

SOIL SURVEY

Cherry County Nebraska



Series 1940, No. 21

Issued August 1938

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

In cooperation with the

UNIVERSITY OF NEBRASKA

Conservation and Survey Division

How to Use THE SOIL SURVEY REPORT

THIS REPORT is about the soils of Cherry County. It describes each kind of soil and states how it can be used, how it responds to treatment, how you need to take care of it, and what yields you can expect. Maps in the jacket show the location and extent of each soil. If you want to know how the soils were formed and how they are classified, some information on these subjects is given in a technical section, Genesis, Classification, and Morphology of Soils.

SOILS OF A FARM OR RANCH

If you want to know about the soils of a farm, ranch, or other tract, first find the right place on the map. The map shows township and section lines, towns and villages, roads, streams, most dwelling houses in rural areas, and other landmarks. Remember that an inch on the map equals slightly less than a mile on the ground. Each soil is shown by a symbol, such as AA, and the extent of each area is shown by a boundary line. Color patterns also help you pick out the areas of different soils, although each pattern is used for several soils that resemble each other in some ways.

The map legend gives the soil symbols, arranged in order so you can find them easily, and the name of each soil. The symbol AA, for example, is used for Anselmo fine sandy loam, gently undulating. All areas of this soil, wherever they appear on the map, are shown by this symbol and the same color pattern. Soil names are listed in the table of contents, so you can turn easily to the right page in the section, Soil Types and Phases. There the soil is described and some statements about its use and management are given.

Yields that you can expect from common crops are given in table 8. Soils are listed in alphabetic order in the

second column of this table. Opposite each soil name you will find the yields of crops that can be expected in average years, under prevailing management. These estimates of yields give you a basis for comparing probable responses of the different soils.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils is given in the introductory part of the section, Soils of Cherry County. This section tells about the principal kinds of soils, where they are found, and how they are related. While reading this section, refer to the soil map and notice how the different kinds of soils tend to be arranged in different parts of the county. For example, contrast the soil pattern of the sandhill region in the southern part with the pattern in the area of rough broken land along the Niobrara River. Colors on the map will help. The soils of the county are divided into 18 groups, each shown in a different shade. The soil patterns on the map frequently indicate well-defined differences in type of farming, land use, and land use problems.

A newcomer to the county, especially if he considers buying land, will want to know about the climate; types and sizes of farms; principal farm products and how they are marketed; kinds and conditions of farm tenure; kinds of ranch and farm buildings, equipment, and machinery; availability of churches, schools, roads, railroads, electric power, and water supplies; and location of towns and population centers. Information about all these will be found in the sections, General Nature of the County, and Additional Facts About Cherry County.

This publication on the soil survey of Cherry County, Nebraska, is a cooperative contribution from—

SOIL CONSERVATION SERVICE
and the
UNIVERSITY OF NEBRASKA
CONSERVATION AND SURVEY DIVISION

SOIL SURVEY OF CHERRY COUNTY, NEBRASKA

By M. H. LAYTON, Soil Survey,¹ United States Department of Agriculture, in Charge, and
C. R. BUZZARD and H. E. HOY, Conservation and Survey Division, University of Nebraska

Area inspected by F. A. HAYES, Soil Survey

United States Department of Agriculture in cooperation with the University of
Nebraska Conservation and Survey Division

CONTENTS

	Page		Page
General nature of the county	2	Soils of Cherry County—Con.	
Location and extent	2	Soil types and phases—Con.	
History and population	2	Cody fine sandy loam, gently	
Physiography, relief, and drain-		undulating	44
age	3	Cody loamy fine sand, gently	
Physiography	3	undulating	45
General relief	9	Dawes very fine sandy loam	45
Drainage	9	Dune sand:	
Climate	11	Stabilized, rolling	46
Vegetation	15	Stabilized, hilly	47
Soils of Cherry County	17	Dwyer loamy fine sand	47
Sandhills	17	Elsmere loamy fine sand	48
Niobrara River valley	19	Elsmere-Loup-Sarpy loamy	
Crookston-Springview plain	19	fine sands	49
Pine ridge	19	Elsmere-Valentine loamy fine	
Soil groups	19	sands	50
Group 1	21	Gannett fine sandy loam	50
Group 2	21	Gannett loamy fine sand	51
Group 3	21	Gannett-Valentine loamy	
Group 4	27	fine sands	52
Group 5	27	Goshen very fine sandy	
Group 6	27	loam	52
Group 7	28	Holt fine sandy loam:	
Group 8	28	Gently undulating	53
Group 9	28	Deep, level	54
Group 10	30	Colluvial, gently undu-	
Group 11	31	lating	55
Group 12	31	Undulating	55
Group 13	31	Holt loamy fine sand:	
Major suitability classes	32	Gently undulating	55
Soils best suited to culti-		Undulating	56
vated crops	32	Loup fine sandy loam	57
Soils less suited to cultivated		Muck	57
crops	32	Peat	58
Soils well suited to hay	32	Riverwash	58
Soils and land types suited		Rosebud fine sandy loam:	
mainly to pasture	32	Gently undulating	59
Estimated yields	33	Undulating	60
Range management	33	Gently rolling	60
Know your grasses	36	Rosebud loamy fine sand:	
Range site and condition	36	Gently undulating	61
Soil types and phases	41	Undulating	62
Anselmo loamy fine sand,		Gently rolling	62
gently undulating	41	Rough broken land:	
Anselmo fine sandy loam,		Canyon soil material	63
gently undulating	43	Sand material	63
Canyon fine sandy loam,		Sarpy loamy fine sand	64
rolling	43	Simeon loamy fine sand	65

¹ Field work for this survey was completed while the Soil Survey was a part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

	Page		Page
Soils of Cherry County—Con.		Genesis, classification, and mor-	
Soil types and phases—Con.		phology of soils.....	80
Tripp fine sandy loam.....	65	Factors of soil formation.....	80
Valentine fine sand, undu-		Parent material.....	80
lating.....	66	Climate.....	81
Valentine loamy fine sand,		Relief and drainage.....	81
undulating.....	69	Vegetation.....	81
Valentine-Rosebud loamy		Time.....	81
fine sands, undulating.....	70	Classification of soils.....	82
Valentine-Simeon loamy fine		Morphology of soils represent-	
sands, undulating.....	70	ing the great soil groups..	82
Agriculture.....	71	Chernozem.....	82
Livestock.....	71	Chestnut.....	83
Crops.....	73	Solonetz.....	86
Tenure and size of farms.....	75	Humic Gley.....	87
Farm labor, equipment, and		Bog soils.....	87
conveniences.....	77	Lithosols.....	88
Drainage and irrigation.....	77	Alluvial soils.....	88
Additional facts about Cherry		Dry sands.....	89
County.....	78	Soil survey methods and defini-	
Transportation and markets..	78	tions.....	90
Schools and social facilities..	79	Field study.....	90
Water supply.....	79	Classification.....	90
Wildlife.....	79		

CHERRY COUNTY is in the sandhills of Nebraska. The first settlers were cattlemen who were attracted by the free open range with its abundant grass cover and its good water supply. The early farmers soon learned that the area was not suited to cultivation. Once the land was plowed and broken up it was subject to wind erosion, and frequent droughts burned up their crops. They turned to raising livestock on the open range, and beef production has continued to be the principal source of income in the county.

To assist ranchers and farmers in determining the best use and management of their soils, this survey was made by the United States Department of Agriculture in cooperation with the University of Nebraska Conservation and Survey Division. Field work was completed in 1940, and, unless otherwise specifically mentioned, all statements in this report refer to conditions in the county at that time.

GENERAL NATURE OF THE COUNTY

LOCATION AND EXTENT

Cherry County, the largest county in Nebraska, is in the north-central part of the State (fig. 1). Valentine, the county seat, is 260 miles northwest of Omaha. The county is rectangular. It measures approximately 96 miles from east to west, and 63 miles from north to south. The total area of 6,013 square miles, or 3,848,320 acres, includes 29,740 acres of water and 1,080 acres of intermittent ponds.

HISTORY AND POPULATION

Before 1870 the area now included in this county was inhabited chiefly by Indians. Some of the earliest settlers were cattlemen who located along the valley of the Niobrara River. Most of these settlers came from Texas and were engaged in raising and selling cattle to the

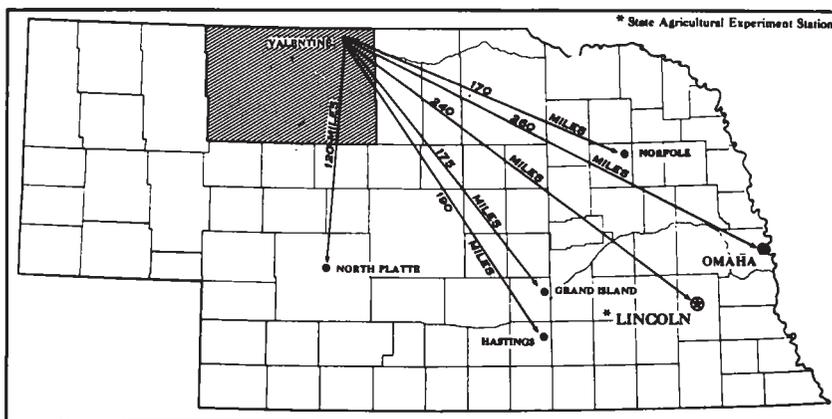


FIGURE 1.—Location of Cherry County in Nebraska.

Federal Government for the Indians then on the Rosebud and Pine Ridge Reservations. Cattle raising was almost the only agricultural pursuit until about 1880, when a few farmers began to fence the best land and to make permanent homes. Several sawmills were put into operation on the more thickly timbered areas.

The establishment of Fort Niobrara in 1880 stimulated settlement and most of the better land was taken up rapidly by homestead, preemption, and timber claim.

The county was organized from unorganized territory in 1883, and was named for Simon Augustus Cherry of the 5th U. S. Cavalry. Valentine, the largest town, was named after Congressman E. K. Valentine, and was chosen as the county seat.

Soon after the county was organized, more settlers came in from eastern and southern Nebraska and from eastern States. The Kincaid Act of April 28, 1904, which allowed the homesteader 640 acres instead of 160, further stimulated settlement.

The county had a population of 8,397 in 1950. In that year Valentine had a population of 2,700. Wood Lake, in the eastern part of the county, had a population of 238; and Crookston, just west of Valentine, 168. Other towns west of Crookston had a population as follows: Kilgore, 189; Cody, 296; and Merriman, 260. These towns are the trade centers for northern Cherry County and parts of Todd and Bennett Counties, S. Dak. Most of the inhabitants in the southern half of the county trade in adjoining counties; there are no trading points within that section.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

PHYSIOGRAPHY

The county is in the northern part of the High Plains section of the Great Plains physiographic province.² It is a part of a former nearly level to rolling constructional plain of Tertiary age on which water and wind erosion have considerably modified the relief. Within the

² FENNEMAN, N. M. *PHYSIOGRAPHY OF THE WESTERN UNITED STATES*. 534 pp., illus. 1931.

county are parts of four rather well-defined physiographic areas: Niobrara River Valley; Crookston-Springview Plain; Pine Ridge; and the sandhills region (fig. 2).

Niobrara River Valley.—This valley extends from east to west across the northern part of the county and is entrenched 150 to 350 feet below the general upland level. It is made up of alluvial lands, old terrace remnants, and the bluffs along the Niobrara River. The alluvial sands occupy only a small part of the valley.

The high terraces (locally called benches) in the Niobrara River Valley are remnants of old rock terraces left when the channel of the river became more deeply entrenched. They lie at different levels, from 175 to 275 feet above the present river channel, and from 30 to 250 feet below the general level of the uplands. Variable thicknesses

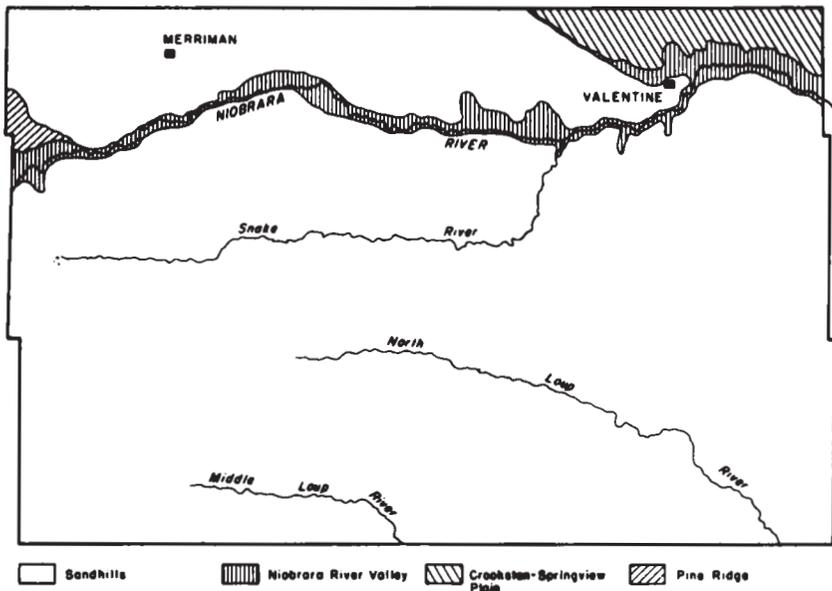


FIGURE 2.—The four main physiographic areas in Cherry County, Nebr.

of sandy water-laid material cap the bedrock on a few of these terraces. In most places the surface of the sandy deposit has been whipped by the wind into a low, rolling, or hummocky relief. Locally however, nearly level areas of the old terrace surface remain. These terrace areas are narrower and less distinct where they border areas of dune sand. Most of the benches occupy discontinuous strips $\frac{1}{4}$ to $\frac{3}{4}$ of a mile wide. Those immediately west of the mouth of Bear Creek have been modified little by the wind and are quite smooth.

