naturally productive, provided an adequate supply of moisture is assured. Most of them contain an abundance of lime at a slight depth and have accumulated enough organic matter that their topsoil layers range in color from dark grayish brown to chestnut brown. All of them are friable and are easily penetrated by air, moisture, and crop roots.

Differences occur in the grain and tame-hay yields on the different cultivated soils, but these are owing largely to differences in soil moisture which is controlled by the surface relief, particularly the slope of the land and its elevation with respect to surrounding soil areas, or to the underlying water table. Differences in the soil-moisture supply are also largely responsible for differences in the agricultural value of the uncultivated or pasture and hay soils. Those areas occupying the steeper slopes and sharper ridge crests, where most of the precipitation is lost through run-off, support a much sparser vegetable growth than those with more even surfaces.

One of the most extensive and productive soils in the county is Keith silt loam. This soil has developed from light-gray floury and limy silt, known geologically as Peorian loess. It covers the greater part of the more nearly level though well-drained upland and has one of the deepest and darkest topsoils in the county. Its subsoil is friable throughout, is retentive of moisture, and is well supplied with lime. The soil is adapted to all crops common to the region, and practically all the land is under cultivation. It does not produce such high yields of corn and alfalfa as do some of the bottom-land soils, especially in dry years, but it is one of the most productive wheat soils in the county.

Tripp silt loam is similar to Keith silt loam in all soil characteristics and is used for the same crops. It occurs on well-drained

terraces and, owing to its lower position and therefore more favorable moisture supply, is a little more productive than the Keith soil, but it occupies less than 1 square mile and is of little agricultural importance in Hitchcock County.

The Bridgeport soils occur on terraces similar to those occupied by Tripp silt loam but are much more extensive than that soil. They are not so well supplied with organic matter as the Keith and Tripp soils and have lighter-colored topsoils. Most of them contain considerable sand and, although they are a little more productive than the Keith soils, owing largely to their more favorable moisture supply, they are less productive than Tripp silt loam. The greater part of the area occupied by these soils is under cultivation.

The Colby soils occupy the more severely eroded parts of the loess-covered upland. They occur wherever surface run-off has prevented or greatly restricted the accumulation of organic matter, and their topsoils are prevailingly light colored. In many places the unweathered gray loess is exposed. The soils occur on the steep valley slopes along most of the drainage ways in the county. They are used principally for grazing land, although some hay is cut on the narrow canyon floors, and a few of the more gradual slopes are used for corn production. The broken phase of Colby silt loam is one of the most extensive soils in the county.

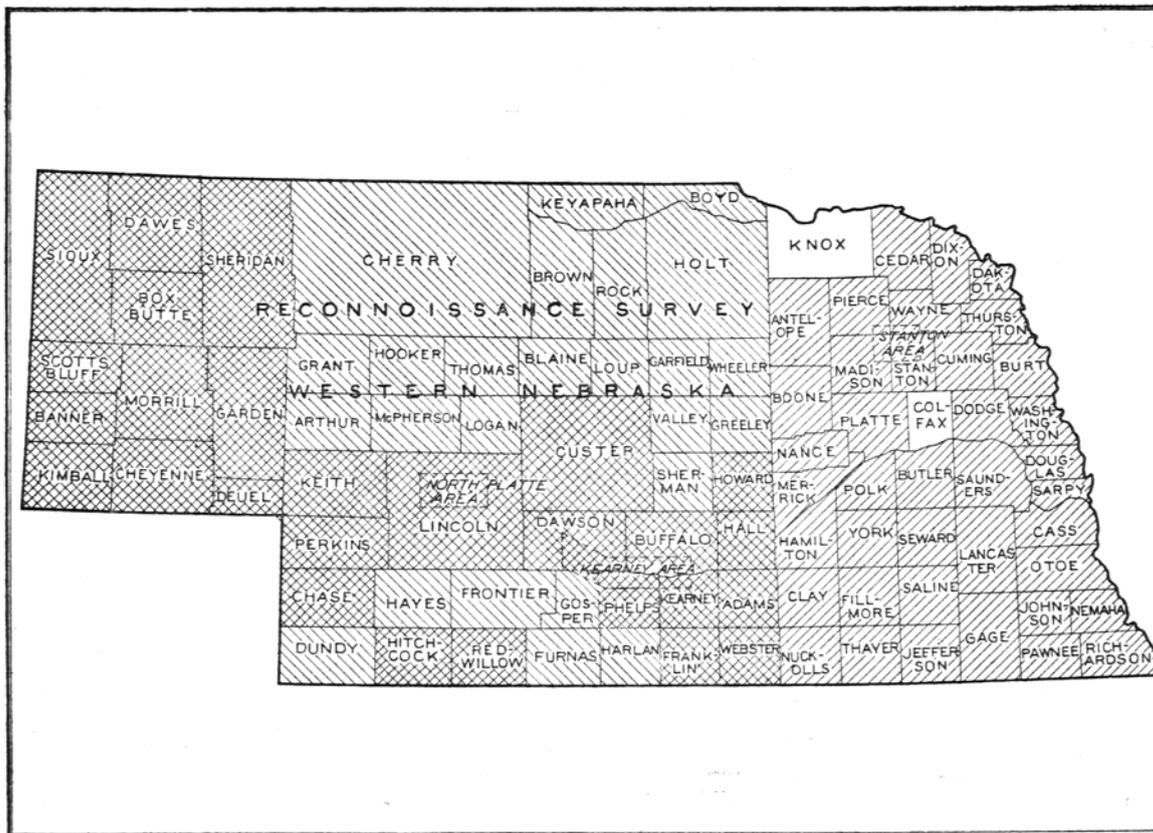
The Valentine soils and areas of dune sand occur locally on the upland south of Republican River in the western part of the county. They are composed largely of incoherent gray sand to a depth of more than 4 feet. The material in the dune sand areas is very unstable, and the land surface is strongly rolling or hilly. The Valentine soils, although subject to considerable wind erosion, are fairly stable, provided they are not used for cultivated crops. Practically all the dune sand and most of the Valentine soil areas are included in pasture land.