The steep valley sides, locally known as the Niobrara River breaks, are on both sides of the river and along the lower courses of its major tributaries, including Schlagel, Gordon, Pole, Leander, Bear, and Minnehaduzza Creeks, and the Snake River (fig. 3). These "breaks" include a strip of steep bluffs produced as the river cut its way through the sandy and gravelly mantle rock and in places into or through the uppermost bedrock—a light colored sandstone



FIGURE 3.—Niobrara River Valley in Township 34 North, Range 25 West, showing rough broken land of the breaks and the old high benches.

(Ogallala formation) of Tertiary age.³ Near the eastern side of the county the river is entrenched from 30 to 50 feet into the Brule formation, which underlies the Ogallala formation and forms the base of the escarpment.

The breaks are less than $\frac{1}{8}$ mile to about $1\frac{1}{2}$ miles wide, and are widest near the mouths of tributaries where erosion has cut narrow canyons, some of which are more than 200 feet deep. These canyons are indicated on the accompanying soil map by areas of rough broken land, Canyon soil material, and Rough broken land, sand material. The breaks are almost continuous across the county, are not of equal height or roughness, and are less rough and more sandy bordering areas of dune sand. At the mouths of the Schlagel and Gordon Creeks and the Snake River the canyon walls are cut into bedrock and are steep, but at the mouths of Bear and Leander Creeks they have been covered by windblown sand from the nearby dunes and are less rugged. In many places the steeper valley slopes are so gullied that they are of little value for grazing and support a rather thin stand of trees.

Dakota-Nebraska Plain.—This plain, known locally as Crookston-Springview Plain, occupies about 185 square miles in the north-eastern part of the county. It is one of the smoother remnants of the old constructional plain. The plain formed on Tertiary bedrock. The breaks along Niobrara River and Minnechaduzza Creek are its southern and western boundary. Its northern and eastern boundaries are in South Dakota and Keya Paha County, Nebr., respectively. The greater part of the plain is nearly level to gently rolling, but the surface is modified in several places by narrow, steep-sided and shallow drainageways, by small areas of typical sandhills, numerous hummocks, and low, elongated sandy ridges (fig. 4). The smooth areas are near the Niobrara River breaks where wind deposition has been least. In this vicinity the surface is marked by barely perceptible sags and swales, and in places by scattered, shallow basins.

Pine Ridge.—This region occupies about 35 square miles in the northwestern part of the county, north of the Niobrara River. This ridge, which lies largely in Sheridan County to the west, has surface features much the same as those of the Crookston-Springview plain, but is about 1,000 feet higher and is capped by the Ogallala formation.

Sandhills.—About 90 percent of the county is in this vast region. Isolated sandhills are also in the Crookston-Springview and Pine Ridge regions. Throughout the sandhills region, wind and a previous erosion cycle have controlled the nature of the land surface. The present relief is undulating to hilly.

The sandhills are believed to have been formed by wind action on late Tertiary and early Pleistocene deposits. Some of the larger hills are not merely huge piles of eolian sand but consist of cores of solid Tertiary rock mantled with sand. One of the best places to observe outcrops of these Tertiary sandhill cores is near the Snake River Falls south of Burge.⁴

³ CONDRA, G. E., and REED, E. C. THE GEOLOGIC SECTION OF NEBRASKA. Nebr. Geol. Survey Bul. 14, 83 pp., illus. 1943.

⁴ LUGN, A. L. THE PLEISTOCENE GEOLOGY OF NEBRASKA. Nebr. Geol. Survey Bul. 10, 2d. ser., 223 pp., illus. 1935.

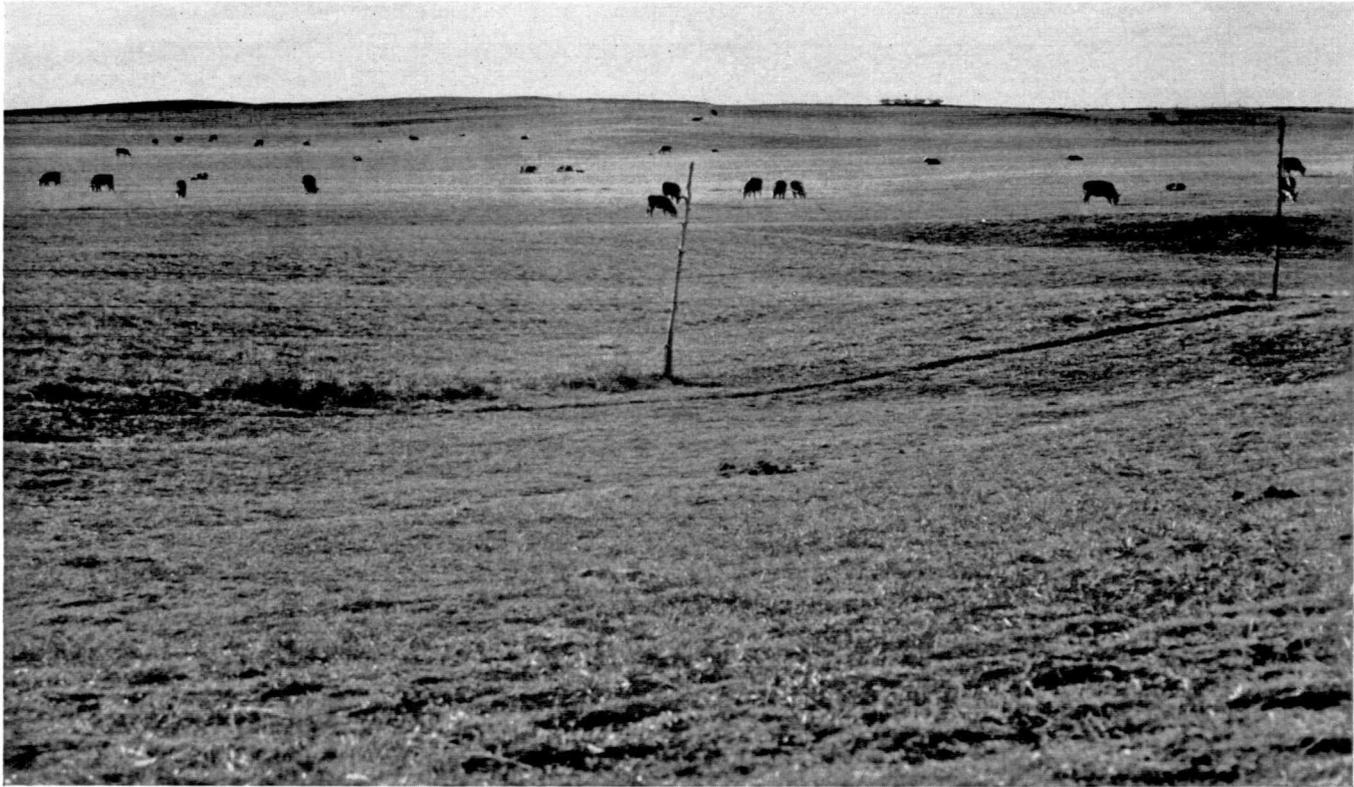


FIGURE 4.—Landscape north of Crookston. Rosebud fine sandy loam on undulating land in the foreground; Canyon fine sandy loam on rolling hilly land in the background.



FIGURE 5.—Topography of Dune sand, stabilized, hilly; yucca plants in foreground; bunches of little bluestem in middle ground.

A monotonous succession of cone-shaped hills 15 to 150 feet high characterizes most places where sand covers hills and ridges of Tertiary rock (fig. 5). The monotony of the landscape is broken by a few points rising 225 feet or more above the surrounding land: Indian Hill and Seven Mile Hill are two of these high points.

Some of the areas having the greatest range in relief are south and west of the Nebraska National Forest, along the Snake River. In this area the hills commonly join and form irregular ridges. Some of the depressions between the ridges are narrow bowl-shaped basins or pockets 100 yards in diameter; others are relatively level valleys more than a mile wide and several miles in length. The ranges of hills, with alternating pockets or valleys between them, normally run parallel in an irregular northwest-southeast direction. The valleys are continuous for great distances only where they contain stream courses and are not interrupted by dunes. As a rule the southerly (leeward) sides of the hills are much steeper than the northerly (windward) sides.

In other parts of the sandhills, the dunes rise on all sides instead of forming elongated ridges. Even the general east-west trend of the hills is difficult to discern. The hills are haphazardly distributed; consequently no extensive valleys exist. The result of this type of hill distribution is an abrupt, rolling surface of considerable relief. Small oval or round depressions alternate with round or conical dunes. Blowouts are numerous in this area (fig. 6). The tops of the higher hills are on a level, but from a few hills of uncommon height one can see for miles across the dunes.

GENERAL RELIEF

Elevations have been determined for many points by the United States Geological Survey and the Coast and Geodetic Survey. The elevation in feet above mean sea level at Wood Lake is 2,690; Valentine, 2,581; Crookston, 2,677; Nenzel, 3,109; Cody, 3,100; Merriman, 3,254; and Irwin, 3,440. The elevation of the Niobrara River in the east is about 2,200 feet, and 3,500 feet in the west. Thus, the Niobrara River falls more than 13 feet per mile in Cherry County.

DRAINAGE

Stream terraces and flood plains occupy only a small part of this county. Terraces and rock benches occur as narrow strips, some continuous and some broken, along most of the streams. They are also in some of the wet valleys and in the sandhill region where natural surface drainage is not obstructed by dunes or ridges of sand.

Flood plains lie from 1 to 6 feet above the normal level of streams and are subject to occasional overflow. They are continuous along the Niobrara River and along some of the smaller streams.

The county as a whole is fairly well drained. The Niobrara and Snake Rivers and their tributaries drain the northern part. These swift-flowing streams, and most of their tributaries, are deepening their channels only a short distance from their outlets. The North and Middle Loup Rivers and Calf and Goose Creeks drain the southern part; they are not so swift as the Snake and Niobrara Rivers, so their channels deepen more slowly.



FIGURE 6.—Blowout in an area of Dune sand south of Valentine. Drifting sand has killed most of the grass. A pool of water stands in the small depression at the center.

The major streams in the area have a remarkably even flow of clear water; the volume varies little during the year. Though not apparent to the casual observer, underground movement of water in the sandhills is an important part of the drainage system. Little water runs off this sandy region. Most of the rainfall is quickly absorbed, moves downward rapidly in the loose sands, and unites with the ground water. The ground water is not stagnant in underground lakes or pools; it moves from areas of high intake to those of natural discharge. Subsurface water that originated in the sandhills supplies well water for many Nebraska areas south and southeast of this county.

In the sandhill section of the county many lakes and ponds occupy parts of the valleys (fig. 7). Some of these lakes are fed by seeps and springs. The water table is near the surface in many places, so the water levels of lakes and ponds fluctuate. Local areas of poorly drained land and marshes, subject to overflow, are along some of the lakes and streams.

The lakes are of various sizes and shapes, and from 100 yards to more than a mile long. They are relatively shallow and the water level fluctuates. Most of the lakes are 3 to 6 feet deep, but there are a few deeper holes.

Some of the largest groups of lakes in this county are in Evergreen and Irwin precincts. The larger lakes in these areas are Dads, Hackberry, Willow, Big Alkali, Red Deer, Dewey, Round, Fish, and Mother Lakes. Some of the separate present-day lakes lying in adjacent valleys apparently were once single large bodies of water. The shore lines of these old larger lakes are now the margins of the tributary valleys and of the wet meadows around the present-day lakes.

CLIMATE

Cherry County has a dry, cool, continental climate characterized by extremes of temperature and marked seasonal variation in rainfall. Table 1 supplies normal monthly, seasonal, and annual temperatures and precipitation for the county. The figures are compiled from the weather station at Valentine, on the Crookston-Springview tableland in the northeastern part of the county, and the Gordon station, on Pine Ridge in Sheridan County. Difference in altitude causes slightly lower precipitation and temperature and a shorter growing season at Gordon. Night temperatures, particularly, are lower at Gordon. Potatoes, a crop that prefers cool weather, yield better at Gordon than at Valentine.

At both stations, January is the coldest month. Short spells of below-zero weather in January and February have an important effect on livestock raising, the main enterprise. The animals require more feed and attention during cold spells. Temperatures stay fairly low through April, rise about 20 degrees through May and June, and reach a peak in July, the hottest month. Spring is a short, cool season marked by occasional late snows. Fall—long, cool, and sunny—is perhaps the most pleasant season.

At Valentine, the average growing season is 151 days, or from May 5, the date of the last killing frost in spring, to October 3, the first in fall. At Gordon the average growing season is 119 days, or from May 23, the date of the last killing frost in spring, to September



FIGURE 7.—Lake south of Valentine. Gannett fine sandy loam borders the lake; Valentine fine sand lies between the Gannett soil and Dune sand, stabilized, in the background.

19, the first in fall. In any given year the growing season may vary considerably from the average. The grazing period at Valentine normally begins about May 15 and ends December 1, but many ranchers winter their livestock on the range by supplementing the pasture with grain, hay, or oil cake.

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Valentine and Gordon weather stations, Nebr.

[Valentine, elevation, 2,581 feet]

Month	Temperature ¹			Precipitation ²			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snow-fall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	25.9	72	-34	0.46	0.05	0.41	6.4
January.....	21.1	68	-38	.56	1.09	1.13	6.9
February.....	25.7	74	-37	.46	.53	1.03	5.7
Winter.....	24.2	74	-38	1.48	1.67	2.57	19.0
March.....	33.7	87	-26	1.25	1.08	2.56	9.6
April.....	46.9	94	0	1.97	2.00	2.44	4.6
May.....	57.4	98	17	2.66	.17	3.08	1.1
Spring.....	46.0	98	-26	5.88	3.25	8.08	15.3
June.....	67.3	104	32	3.16	2.36	3.69	0
July.....	75.3	107	39	2.70	.97	5.49	0
August.....	73.1	104	36	2.00	.33	2.60	0
Summer.....	71.9	107	32	7.86	3.66	11.78	0
September.....	62.6	102	12	1.20	.36	2.10	.1
October.....	50.6	96	-6	1.17	1.01	3.01	2.0
November.....	35.3	79	-18	.64	.19	1.37	5.4
Fall.....	49.5	102	-18	3.01	1.56	6.48	7.5
Year.....	47.9	107	-38	18.23	³ 10.14	⁴ 28.91	41.8

[Gordon, elevation, 3,554 feet]

December.....	23.9	65	-36	.58	.26	.79	6.3
January.....	20.6	64	-40	.55	.99	1.00	6.7
February.....	25.3	68	-33	.45	.89	1.80	3.5
Winter.....	23.3	68	-40	1.58	2.14	3.59	16.5
March.....	33.6	86	-21	1.06	.74	2.06	7.8
April.....	45.2	93	-3	2.00	1.14	2.98	10.0
May.....	54.8	96	15	2.72	.69	2.30	1.5
Spring.....	44.5	96	-21	5.78	2.57	7.34	19.3

See footnotes at end of table.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Valentine and Gordon weather stations, Nebr.—Con.*

[Gordon, elevation, 3,554 feet]

Month	Temperature ¹			Precipitation ²			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
June.....	65.0	101	25	2.90	2.51	3.87	(⁵)
July.....	72.4	105	31	2.35	.38	4.31	0
August.....	70.0	103	27	1.76	.48	1.63	0
Summer.....	69.1	105	25	7.01	3.37	9.81	0
September.....	60.1	101	1	1.24	.45	3.53	.6
October.....	48.0	95	-11	1.13	.27	1.50	3.4
November.....	34.0	79	-25	.61	1.20	.67	5.5
Fall.....	47.4	101	-25	2.98	1.92	5.70	9.5
Year.....	46.1	105	-40	17.35	⁶ 10.00	⁷ 26.44	45.3

¹ Valentine: Average temperature based on a 65-year record, through 1954; highest and lowest temperatures on a 41-year record, through 1930. Gordon: Average temperature based on a 44-year record, through 1954; highest and lowest temperatures on a 21-year record, through 1930.

² Valentine: Average precipitation based on a 67-year record, through 1954; wettest and driest years based on a 66-year record, in the period 1889 through 1954; snowfall based on a 38-year record through 1930. Gordon: Average precipitation based on a 53-year record, through 1954; wettest and driest years based on a 51-year record, in the period 1898 through 1954; snowfall based on a 23-year record, through 1930.

³ In 1894. ⁴ In 1929. ⁵ Trace. ⁶ In 1936. ⁷ In 1915.

Table 1 shows that the average rainfall is greatest in the period May through August, the time when moisture is most needed for growing crops. Actually, however, rainfall is not dependable during the growing season. The amount and time of rainfall vary greatly from year to year. Generally rainfall during May and June is more dependable than in July and August. Dry spells lasting several weeks are common in midsummer. They greatly reduce yields of pasture grasses and crops. Corn, a slow-maturing crop that requires moisture late in summer, is more affected by drought than the small grains. Dry weather in May and June favors hatching and growth of grasshoppers, which damage crops in some years.

Prevailing winds blow from the northwest in October through March, and from a southerly direction the rest of the year. The normal wind speed is between 10 and 15 miles per hour, though strong winds are common during cyclonic storms and thunderstorms. Tornadoes and hailstorms are infrequent, but some winters have blizzards, or snows accompanied by cold winds. The relative humidity at Valentine does not deviate greatly from 60 percent. During the growing season, April to October, it averages 62 percent.

VEGETATION

Grasses dominate in this county, but some trees grow on valley slopes, particularly north-facing slopes, and along the channels of the Niobrara River and its tributaries. Deciduous trees dominate along permanent streams, and conifers on the rough broken land along the Niobrara River. Plant groups are closely associated with conditions of drainage, soil, and topography.⁵

Many kinds of water-loving plants grow around lakes and marshes and along streams. Saltgrasses and rushes are common on salty soils of the lowlands. In most poorly drained areas and wet meadows, tall, coarse grasses, rushes, and sedges grow. A variable association of tall grasses grows on the areas of dune sand.

Overgrazing, and to some extent selective grazing, has brought about a marked change in the composition of sandhill vegetation (fig. 8). Sand bluestem, switchgrass, and lovegrass have nearly disappeared, but sand dropseed, sand reedgrass, blue grama, threadleaf sedge, and buffalograss (*Buchloe dactyloides*) have increased. See the section, Range Management, for further information on native grasses and methods of preventing overgrazing.

Deciduous trees and shrubs grow along streams, in valleys, in deep canyons, or in places protected from strong winds. They require areas not subject to flooding that have a relatively permanent water table within the reach of their roots.

The coniferous trees are dominantly on the rough broken land, or breaks, along the valley of the Niobrara River. In fact, about one-third of this area has stands ranging from a few scattered pines to dense growths of pines and cedars. The undergrowth is a variable, usually sparse, growth of grasses, perennial herbs, and woody shrubs. Most of the big pine trees were cut by early settlers. Those remaining are usually less than 40 feet tall. Some believe there were once many more pines in this area, but that large numbers were destroyed by prairie fires before white men arrived.

The main coniferous trees are redcedar (*Juniperus virginiana*) and Ponderosa pine (*Pinus ponderosa*). Redcedar grows in association with deciduous trees and in scattered pure stands. Ponderosa pine grows mainly on rough broken land.

A small area in the Nebraska National Forest has been planted to trees—mainly Ponderosa pine (*Pinus ponderosa*) and jack pine (*Pinus banksiana*). This forest reserve—covering 115,843 acres in the county—is used to demonstrate tree-growing methods for the sandhill areas and to provide seedlings for planting on farms and ranches. It also provides part-time grazing for hundreds of cattle each year.

Experiments show that both deciduous and coniferous trees will grow well on both the sandy and hard lands in this county, provided they are properly cared for when young. Ponderosa pine and cedar are probably best for planting because they require no irrigation, stand drought well, and provide good cover both in summer and in winter. These and other conifers are difficult to start in dry years, and grow slowly, but are hardy once established.

⁵ TOLSTEAD, W. L. VEGETATION OF THE NORTHERN PART OF CHERRY COUNTY, NEBR. Ecol. Monog. 12: 255-292, illus. 1942.

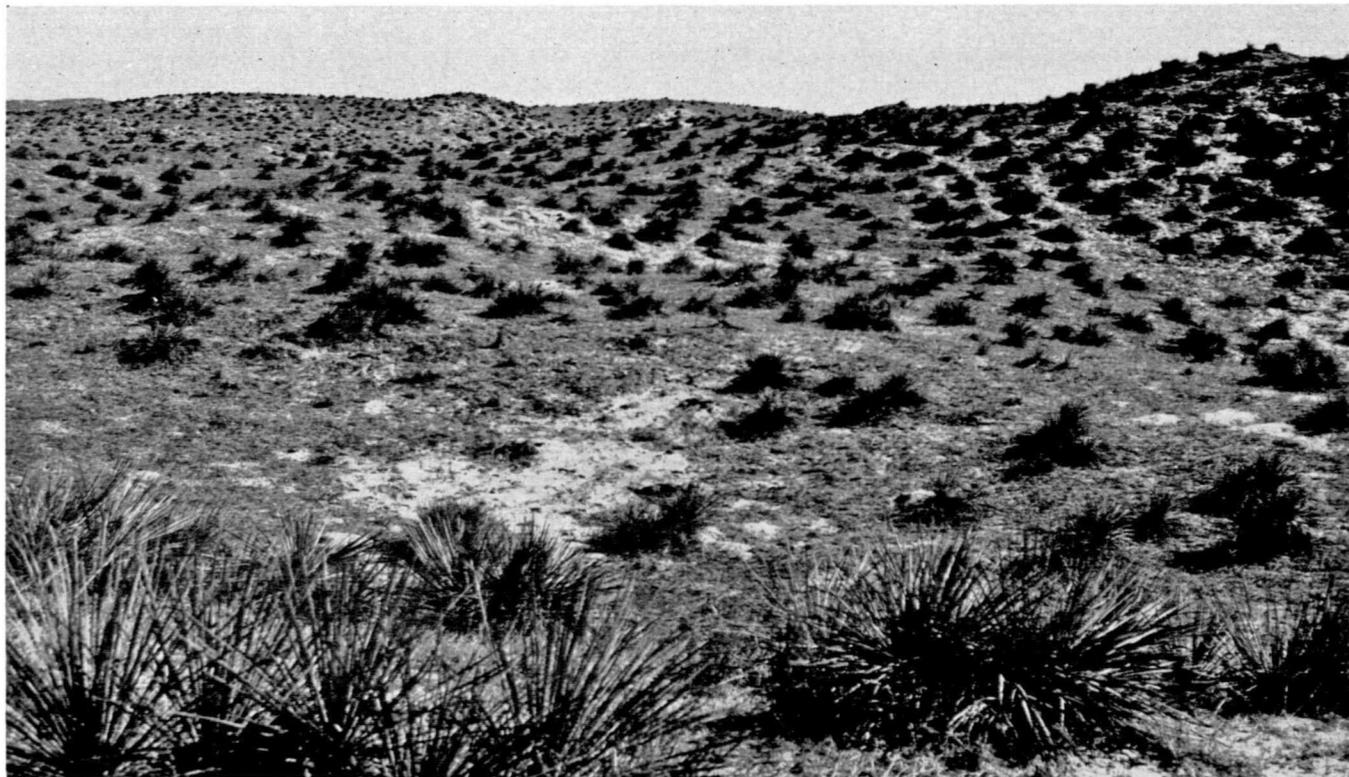


FIGURE 8.—Overgrazed area of Dune sand, stabilized, hilly, showing many bare spots and yucca plants.

Deciduous trees are easily established and grow rapidly in favorable years, but they cannot stand prolonged drought and generally require irrigation. They are best suited to subirrigated soils such as the Loup, Elsmere, and Sarpy. They are not suitable for most of the hard lands.

No special effort is made to protect and conserve the native trees. Trees on the bottomlands are cut to clear the land for farming or to provide fuel and fence posts. Interest in shelterbelts is growing, however, and many plantings have been made, particularly around farm and ranch buildings and on feeding grounds. These plantings add beauty to the otherwise treeless sandy lands, furnish cover for game, and protect homes and livestock from the wind. Plantings are particularly desirable for public picnic grounds and other recreational areas.

SOILS OF CHERRY COUNTY

The general nature of the soils in Cherry County is more readily understood if they are discussed according to the four physiographic sections. The sandhills section covers about 90 percent of the county, or all of the southern part and much of the northwestern part (see fig. 2, p. 4). The remaining three sections are in the northern third of the county. Southernmost of the three is the Niobrara River valley, a strip of rough broken land extending across the county on both sides of the Niobrara River. The Crookston-Springview plain is north of the Niobrara River in the eastern part of the county, and the eastern end of Pine ridge occupies about 35 square miles just north of the river along the western boundary.

Sandhills.—The dominant soil series of the sandhills section are shown in figure 9 as they typically occur. Most of the soils are forming in wind-laid sand that has not been held in place long by vegetation. The areas of Dune sand and of Valentine soils are light colored because they do not support a grass cover heavy enough to provide much organic matter. In addition, air moves easily through the sands and promotes oxidation rather than accumulation of organic materials.

The soils in basins, valleys, and wet meadows of the sandhills section—the Gannett and Loup, for example—have thicker and darker surface layers than the soils of the sandhills proper. This difference results because the moisture in these sites permits growth of a heavier stand of grass and retards aeration.