Scott silty clay loam occupies scattered poorly drained depressions throughout the more nearly level parts of the upland. The topsoil is thin and the subsoil is extremely dense and claypanlike. Most of this soil is used for pasture land although some hay is cut in the larger depressions.

The bottom-land soils of the county include the Sarpy and Laurel soils. They occur principally along Republican River and Frenchman Creek and have developed from recently deposited stream sediments. The Laurel soils are from the more silty sediments and are fine textured throughout, and the Sarpy soils are from the sandy and gravelly stream deposits. None of these soils has accumulated much organic matter, and their topsoils are very light in color. They lie only a few feet above the normal flow of the streams, and much of the area occupied by them is subject to overflow. However, the water drains off, in most places, within a few hours after the streams subside, and about 70 per cent of the land is sufficiently well drained for crop production. The cultivated areas include some of the most productive corn and alfalfa soils in the county and are used chiefly for these crops. The uncultivated areas are used for native pasture and hay land.

Authority for printing soil survey reports in this form is carried in Public Act No. 269, Seventy-second Congress, second session, making appropriations for the Department of Agriculture, as follows:

There shall be printed as soon as the manuscript can be prepared with the necessary maps and illustrations to accompany it a report on each soil area surveyed by the Bureau of Chemistry and Soils, Department of Agriculture, in the form of advance sheets bound in paper covers, of which not more than two hundred and fifty copies shall be for the use of each Senator from the State and not more than one thousand copies for the use of each Representative for the congressional district or districts in which a survey is made, the actual number to be determined on inquiry by the Secretary of Agriculture made to the aforesaid Senators and Representatives, and as many copies for the use of the Department of Agriculture as in the judgment of the Secretary of Agriculture are deemed necessary.



**Areas surveyed in Nebraska, shown by shading**

Detailed surveys shown by northeast-southwest hatchings; reconnaissance surveys shown by northwest-southeast hatchings; cross hatchings indicate areas covered in both ways.

# Accessibility Statement

---

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at [www.section508.gov](http://www.section508.gov).

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email [Section508@oc.usda.gov](mailto:Section508@oc.usda.gov). If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the [USDA Section 508 Coordination Team](#).

## **Nondiscrimination Statement**

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the

Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

- (1) mail: U.S. Department of Agriculture  
Office of the Assistant Secretary for Civil Rights  
1400 Independence Avenue, SW  
Washington, D.C. 20250-9410;
- (2) fax: (202) 690-7442; or
- (3) email: [program.intake@usda.gov](mailto:program.intake@usda.gov).

USDA is an equal opportunity provider, employer, and lender.