Considering the soils of the sandhills section as a whole, they are admirably suited to grasses. The soils are droughty, but the loose, porous surface soil absorbs water so rapidly that runoff and evaporation are small. Over much of the sandhills section, the water table is within the reach of grass roots. The water falling on the sandhills during light rains penetrates to the plant roots before it can evaporate. Native grasses on these soils stay green much longer than grain and hay crops on the well-drained, fine-textured soils elsewhere in the county.

Management of the sandhill grazing lands involves special problems. The grass cover, though well established in most places, is sparse and does not entirely prevent wind erosion. Land overgrazed or trampled too frequently by livestock may begin to blow badly,

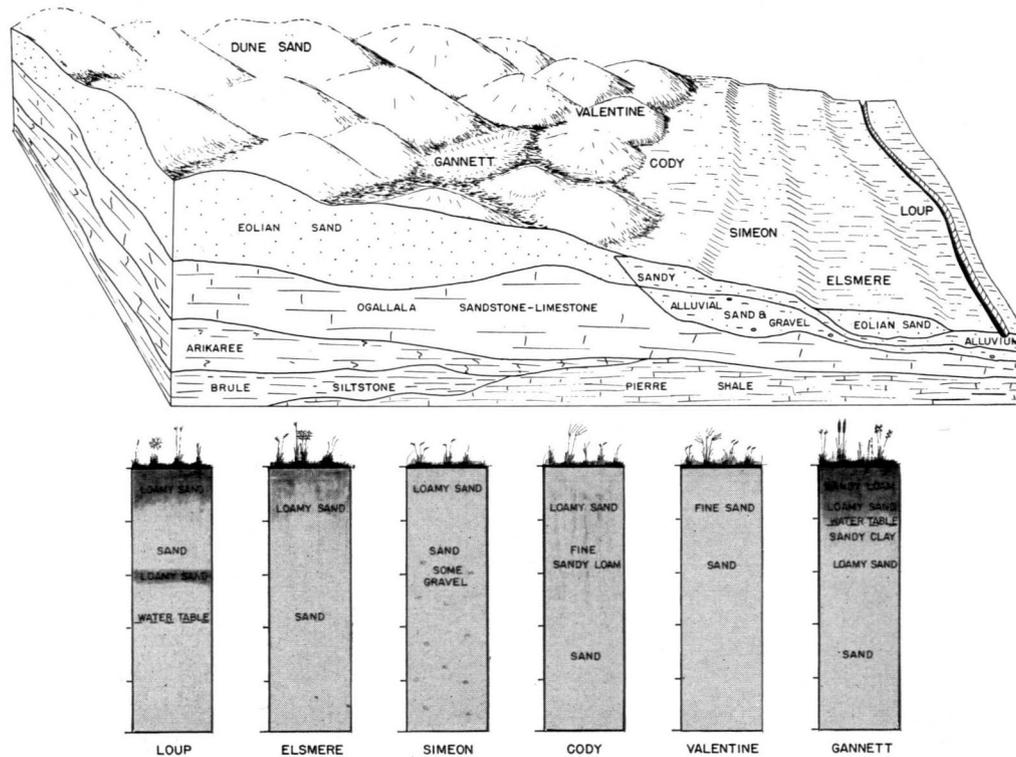


FIGURE 9.—Diagram showing typical association of soils in the sandhills section of Cherry County, Nebr. Textures of profile layers are generalized and approximate.

and then special treatment is needed to control erosion. Plowing the very sandy soils invites trouble from blowing. The few sand-hill areas that are tilled are used mostly for growing the grain forage and hay needed to supplement native hay and pasture.

Niobrara River valley.—In this section are the mapping units of rough broken land on bluffs on both sides of the Niobrara River, as well as the Tripp soil on low terraces and the Sarpy soil on bottom lands along the river (see fig. 10). The rough broken lands predominating in this section have little true soil development. Erosion is rapid because slopes are steep and vegetation is too thinly scattered. Most of the area remains as raw or slightly weathered bedrock. It cannot be tilled and has little value for grazing.

On the stream bottoms and terraces in this section both light and dark-colored soils occur. The darker, better developed soils such as the Tripp are generally on terraces above the streams, whereas the immature kinds such as the Sarpy are at much lower levels and subject to flooding. The soils subject to flooding are at first easily eroded by wind and water, but if given an opportunity, develop a dense growth of grasses and, in some places, a fair stand of trees. Once vegetation is established, they suffer little loss through erosion, though wind and water may still deposit material on the surface.

Crookston-Springview plain.—This plain covers the northeastern part of the county. The dominant soils are the Holt, Rosebud, and Canyon, which developed over weathered limestone, and the Anselmo and Valentine, which formed on eolian sands (fig. 10). In this section the light-colored soils—Anselmo and Valentine—are less extensive than the well-drained, dark-colored upland soils that have developed from sandstone weathered in place. The dark-colored soils rather strongly express the effects of climate and vegetation; their development has not been influenced much by nature of the parent material. These dark-colored soils are not so easily eroded by wind as those in the sandhills section. Accumulated plant remains have contributed to the development of dark, crumb-structured surface layers about a foot thick. The subsoils usually have a vertical structure, called prismatic. Some of the soils have claypan layers below the dark surface material.

Pine Ridge.—This section covers a small area in the northwestern part of the county, north of the Niobrara River. It has surface features much the same as the Crookston-Springview plain but is about 1,000 feet higher. The soils are essentially the same as those of the Crookston-Springview plain.

SOIL GROUPS

The soils of Cherry County have been placed in 13 groups so that their relationships may be readily understood (see table 2). Each of these groups is made up of soils that have about the same productivity and suitability for agricultural use. The location and extent of each group can be seen easily on the soil map, for all the soils in one group have the same color on the map. The characteristics and agricultural suitabilities of the various groups are discussed in the pages following.

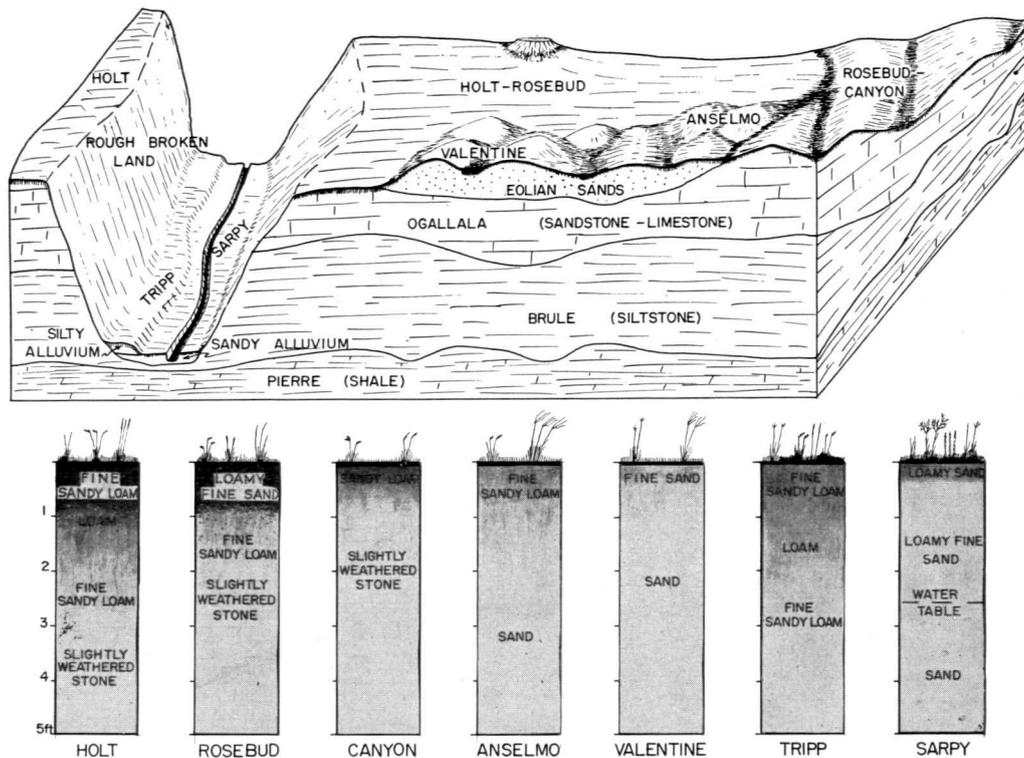


FIGURE 10.—Diagram showing typical association of soils and land types in the Niobrara River valley and on the Crookston-Springview plain of Cherry County, Nebr. Textures of profile layers are generalized and approximate.

1. DEEP TO MODERATELY DEEP, DARK, FRIABLE LOAMY SOILS OF SMOOTH UPLANDS

The soils of this group occur in the northern part of the county, mainly on the Crookston-Springview tableland and on Pine ridge. A few areas are near the "breaks" along the Niobrara River. The topography is nearly level to gently rolling (figs. 4 and 11). The soils of the group are:

Goshen very fine sandy loam	Holt loamy fine sand, gently undulating
Holt fine sandy loam, gently undulating	Rosebud fine sandy loam, gently undulating
Holt fine sandy loam, colluvial, gently undulating	Rosebud loamy fine sand, gently undulating
Holt fine sandy loam, deep, level	

Soils of this group have a grayish-brown to dark grayish-brown granular surface layer, 8 to 16 inches thick. The subsoil is weakly prismatic and lighter colored than the surface layer. The soils are of crumbly consistence.

The Holt and Rosebud soils have developed in weathered, limy, fine-grained sandstones. The Goshen soil has formed in sandy and loamy material washed from higher lying soils that are forming in weathered sandstones.

The soils of this group have slope sufficient to insure good drainage, but not enough to cause excessive water erosion. They resist severe wind erosion because of their finer texture and their tendency to form crumbs and granules. They are the most productive soils for small grains. Most of the potatoes and a large part of the corn are grown on these dark soils of the smooth uplands.

2. DEEP, DARK, CLAYPAN SOILS OF SMOOTH UPLANDS

The only soil in this group—Dawes very fine sandy loam—occupies a minor acreage confined almost entirely to level, depressional areas near Crookston (fig. 12).

The surface soil is a brown to grayish-brown, friable, crumb-structured fine sandy loam about 10 inches thick. The subsoil, a distinctive feature of the Dawes soil, is brown or dark-brown clay loam of strong prismatic or columnar structure. This claypan subsoil is about a foot thick. Below the claypan there is a light-colored layer in which lime has accumulated, and below that lies the weathered sandstone.

Most of this claypan soil is in pasture. Cropping of this soil is especially hazardous, since it is the first to show the adverse effects of too much or too little moisture.

3. MODERATELY DEEP, DARK, SANDY SOILS OF SMOOTH UPLANDS

The soils of this group occupy small, nearly level to gently rolling upland areas in the northern part of the county. They are:

Anselmo loamy fine sand, gently undulating	Anselmo fine sandy loam, gently rolling
--	---

These soils have a grayish-brown, crumb-structured sandy surface layer, about a foot thick, that is underlain by a lighter colored loamy subsoil. Below the subsoil are several feet of loose fine sand.

These soils are more stable than many of those that developed in wind-deposited sands. They are easy to till and can be used for corn, rye, and forage crops. If reasonable care is taken, wind erosion can be prevented.

TABLE 2.—*Soil series of Cherry County, Nebr., arranged by groups, and outstanding features of each*

Soil group and series	Topography	Natural drainage		Subsoil			Parent rock or material
		External	Internal	Texture	Consistence	Lime content	
1. Deep to moderately deep, dark, friable loamy soils of smooth uplands: Holt (gently undulating) . . .	Nearly level to gently undulating.	Moderate	Moderate	Loam or sandy loam.	Friable	Medium	Limy Tertiary sandstone. Limy Tertiary sandstone. Medium-textured, alluvial-colluvial material.
Rosebud (gently undulating). Goshen	Same	Moderate	Moderate	Loamy fine sand to loam. Loam to clay loam	Friable	High Medium	
2. Deep, dark, claypan soils of smooth uplands: Dawes	Nearly level to gently undulating or slightly depressional.	Moderate	Moderate				
3. Moderately deep, dark, sandy soils of smooth uplands: Anselmo	Same	Slow	Slow	Sandy clay or clay (claypan).	Very heavy; very hard when dry, sticky and plastic when wet.	High	Limy Tertiary sandstone.
4. Shallow to moderately deep, dark, friable loamy soils of hilly uplands: Canyon	Nearly level to gently undulating and gently hummocky.	None	Rapid	Fine sandy loam to loam.	Friable	Low	Incoherent eolian fine sand.
Holt (undulating)	Rolling	Very rapid	Moderate	Sandy loam	Calcareous	High	Limy Tertiary sandstone.
Rosebud (undulating and gently rolling). Valentine	Undulating to gently rolling.	Rapid	Moderate	Loam or sandy loam.	Friable	High	Limy Tertiary sandstone.
Dwyer	Gently rolling	Rapid	Moderate	Loamy fine sand to loam.	Friable	High	Limy Tertiary sandstone.
5. Light-colored very sandy soils of uplands: Dwyer	Rolling to hummocky.	None	Excessive	Fine sand	Incoherent	Low	Eolian sand.
6. Deep, dark, friable loamy soils of terraces: Tripp	Gently rolling to hummocky.	None	Rapid to excessive.	Fine sand	Incoherent	High	Eolian calcareous fine sand.
	Nearly level to very gently sloping.	Moderate	Moderate	Loam or fine sandy loam.	Friable	High	Medium-textured, calcareous stream alluvium.

7. Moderately thick, dark, sandy soils of terraces:- Cody.....	Nearly level to gently undulating.	None.....	Moderate.....	Fine sandy loam or loam.	Loose or friable.....	Low.....	Noncalcareous sandy stream alluvium.
8. Light-colored very sandy soils of terraces: Simcon.....	Same.....	None.....	Rapid to excessive.	Sand and gravel.....	Incoherent.....	Low.....	Alluvial sands and gravels.
9. Subirrigated soils of bottom lands, upland pockets, and swales: Elsmere.....	Level basins, valley floors, and long gentle slopes.	Very slow to none.	Rapid to level of water table.	Fine sand.....	Incoherent.....	Low.....	Eolian and alluvial sands.
Loup.....	Same.....	Slow.....	Same.....	Fine sand.....	Incoherent.....	Low.....	Eolian and alluvial sands.
Sarpy.....	Nearly level flood plains.	Moderate to slow.	Moderate.....	Fine sands.....	Slightly coherent.....	Low.....	Recent sandy alluvium.
Gannett.....	Nearly level basins.....	None.....	Very slow.....	Fine sands.....	Slightly coherent.....	Medium to low.	Eolian sands.
10. Sandhills: Dune sand, stabilized.....	Hummocky hills and ridges.	None.....	Excessive.....	Sand.....	Loose.....	Low.....	Eolian sands.
11. Rough broken land: Rough broken land, Canyon soil material.	Rough and broken.....	Excessive.....	Slow.....	(1)	(1)	(1)	Limy sandstone.
Rough broken land, sand material.	Rough and broken.....	Excessive.....	Very rapid.....	(1)	(1)	(1)	Eolian sand.
12. Organic soils: Muck.....	Level basins.....	None.....	Very slow.....	Sand and peat.....	Fine and fibrous.....	Low.....	Sand and peat.
Peat.....	Nearly level to depressional.	None.....	Slow or very slow.	Peat.....	Fibrous.....	Low.....	Decayed plant remains.
13. Riverwash: Riverwash.....	Nearly level.....	Slow.....	Slow or none.....	Sand.....	Loose or slightly coherent.	Low.....	Recent sandy alluvium.

¹ No subsoil.



FIGURE 11.—Topography of Holt fine sandy loam, deep, level, north of Crookston. Corn and small grains are grown in strips.



FIGURE 12.—Landscape north of Crookston: Dawes very fine sandy loam in foreground; Rosebud fine sandy loam on gently rolling slopes in background.



FIGURE 13.—Sandstone of the Ogallala group, in a quarry north of Crookston, shows weathering to a depth of about 8 feet; some layers of concretions in upper 3 feet have resisted weathering. Canyon fine sandy loam, rolling, has developed in the upper part of the weathered sandstone.

4. SHALLOW TO MODERATELY DEEP, DARK, FRIABLE LOAMY SOILS OF HILLY UPLANDS

This group of soils occurs mainly in the northern part of the county. The topography is rolling to hilly and slopes exceed 10 percent. The soils are similar to those of group 1 but are not so deep. The members of this group are:

Canyon fine sandy loam, rolling	Rosebud fine sandy loam, undulating
Holt fine sandy loam, undulating	Rosebud loamy fine sand, gently rolling
Holt loamy fine sand, undulating	
Rosebud fine sandy loam, gently rolling	Rosebud loamy fine sand, undulating

These soils typically have a thin, brown or grayish-brown loamy surface layer that rests directly on weathered sandstone or is separated from it by a thin, indistinct subsoil (fig. 13). The soils have formed in material weathered from fine-grained, usually limy, sandstone. The limestone outcrops in places. The soils are thin because water erodes away the dark surface soil almost as rapidly as it forms.

The soils have a good grass cover and are used for grazing or hay production. They are not suited to cultivation.

5. LIGHT-COLORED VERY SANDY SOILS OF UPLANDS

The soils in this group occur within and bordering sandhill areas. In some places the topography is nearly level to gently undulating, but in others it is rolling to hummocky. The soils are:

Dwyer loamy fine sand	Valentine-Rosebud loamy fine sands, undulating
Valentine fine sand, undulating	
Valentine loamy fine sand, undulating	

The Dwyer soil and the undulating phases of Valentine fine sand and Valentine loamy fine sand are closely related to the two mapping units of Dune sand, stabilized, but have a somewhat thicker dark surface soil because they occupy smoother sites, support a better grass cover, and are less exposed to severe wind erosion. The complex of Valentine-Rosebud loamy fine sands, undulating, covers areas where the drifting sand has only partly covered bedrock. The complex consists of intricately mixed small areas of two soil types, the Valentine that developed on eolian sand, and the Rosebud that developed from weathered sandstone.

Probably less than 10 percent of the acreage in this group is cultivated. The soils are stable if the native grass is not disturbed, but when cropped they lose humus, become lighter in color and less coherent, and drift badly. In spite of the poor suitability for cultivation, some areas are used for corn and small grains. This is done because in many places in the sandhills these soils are the best available for growing the grain needed for feeding cattle.

6. DEEP, DARK, FRIABLE LOAMY SOILS OF TERRACES

The only soil of this group—Tripp fine sandy loam—occupies a few small areas, mostly along Minnechaduzza Creek and near the headquarters of the Niobrara Game Refuge. The soil has developed in loamy stream deposits left on terraces that are now above flood level. This alluvial material was derived from weathered sandstone of the smooth uplands.

The soil resembles the deep, dark soils of group 1. Its grayish-brown surface soil, up to 14 inches thick, is underlain by about 10 inches of lighter colored subsoil. The subsoil rests on the sandy parent alluvium. The soil lies below surrounding uplands, where it receives extra moisture by runoff and seepage. It has a high water-holding capacity and is fertile. Almost all of it is cultivated, mainly to corn. Oats, wheat, rye, barley, and alfalfa are also grown.

7. MODERATELY THICK, DARK, SANDY SOILS OF TERRACES

The soils of this group occupy nearly level to gently undulating high benches along the valley of the Niobrara River. They are like the dark, sandy upland soils but are underlain by sandy and gravelly alluvium instead of sandstone. The two members of this group are:

Cody fine sandy loam, gently undulating Cody loamy fine sand, gently undulating

The surface soil, a brown friable fine sandy loam or loamy fine sand, has a single grain or fine crumb structure and is about 7 inches thick. The upper subsoil, about 15 inches thick, is friable and slightly lighter colored and usually a little heavier textured than the surface soil. The lower subsoil consists of fine or medium sand, mixed with a little silt and clay; it rests at depths of 2 to 4 feet or more on loose sand or mixtures of sand and gravel.

These soils are not so productive as Tripp fine sandy loam, but are cultivated. Corn, rye, and forage crops are commonly grown.

8. LIGHT-COLORED VERY SANDY SOILS OF TERRACES

The soils of this group have formed in sands and gravels left on old high benches along the Niobrara River. The two mapping units are:

Simeon loamy fine sand Valentine-Simeon loamy fine sands, undulating

The Simeon soil is nearly level to gently undulating. It has a surface layer of grayish-brown to dark grayish-brown loose loamy fine sand about 8 inches thick. This layer rests on light-colored, stratified, loose sand or a mixture of sand and gravel that usually becomes coarser with increasing depth.

The complex of Valentine and Simeon loamy fine sands is undulating to gently rolling or hummocky. The Valentine soil of this complex is as described in group 5.

This group provides fairly good pasture but is too droughty and erodible to be of any value for cultivated crops.

9. SUBIRRIGATED SOILS OF BOTTOM LANDS, UPLAND POCKETS, AND SWALES

This group consists of soils in which plant roots are able to reach moist soil just above the permanent water table. They occur in many places—on bottom land along streams; at the heads of drainageways in the sandhills; in valleys blocked by sand dunes; in pockets and swales in the upland; and around the edges of lakes (fig. 14). The members of this group are:

Elsmere loamy fine sand	Gannett loamy fine sand
Elsmere-Loup-Sarpy loamy fine sands	Gannett-Valentine loamy fine sands
Elsmere-Valentine loamy fine sands	Loup fine sandy loam
Gannett fine sandy loam	Sarpy loamy fine sand

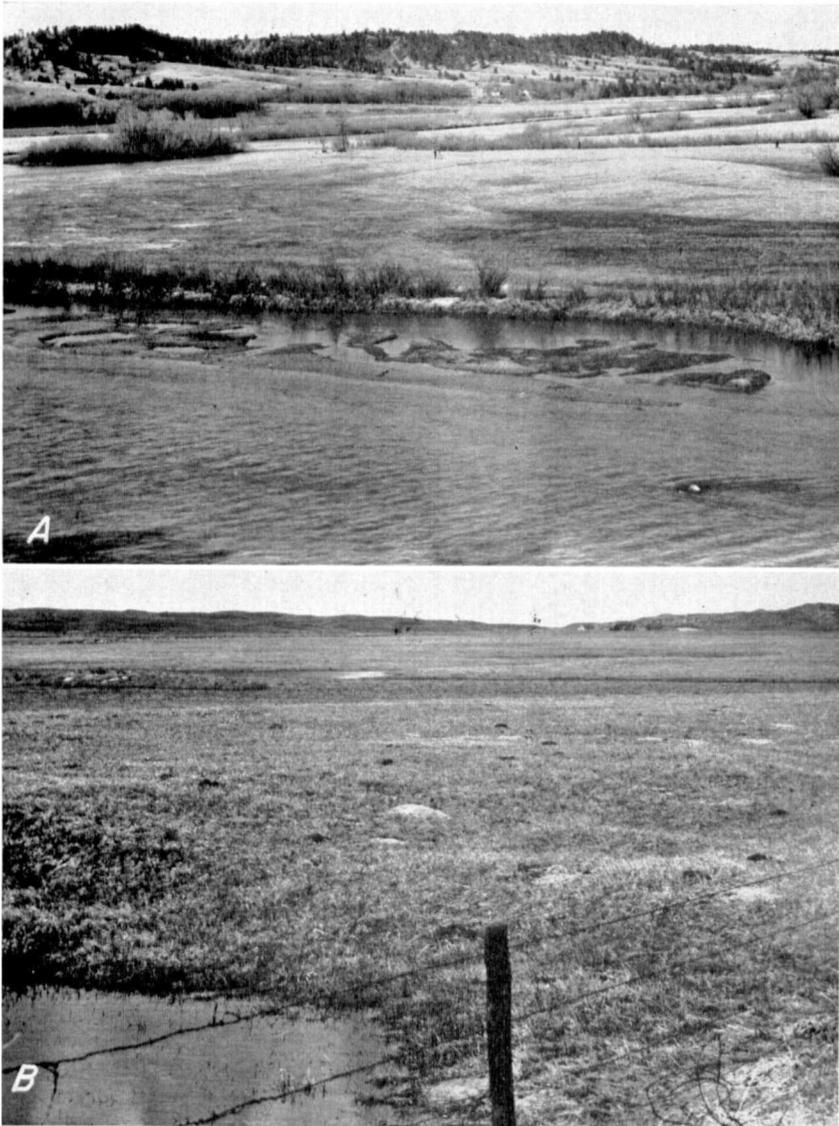


FIGURE 14.—Typical locations for soils of group 9.

- A. View of Niobrara River valley from Bryant bridge southeast of Valentine: Sandbars in channel are classed as Riverwash, the floodplain as Elsmere loamy fine sand, and the breaks in the background as Rough broken land.
- B, Gannett fine sandy loam in low ponded places in sandhill valley in Township 31 North, Range 28 West: Valentine fine sand on undulating areas in the valley, and Dune sand, stabilized, hilly, in background.

The surfaces of most of these soils are remarkably smooth, and surface drainage is poorly established, except along the larger streams. In a few places drifting sand and small streams have roughened the land.

Ditches and tile drainage systems are used on much of the land in this group to prevent waterlogging and to make easier the harvesting of hay. The water table lies 2 to 10 feet below the surface most of the year. In places, it may rise to the surface in wet seasons; it is lowest during July and August and early in September.

The Gannett, Loup, and Elsmere soils of this group have dark-colored surface layers 8 to 10 inches thick. The Gannett, occupying undrained basins, are the darkest, most poorly drained, and most deeply developed soils of the group. The Loup and Elsmere soils are similar to the Gannett but have outlets for surface drainage; their dark layers are not so thick as those of the Gannett, nor are the layers below the subsoil so highly mottled with dark colors.

The Sarpy is a light-colored immature soil of the stream floodplains; it is subject to more flooding than others of this group. The Valentine soils, included in this group only as a part of the Gannett-Valentine complex, have been previously described.

The soils of this group are used mostly for producing native and tame hay. The yield and quality of hay have been increased in many meadows without resorting to cultivation. This has been done by seeding a mixture of timothy, clover, and redtop among the native grasses. Some areas are pastured, and a few are used for home gardens.

10. SANDHILLS

This group covers almost the entire southern two-thirds of the county, as well as much of the northwestern part. The mapping units consist of lime-free medium to fine sand, the surface inch or two of which is darkened by organic matter. They are:

Dune sand, stabilized, rolling

Dune sand, stabilized, hilly

The landscape is monotonous—a succession of hills or ridges 15 feet or more high that are separated by valleys and basins. The nearly level skyline is broken only by scattered higher dunes. The dunes have been stabilized because grasses have become established and protect the surface soil from wind. In places, however, there are blowouts, or areas where loose sands are blown about by the wind because the surface is bare. Blowouts are most numerous in areas of dune sand, stabilized, hilly, because it supports a thinner grass cover.

The large areas of stabilized dune sand provide some of the most dependable grazing in Nebraska, and the largest cattle ranges in the State are located on them. The sandhills are used almost entirely for pasture and hay because they erode rapidly and severely when cultivated.

Trees are difficult to start in the sandhills, but some species thrive once they are established. Large demonstration plantings of conifers are growing vigorously in the Nebraska National Forest. In many other places, cedar, pine, elm, and cottonwood trees are growing successfully on dune sand.

11. ROUGH BROKEN LAND

This group consists of steep, rough, broken areas not suitable for cultivation that run across the county on both sides of the Niobrara River. The two mapping units, named for the kind of rock material, are:

Rough broken land, Canyon soil material Rough broken land, sand material

Drainage channels have cut deeply and developed many sharp divides and ridges separated by narrow, steep-sided valleys and gullies. Masses of loose material slide down the steep slopes and produce a series of short vertical exposures called catsteps. Bedrock crops out in many places, usually in the form of steep irregular slopes or cliffs.

Erosion is severe because practically all the water that falls runs off rapidly. In most places the plant cover is thin or lacking. True soil development occurs only along the bases of slopes and in pockets and valleys where rock debris accumulates. Elsewhere soils cannot form because the loose products of rock weathering are removed nearly as fast as they form.

Grasses and trees grow on this land, but most areas are used only for grazing. Some timber is cut for fence posts and fuel.

12. ORGANIC SOILS

The two kinds of organic soils mapped in this county—Peat and Muck—occur in low marshy places around lakes and ponds and along some streams. They are associated with the Loup and Gannett soils.

Peat consists almost entirely of brown, spongy, fibrous, partly decomposed remains of rushes, sedges, ferns, grasses, and willows. It ranges from 2 to 8 feet in depth. Locally, thin layers of sand occur in the peat.

Muck has a surface layer consisting of partly decomposed plant remains and fine sand, mixed together in equal parts by volume. The surface layer, about 18 inches thick, rests on bluish-green fine sand.

Areas of Peat that can be drained easily are sometimes used as gardens. For the most part, however, both Peat and Muck are used for growing hay. The yields of hay are high, but the quality is low unless the tame grasses such as timothy and clover have been seeded among the native species. Peat and Muck generally are not good for grazing because they are boggy.

13. RIVERWASH

Riverwash consists of various more or less stratified sediments deposited as bars, islands, cutoff meanders, and natural levees along the Niobrara River. It is frequently covered by water and is subject to movement.

Riverwash is not a soil, but stream-laid materials in the first stage of soil development. Its organic matter, texture, and color are derived from the soils and rocks that yielded the sediments. It will become a soil as it stabilizes, vegetation increases, and humus is added.

This land is not farmed and its sparse cover of grass and small trees is of little value, even for grazing.

MAJOR SUITABILITY CLASSES

This subsection is designed to aid those who are interested in planning land use for large areas. It places the 13 groups of soils already discussed in four major use-suitability classes. In the first class are soils best suited to cultivated crops; in the second, soils less suited to cultivated crops; in the third, soils well suited to hay; and in the fourth, soils and miscellaneous land types suited mainly to pasture.

SOILS BEST SUITED TO CULTIVATED CROPS

The soils best suited to cultivated crops are all of those in groups 1, 2, 3, 6, and 7, except the loamy fine sands of the Holt, Rosebud, Anselmo, and Cody series. Soils of this class are used almost entirely for the cultivated crops normally grown, and they produce the highest yields in the county. These soils occur principally on the Crookston-Springview tableland, north of Valentine, and in the central and western parts of the county along the Niobrara River.

SOILS LESS SUITED TO CULTIVATED CROPS

The soils less suited to cultivated crops are all those of group 4, except Canyon fine sandy loam, rolling, and in addition, the loamy fine sands of the Holt, Rosebud, Anselmo, Cody, and Valentine series from groups 1, 3, 5, and 7.

The soils of this class are the best on many holdings. They are sandy and subject to wind erosion, so they should be carefully managed when not protected by vegetation.

Corn, rye, and forage—the crops usually grown—are fed to livestock in winter to supplement the harvest of native hay. The farmers need the supplemental feed, and they grow it on these less desirable soils if no better land is available. Yields are somewhat lower than on the soils best suited to cultivated crops. Rye can be planted between rows of corn to protect the soils during the windy winter months.

SOILS WELL SUITED TO HAY

The soils well suited to hay are those of groups 9 and 12. They occur on the bottom lands, in blocked valleys, and in pockets and swales in the uplands and are poorly drained and subirrigated.

These soils are used almost exclusively for hay, an important crop in this vast cattle-raising country. The number of cattle a rancher can raise is largely governed by the amount of hay he can produce.

The high water table makes these soils largely unsuitable for cultivation but it provides a constant source of moisture for grasses. Hay yields are unusually high, especially in meadows seeded with a mixture of timothy and clover.

SOILS AND LAND TYPES SUITED MAINLY TO PASTURE

The soils and land types suited mainly to pasture are Canyon fine sandy loam, rolling, from group 4, and all the soils and land types in groups 5, 8, 10, 11, 12, and 13.

This class of soils covers about 75 percent of the county and is the principal land resource of the ranchers. The soils are too sandy or too rough for cultivation. They are used principally for grazing livestock.

ESTIMATED YIELDS

Yields are mainly influenced by climate, relief, management, and the nature of the individual soil. Table 3 gives yields based on the average management now practiced. These yields indicate the relative productivity of the soils and allow farmers to estimate the average long-term production from a farm or field. Farmers need to make such an estimate in budgeting a farm business and in calculating the costs and returns to be expected from planned changes in the system of farming.

In deriving the yield estimates for table 3, long-term yields from county records were used whenever available. Other data on long-term yields were collected by the field party during and after the survey. Free use was made of unpublished estimates on average annual crop yields for the period 1923 through 1932, which were made by the United States Department of Agriculture in cooperation with the Nebraska Department of Agriculture.

The rather low yields estimated for some of the soils do not necessarily indicate that they are poorly suited to the crops grown on them. Farming in this county covers a large acreage and employs low-cost methods. The expenditure per acre is low, so production can be profitable though yields per acre are relatively low.

The prevailing management used in estimating the yields given in table 3 is not intensive. Systematic crop rotation is not practiced, but most farmers plant rye or oats at 3- or 4-year intervals on land used for corn.

No commercial fertilizer is applied because all the soils will produce good yields if they receive enough moisture. Much manure is available but it is seldom used on cropland. Sometimes it is applied to soils of the bottom lands and terraces that have enough moisture to assure rapid decay. On upland soils used for grain, manure decays slowly and tends to reduce yields, especially the first year.

Tillage practices, planting dates, rates of seeding, and other general information pertinent to the system of management prevailing in this county will be found in the section, Agriculture.

For many soils of the county, improved management would increase yields 20 to 40 percent above those given in table 3. Some suggestions for improved management are given in the section, Soil Types and Phases.

RANGE MANAGEMENT

More than three-fourths of the land in Cherry County is used for grazing. The sandhill ranges produce good forage and are widely known as a source of feeder cattle. The soils used for grazing as a rule are not suitable for cultivation and planting of crops but will produce good crops of grass year after year. Your grass crop, like any other, responds to proper care and management. Yields are important to you, although you have to measure them in pounds of beef, and in your estimates of forage reserves rather than directly in bushels or tons per acre. The livestock industry, by far the biggest one in the county, depends for its existence on the way the ranchers manage and take care of their range forage.

HG	Holt loamy fine sand:										
	Gently undulating-----	15	13	5	13	10	1.0	.3	40	.5	-----
HH	Undulating-----									.4	-----
LA	Loup fine sandy loam—										
	Imperfectly drained ² -----	25	25	9	10	24	3.2	1.6	140	1.0	2.4
	Poorly drained ² -----									2.0	4.4
MA	Muck-----									1.0	2.2
PA	Peat-----									2.0	4.4
RA	Riverwash-----										
	Rosebud fine sandy loam:										
RB	Gently rolling-----									.3	-----
RC	Gently undulating-----	30	33	20	18	24	3.0	.8	160	.5	-----
RD	Undulating-----									.4	-----
	Rosebud loamy fine sand:										
RE	Gently rolling-----									.2	-----
RF	Gently undulating-----	13	13	5	8	8	1.0	.2	60	.5	-----
RG	Undulating-----									.3	-----
RH	Rough broken land, Canyon soil material-----										-----
RK	Rough broken land, sand material-----										-----
SA	Sarpy loamy fine sand-----									.4	-----
SB	Simeon loamy fine sand-----									.2	-----
TA	Tripp fine sandy loam-----	30	33	13	15	24	2.4	1.5	140	.5	-----
VA	Valentine fine sand, undulating-----									.3	-----
VB	Valentine loamy fine sand, undulating-----	15	13	5	15	16	1.6	.4	60	.4	-----
VC	Valentine-Rosebud loamy fine sands, undulating-----										-----
VD	Valentine-Simeon loamy fine sands, undulating-----									.2	-----

¹ Consists of timothy, alsike clover, red clover, and redbud planted in native hay meadows without cultivation.

² Subdivision to show how drainage affects yield, not a part of the soil name.

Know your grasses.—Different kinds of grass have different characteristics and habits of growth. Some grow best in cool seasons, and others make their growth chiefly in warm weather. Some grow well in lowlands and on moist sands; others, less productive but better suited to the drier sites, get along well on the upland loams and clays. Some spread by underground stems and can be grazed closer without harm than the others that grow from seed or spread by stem on top of the ground. Usually a combination of plants having somewhat different habits grows better than any one would grow alone. The kinds that grow best depend on the nature of the site. The way the plants are managed and grazed influences the condition of the range.

Range site and condition.—*Range site* means the soils in a given kind of geographic location and the local climate, drainage, water supply, and other factors of the environment in that location. *Range condition*, an indirect measure of past grazing management, is arrived at by comparing the kind and amount of present vegetation with the original. Range condition is estimated in this way because the combination of native grasses that will produce the most beef in this county is usually the one nature had on the ground when the first white men came. The combination of plants that grew originally is called the climax vegetation.

Usually three or four kinds of native grass are dominant in the climax vegetation of a range site. For example, as shown in table 4, the choppy sandhills site had prairie sandreed, sand bluestem, sand lovegrass, and little bluestem. Many other grasses probably grew, but these four made up more than 75 percent of the total forage on the site. If the choppy sandhills site is grazed so that these four kinds of grasses are still dominant, it is probably producing near the maximum amount of forage. The same holds true for the other sites; they produce the most over a long period when the grasses are as near as possible to the original cover.

Whatever the range site or the range condition, there are four simple principles that must be rigidly applied to achieve good range management: (1) Stocking the proper number of livestock; (2) proper distribution of grazing; (3) proper season of use; and (4) proper kinds of grazing animals.

Table 4 has been provided to aid ranchers in proper stocking of their range. It lists the range sites, the soils that are in those sites, the dominant native grasses on those sites, and suggested stocking rates according to four range conditions—excellent, good, fair, and poor.

First, locate the soils on your range on the soil map. Then refer to table 4 and find which range site or sites your soils cover. Next, examine your range and compare the kinds of plants on it with those the table shows grew there originally. Finally, on the basis of this comparison, vigor of the plants, and number of weeds, you need to estimate the range condition. The soil conservation technician will help you do this. Table 4 then gives you, for each range site in excellent, good, fair, or poor condition, the suggested stocking rate. This rate is the approximate number of livestock that can be grazed during the 6-month grazing season.

TABLE 4.—*Soils of Cherry County, Nebr., arranged by range sites, grasses originally dominant on each site, and suggested stocking rates by range condition classes*

[Stocking rates are for a 6-month (or equivalent) grazing period in normal years; rates for good, fair, and poor conditions will permit range to regain excellent condition; range in poor condition preferably should be given complete rest, often along with reseeding, rather than stocked at indicated rates; adjust all stocking rates from year to year according to amount of rainfall]

Range site and soil	Map Symbol	Dominant grasses on site when range is in excellent condition class	Suggested stocking rates by range condition classes			
			Excellent	Good	Fair	Poor
Wet land (water table above surface part of season but soils not ponded):			<i>Acres per cow¹</i>	<i>Acres per cow¹</i>	<i>Acres per cow¹</i>	<i>Acres per cow¹</i>
Gannett fine sandy loam.....	GA	Bluejoint reedgrass; prairie cordgrass; tall grasslike plants, but normally not the cattails and reeds common in marshes.	3.5	4.5	7.5	15.0
Gannett loamy fine sand.....	GB					
Loup fine sandy loam.....	LA					
Subirrigated (water table rarely above surface and generally at depths of 18 to 36 inches):						
Dwyer loamy fine sand.....	DD	Switchgrass, Indian-grass, big bluestem.	5.0	7.0	11.0	22.0
Elsmere loamy fine sand.....	EA					
Elsmere-Valentine loamy fine sands.....	EC					
Gannett-Valentine loamy fine sands.....	GC					
Overflow ² (Soils regularly receive extra moisture from higher land, from stream overflow, and from higher slopes):						
Elsmere-Loup-Sarpy loamy fine sands.....	ER	Big bluestem, western wheatgrass, switchgrass.	7.5	10.0	15.0	30.0
Muck.....	MA					
Sarpy loamy fine sand.....	SA					
Tripp fine sandy loam.....	TA					

See footnotes at end of table.

TABLE 4.—*Soils of Cherry County, Nebr., arranged by range sites, grasses originally dominant on each site, and suggested stocking rates by range condition classes—Continued*

[Stocking rates are for a 6-month (or equivalent) grazing period in normal years; rates for good, fair, and poor conditions will permit range to regain excellent condition; range in poor condition preferably should be given complete rest, often along with reseeding, rather than stocked at indicated rates; adjust all stocking rates from year to year according to amount of rainfall]—Continued

Range site and soil	Map Symbol	Dominant grasses on site when range is in excellent condition class	Suggested stocking rates by range condition classes			
			Excellent	Good	Fair	Poor
Sands (deep, loose, coarse-textured soils, predominantly sand, on gentle slopes):			<i>Acres per cow¹</i>	<i>Acres per cow¹</i>	<i>Acres per cow¹</i>	<i>Acres per cow¹</i>
Anselmo loamy fine sand, gently undulating.....	AR	Switchgrass, prairie sandreed, sand bluestem, little bluestem.	10.0	14.0	20.0	40.0
Cody loamy fine sand, gently undulating.....	CC					
Dunc sand, stabilized, rolling.....	DC					
Holt loamy fine sand, gently undulating.....	HG					
Holt loamy fine sand, undulating.....	HH					
Rosebud loamy fine sand, gently rolling.....	RE					
Rosebud loamy fine sand, gently undulating.....	RF					
Rosebud loamy fine sand, undulating.....	RG					
Simeon loamy fine sand.....	SR					
Valentine loamy fine sand, undulating.....	VR					
Valentine fine sand, undulating.....	VA					
Valentine-Rosebud loamy fine sands, undulating.....	VC					
Valentine-Simeon loamy fine sands, undulating.....	VD					
Sandy (normal sandy loams):						
Anselmo fine sandy loam, gently undulating.....	AA	Little bluestem, prairie sandreed, needle-and-thread, sand dropseed, threadleaf sedge.	10.0	14.0	20.0	40.0
Cody fine sandy loam, gently undulating.....	CR					
Holt fine sandy loam, colluvial, gently undulating.....	HA					
Holt fine sandy loam, deep, level.....	HR					
Holt fine sandy loam, gently undulating.....	HD					

Holt fine sandy loam, undulating.....	HE					
Rosebud fine sandy loam, gently undulating.....	RC					
Rosebud fine sandy loam, undulating.....	RD					
Rosebud fine sandy loam, gently rolling.....	RR					
Silty (very fine sandy loam over claypan for Dawes soil; thick layer of very fine sandy loam over light clay loam for Goshen):						
Dawes very fine sandy loam.....	DA	Western wheatgrass, blue grama, green	10.0	14.0	20.0	40.0
Goshen very fine sandy loam.....	GD	needlegrass, needle-and-thread.				
Choppy sandhills (deep, loose, coarse-textured soil, predominantly sand, that has abrupt slopes):						
Dune sand, stabilized, hilly.....	DR	Prairie sandreed, sand bluestem, sand lovegrass, little bluestem.	12.0	16.0	24.0	48.0
Shallow (soil at least 10 inches deep, but few roots penetrate deeper than 20 inches):						
Canyon fine sandy loam, rolling.....	CA	Blue grama, dryland sedges, needle-and-thread, sand dropseed.	12.0	16.0	24.0	48.0
Thin breaks (poorly developed mixed soils derived from various materials that outcrop on slopes of 20 to 35 percent or more):						
Rough broken land, sand material.....	RK	Little bluestem, prairie sandreed, side-oats grama, stonyhills muhly; a few trees on the outcrops.	15.0	20.0	30.0	60.0
Very shallow (mixed soils into which few roots can penetrate deeper than 10 inches, but have some joints in bedrock that allow deeper root penetration; joints in bedrock usually marked by tall grass, shrubs, or trees):						
Rough broken land, Canyon soil material.....	RH	Blue grama, dryland sedges, junegrass..	30.0	40.0	60.0	120.0

¹ A mature cow only, not a cow and the calf running with her.

² Peat and Riverwash, though subject to overflow, are not listed because they have little or no value for grazing.

Adjust livestock numbers from season to season by watching degree of use. Graze about half the growth and then move the animals to other pasture, market them, or provide supplemental feed.

Your local Soil Conservation Service technician can help you in learning about the different kinds of rangeland you have, the grasses it will produce, the additional snowmelt you could store, and the amount of grazing you can expect.

Proper number of livestock.—The number of livestock on the range must be balanced against the time they will graze and the condition of the forage. If the balance is correct, the forage left on the ground does these things:

- (1) Serves as a mulch that causes rapid intake and storage of water; the more water stored in the ground, the better the growth of grass for grazing.
- (2) Allows roots to reach deep moisture; overgrazed grass cannot reach deep moisture because not enough green shoots are left to provide the food needed for good root growth.
- (3) Protects soil from wind and water; grass is the best kind of cover for preventing erosion.
- (4) Allows grass to crowd out weeds, which means that range in poor or fair condition will improve.
- (5) Enables plant roots to store food in their roots for quick and vigorous growth after droughts and in spring.
- (6) Stops snow where it falls so that it soaks into the soil when it melts; snow blown into drifts melts in drainageways and bushes where it is of little benefit.
- (7) Provides a greater feed reserve for the dry spells that otherwise might force sale of livestock at a loss.

Proper distribution of grazing.—Many pastures in Cherry County are overgrazed in some parts and undergrazed or not grazed at all in others. This problem usually can be overcome by proper distribution of salt and water and careful location of fences.

Salt should be placed on lightly grazed areas where livestock can reach it from several directions; it should not be placed in sandy or other erodible spots. Watering places should be developed over the entire pasture if possible, so that livestock do not have to walk too far to get a drink. Poor water distribution is one of the major causes of uneven grazing.

Fences should be located so as to provide pastures for all the classes of livestock that will run in summer, and also to furnish pastures for winter use. Where possible, put temporary fences on the boundaries between range sites. Subirrigated sites should not be fenced along with sandhill sites. The grasses are different on the two sites, and if the two are fenced together it will be difficult to graze the whole pasture uniformly.

Proper season of use.—Pasture fences and time of grazing often can be arranged so that livestock will graze cool-season grasses early in spring and warm-season grasses in the summer. The kinds and amounts of grass that each pasture will produce and the best time for grazing are determined by the range site and the condition of the grass cover. Pastures in fair to poor condition usually should be rested until fall or winter, as this permits the better grasses to spread

from underground stems and by seeding. Your Soil Conservation Service technician can specify seasons of use and rest for individual pastures.

Proper kinds of grazing animals.—The animals grazed should suit the grass, soils, and climate of the area. The people in Cherry County have learned that cattle are best suited. Sheep are not particularly well adapted because their habits of close grazing and trailing encourage serious erosion of the sandy soils.

SOIL TYPES AND PHASES

The soil types and phases of the county are described in the following pages, and their agricultural relations are discussed. Their approximate acreage and proportionate extent are given in table 5, and their location is shown on the soil map that accompanies this report. Soil terms used throughout this report are defined in the section, Soil Survey Methods and Definitions.

Anselmo loamy fine sand, gently undulating (0 to 2 percent slopes) (AB).—This imperfectly developed, moderately deep, dark sandy soil has formed in wind-deposited sand. This sand contains enough fine material, chiefly silt, to have slight coherence. The soil occupies numerous nearly level to gently undulating upland areas north of Valentine, mostly in association with the mapping units of Holt fine sandy loam and Rosebud fine sandy loam. The Anselmo parent material has been derived from areas of these soils and from weathering outcrops of sandstone. Surface drainage channels are imperfectly developed or absent, as rainfall is rapidly and completely absorbed. Internal drainage is rapid. The largest single area of this soil is about 600 acres.

Profile description: ⁶

0 to 8 inches, grayish-brown friable loamy fine sand of weak crumb structure; well supplied with organic matter; 7 to 12 inches thick.

8 to 21 inches, grayish-brown massive friable fine sandy loam which becomes yellowish brown in the lower part; 13 to 16 inches thick.

21 inches+, light grayish-brown loose fine sand.

This profile is almost always free of carbonate of lime and neutral in reaction. The soil includes a few small areas in which the surface soil texture is loamy fine sand instead of fine sandy loam or fine sand.

Use and management.—This soil absorbs water rapidly and releases it readily to plants. It has a higher water-holding capacity than very sandy light-colored upland soils such as Valentine fine sand. Plants, particularly those of cultivated crops, suffer from lack of moisture in dry seasons. If the native grass is removed, this coarse-textured soil is easily eroded by wind.

Most areas are cultivated. Since the county lacks land that can be used for cultivated crops, it is not likely that this soil will be removed from cultivation. The principal crops are corn and rye. Forage crops are grown on a few areas. The natural vegetation consists of grasses, mostly tall, coarse species.

⁶ In soil profiles the description of each layer begins with usual depth in inches, of its top and bottom from the mineral surface of the soil; the layer ranges in thickness as mentioned at the end of the description.

TABLE 5.—*Approximate acreage and proportionate extent of soils in Cherry County, Nebr.*

Soil	Acres	Per cent
Anselmo fine sandy loam, gently undulating.....	24,466	0.6
Anselmo loamy fine sand, gently undulating.....	4,504	.1
Canyon fine sandy loam, rolling.....	31,080	.8
Cody fine sandy loam, gently undulating.....	19,564	.5
Cody loamy fine sand, gently undulating.....	3,794	.1
Dawes very fine sandy loam.....	2,009	.1
Dune sand:		
Stabilized, hilly.....	757,776	19.7
Stabilized, rolling.....	1,463,341	38.0
Dwyer loamy fine sand.....	4,132	.1
Elsmere loamy fine sand.....	61,429	1.6
Elsmere-Loup-Sarpy loamy fine sands.....	2,128	.1
Elsmere-Valentine loamy fine sands.....	17,770	.5
Gannett fine sandy loam.....	121,978	3.2
Gannett loamy fine sand.....	23,035	.6
Gannett-Valentine loamy fine sands.....	24,768	.6
Goshen very fine sandy loam.....	1,387	(¹)
Holt fine sandy loam:		
Colluvial, gently undulating.....	1,085	(¹)
Deep, level.....	13,990	.4
Gently undulating.....	21,826	.6
Undulating.....	476	(¹)
Holt loamy fine sand:		
Gently undulating.....	3,601	.1
Undulating.....	666	(¹)
Loup fine sandy loam.....	69,012	1.8
Muck.....	13,600	.3
Peat.....	9,298	.2
Riverwash.....	86	(¹)
Rosebud fine sandy loam:		
Gently rolling.....	35	(¹)
Gently undulating.....	23,432	.6
Undulating.....	1,304	(¹)
Rosebud loamy fine sand:		
Gently rolling.....	685	(¹)
Gently undulating.....	23,175	.6
Undulating.....	8,429	.2
Rough broken land:		
Canyon soil material.....	63,484	1.6
Sand material.....	15,142	.4
Sarpy loamy fine sand.....	8,048	.2
Simeon loamy fine sand.....	22,489	.6
Tripp fine sandy loam.....	2,065	.1
Valentine fine sand, undulating.....	891,368	23.2
Valentine loamy fine sand, undulating.....	25,609	.7
Valentine-Rosebud loamy fine sands, undulating.....	18,023	.5
Valentine-Simeon loamy fine sands, undulating.....	17,411	.5
Intermittent ponds.....	1,080	(¹)
Water.....	29,740	.8
Total area in county.....	3,848,320	100.0

¹ Less than 0.1 percent.

Corn is planted in spring with a corn lister and cultivated three or four times during the growing season. No well-established system of crop rotation is followed. Corn is often grown for several years in succession. Stripcropping of corn and rye is practiced to some extent, and rye is sometimes planted between the corn rows to prevent erosion in fall.

This soil is best suited to pasture and hay. If it is very carefully managed when cropped, there is no reason why it should erode severely. Soil continuously cropped or grazed gradually declines in fertility unless organic matter and minerals are added. If a decline in fertility is permitted, this soil will become difficult to till and more susceptible to erosion. The soil can be protected and even improved by using rotations that include grass and legumes and by scattering available manure on the land, instead of allowing it to rot in one pile. The use of organic mulches (stubble mulches) will do much to prevent excessive wind erosion.

Anselmo fine sandy loam, gently undulating (0 to 2 percent slopes (AA).—This soil resembles Anselmo loamy fine sand except for having a finer textured topsoil. It occurs chiefly in Lavaca precinct in the western part of the county, although some is located on the Crookston-Springview plain. The parent material, topography, and drainage are like those for Anselmo loamy fine sand, gently undulating.

Profile description:

- 0 to 9 inches, grayish-brown friable fine sandy loam of fine crumb structure, 8 to 12 inches thick.
- 9 to 25 inches, grayish-brown (slightly lighter colored than surface soil) heavy fine sandy loam to loam; weak irregularly blocky structure; material light yellowish brown and somewhat finer textured in the lower part; 12 to 20 inches thick.
- 25 inches +, light grayish-brown or pale-brown loose fine sand.

This soil is neither very acid nor alkaline. It usually lacks free carbonate of lime. Freshly plowed areas usually show a mottled light-and-dark surface because of spotty removal of the topsoil. A few small areas that have very fine sandy loam topsoil are included with this soil.

Use and management.—This soil has a somewhat higher water-holding capacity than Anselmo loamy fine sand, gently undulating, is slightly more resistant to wind erosion, and is better suited to agriculture. It has the same limitations as the Anselmo loamy fine sand, gently undulating, and must receive the same careful treatment if its stability and productivity are to be maintained. Corn and rye are the principal crops.

Canyon fine sandy loam, rolling (5 to 12 percent slopes) (CA).—This young, shallow, stony soil is forming in partially weathered calcareous soft sandstones on rolling to hilly areas. It occupies many patches and strips within areas of Rosebud and Holt soils in the northern part of the county.

The parent rock is Ogallala sandstone of Tertiary age (fig. 13). External drainage is rapid. Runoff is excessive. The weathering parent material is eroding so rapidly that only a shallow soil can

develop. The vegetation is chiefly prairie grasses, but on the north-facing slopes there are thin stands of trees.

Profile description:

- 0 to 5 inches, grayish-brown single-grained fine sandy loam; 3 to 6 inches thick.
- 5 to 12 inches, light grayish-brown or gray partially weathered sandstone of loamy texture; contains many soft fragments of sandstone; 2 to 12 inches thick.
- 12 inches +, slightly weathered or unweathered limy sandstone, many feet thick.

This soil typically has free carbonate of lime in all layers. The topsoil contains many rock fragments. Bedrock crops out in a small patches throughout the soil area.

Use and management.—This sandy, rocky, shallow soil has a low water-holding capacity. The bedrock is impervious to plant roots. Because it is difficult to plow and cultivate, this soil is not used for tilled crops.

Most areas are pastured. When not overgrazed, the soil has a medium carrying capacity. Hay is cut from some places where the soil is not too steep or rock outcrops too numerous.

Cody fine sandy loam, gently undulating (0 to 2 percent slopes) (Cv).—This is a dark, moderately deep soil of the high terraces or benches along the Niobrara River in the western part of this county. The parent material is fine sandy alluvium deposited by the Niobrara River and subsequently left high and dry when the river cut to a lower level. At some places the sand contains a little gravel. The soil occupies nearly level to gently undulating areas lying 80 to 150 feet above the bottom lands. It is associated chiefly with Simeon loamy fine sand. The soil is well drained. It does not gully excessively because rainwater usually soaks in as fast as it falls. The original plant cover was a good stand of tall and short grasses.

Profile description:

- 0 to 7 inches, brown fine sandy loam of loose or fine clumb structure; 4 to 8 inches thick.
- 7 to 22 inches, brown (slightly lighter colored than surface layer) fine sandy loam to loam of loose or fine crumb structure; 10 to 20 inches thick.
- 22 to 48 inches, light grayish-brown fine sand that contains enough silt and clay to be slightly sticky when moist; 2 to 3 feet thick.
- 48 inches +, loose fine sand that usually contains a little gravel; layer ranges from few to many feet thick.

This soil is neutral to slightly acid; it does not contain free lime carbonate.

Use and management.—In physical characteristics this soil is similar to Anselmo fine sandy loam, gently undulating. It occupies terraces instead of uplands, however, and therefore receives some extra water from runoff and seepage. Like the Anselmo soils, it is susceptible to erosion whenever its surface is left bare and exposed to the wind. Stripcropping, the use of rotations emphasizing grasses and legumes, and stubble-mulch cultivation will help to protect the soil and prevent rapid loss of organic matter.

Practically all the areas are cultivated. Corn is the principal crop grown for grain. Oats and sorghums are commonly cut for forage. Other crops common to the region will do well on this soil.

Cody loamy fine sand, gently undulating (0 to 2 percent slopes) (Co).—This soil occupies one large and several small areas at Valentine, as well as two strips along the Niobrara River in Township 33 North, Range 25 West. This soil is on high sandy benches in association with Simeon loamy fine sand. The soil is nearly level to undulating and slightly hummocky.

Profile description:

0 to 9 inches, brown loamy fine sand of single grain or weak crumb structure; has a good water-holding capacity 8 to 10 inches thick.

9 to 24 inches, slightly lighter colored brown loose fine sand that contains a little gravel; 10 to 18 inches thick.

24 inches +, light yellowish-brown loose mixture of fine sand and gravel.

The profile everywhere lacks free lime carbonate. Except for its coarser texture throughout, it resembles the profile of Cody fine sandy loam.

Some of this soil is now cultivated; some areas formerly cultivated have grown up to grasses and weeds. No surface drainage channels have formed, as the soil rapidly absorbs rainfall.

Use and management.—Because the soil is loose and sandy, it is easily eroded, droughty, and consequently not good for cultivated crops. When the soil is first plowed, the grass roots and decayed organic matter in it act as binders and keep the water-holding capacity fairly high. After a few years of cultivation the grass roots disappear, the organic matter is oxidized, and the soil becomes unstable and unable to resist wind action. It then may take several years to get a grass pasture started again.

About 60 percent of this soil was once cultivated, but a large part is now idle or has been reseeded to grass. Fair to good yields of corn and rye are obtained when the amount and distribution of rain are favorable.

This soil is most profitably used for hay and pasture. On farms where it must be cultivated, care should be taken to keep the amount of soil humus high. This may be done by tilling the land infrequently and by using rotations that keep grass or a legume on it most of the time. All crop residues should be kept at or near the surface of the soil to help control wind erosion.

Dawes very fine sandy loam (0 to 1 percent slopes) (Da).—This soil occupies a small total area, mainly in the Crookston precinct. It has a dark friable surface layer and a dark claypan subsoil, which have developed in weathered limy sandstone of the Ogallala formation. The soil occurs in flat-bottomed basins that lie only a little below the level of the surrounding tableland (fig. 12). This soil can be distinguished from the associated Holt, Rosebud, and Anselmo soils by its much heavier textured subsoil. Surface drainage is poorly established. Water is absorbed rather slowly but seldom ponds, even after heavy rains. Short and medium grasses make up most of the native plant cover.

Profile description.

0 to 12 inches, brown friable very fine sandy loam of fine crumb structure; lower 1 or 2 inches commonly grayish brown or gray because water percolating through the soil has removed organic matter; 7 to 14 inches thick.

- 12 to 21 inches, brown or grayish-brown columnar clay loam or clay; contains enough sand to have a gritty texture; this claypan layer becomes dense and hard when dry but is sticky and plastic when wet and is not penetrated easily by moisture and plant roots; layer somewhat coarser and lighter colored in the lower part; 7 to 15 inches thick.
- 21 to 30 inches, light grayish-brown to nearly white friable very fine sandy loam, loam, or silt loam of weak blocky structure; very high in free carbonate of lime; 8 to 12 inches thick.
- 30 inches +, light-gray weathered limy sandstone having fine sand or loamy fine sand texture; 1 to 2 feet thick.

As mapped in this county, this soil includes small patches of fine sandy loam and sandy loam.

This soil results partly from a soil-forming process called "solonization" (or "alkalinization"). In this process, soils containing sodium salts become partly leached and strongly alkaline and develop a plastic heavy clay layer below the topsoil. This is the only soil recognized in this county that has been strongly influenced by this process.

Use and management.—Plowing exposes the thin topsoil to erosion. The claypan lies near the surface and is so dense that plant roots and water do not penetrate readily. The roots are concentrated in the topsoil, so plants suffer sooner from too little or too much water than those on most other soils of the county.

Native grasses provide fair to good grazing. Small grains and corn are grown on the small cultivated areas, but they do not yield satisfactorily if the season is not favorable. Small grains will likely yield more profitably on this soil if the fields are summer fallowed. Corn, which needs a much longer time to mature than grain, is not adapted. Most of this soil occurs in small patches within larger bodies of better soils, so it is handled as part of the larger unit.

Dune sand, stabilized, rolling (8 to 15 percent slopes) (Dc).—This soil occupies a large part of the county. It consists of sand dunes, hills, and ridges that no longer shift and blow with the wind because their surfaces are covered with grass. Trees grow naturally in a few of the low spots in the sandhills; plantings have been made in many other places.

Bodies of this soil may be seen everywhere except on the Crookston-Springview plain and on Pine Ridge. At most places in the southern and western parts, this soil consists of hills and ridges 50 to 125 feet high, some low hummocky areas, and numerous blowouts. The dunes and ridges were derived mainly through the breakdown and wearing away of the soft sandstones that cap the region. During the erosion process, finer materials in these sandstones were separated and deposited farther away as dunes and ridges. Near the Niobrara River, in the northern part, the ridges and hills diminish.

The most extensive associated soil is Dune sand, stabilized, hilly. Basins, swales, and valleys between the sandhills are occupied by members of the Gannett, Loup, and Elsmere series (fig. 14, B). Valentine soils occur within areas of this mapping unit and around its edges.

Profile description:

- 0 to 3 inches, brown, loose, open and porous fine or medium sand; grass roots numerous; 2 to 4 inches thick.
- 3 inches +, pale brown or light yellowish-brown loose porous fine or medium sand containing little organic matter; a few to many feet thick.

As shown in the foregoing description, the profile consists of a thin dark surface layer underlain by a few to many feet of loose fine sand. Usually the profile contains no carbonate of lime.

Drainage channels are few and indistinct. Rainwater and most of the melted snow soak in rather than run off. Internal drainage is rapid. The water table is relatively near the surface. In the basins and valleys, ground water is usually within 10 feet of the surface.

Use and management.—This droughty soil is highly susceptible to wind erosion. The sand itself cannot store much water. The amount of humus in the thin, dark, surface layer is not enough to provide adequate storage. The sand drifts freely, once the protective cover of grasses is gone. Small patches of this soil are plowed and seeded from time to time, but the crop usually fails and the land is allowed to go back to grass. Grazing is the best use. The amount of grass produced is not large, but the supply is quite dependable. Sometimes grass is cut for hay, but the hay is of low quality.

Important management practices are those that will protect and improve the grass cover, such as prevention of overgrazing, stabilizing blowouts, protecting the grass near roads, paths, and watertanks, and preventing range fires.

Dune sand, stabilized, hilly (15 to 50 percent slopes (D_B).—This soil of the sandhill region consists mainly of irregularly distributed hills and ridges 100 to 250 feet high. Sharp, cone-shaped dunes, with cup-shaped cavities on the north and west sides, add variety to the landscape. This soil, with Dune sand, stabilized, rolling, covers more area than all other soils in the county combined.

This soil differs from Dune sand, stabilized, rolling, principally in having higher and steeper dunes, hills, and ridges, which support a thinner stand of grass and are more frequently marked by blowouts (fig. 14, B). This soil entirely lacks surface drainage; all rainfall is absorbed.

Profile description:

- 0 to 2 inches, brown, loose, porous fine or medium sand; grass roots most numerous in this layer; 1 to 3 inches thick.
- 2 inches +, pale-brown or light yellowish-brown loose porous fine or medium sand containing very little organic matter; 20 to 200 inches thick.

There generally is no free lime carbonate in any part of this soil.

Use and management.—Unfavorable topography makes this soil valueless as cropland. None of it is cultivated, and it does not produce hay. The soil can be used only for grazing. Care should be taken to prevent blowouts and to maintain a good cover of grass. The carrying capacity depends on grazing practices in the past and on seasonal rainfall. Since many ranches are made up largely of this soil, stocking should be adjusted from season to season to prevent overgrazing. Animals should be moved to other pastures, marketed, or given supplemental feed before they have grazed the grass so close that the stand will be damaged.

Dwyer loamy fine sand (0 to 4 percent slopes) (D_b).—This soil occupies small patches and narrow strips on nearly level to gently sloping old alluvial fans.

It occurs along the Niobrara River and Dry Creek. Few of the areas exceed 80 acres, and many are considerably smaller. The soil has formed on a moderately deep, limy, very sandy deposit that came from sandy soils of the high uplands or from weathering sandstone outcrops. This material was deposited directly by wind, or was first deposited by water and later whipped about and reworked by wind. The Simeon, Rosebud, Canyon, and Elsmere soils are associated with this soil.

This soil receives considerable runoff water from higher levels. Surface drainage is imperfect. There is little or no runoff. Internal drainage is rapid but not excessive; the soil is never waterlogged.

The natural vegetation includes many sand-loving species, such as Indiangrass and switchgrass, as well as big and little bluestems and various weeds.

Profile description :

- 0 to 12 inches, brown to grayish-brown loose or slightly coherent loamy fine sand, well supplied with organic matter; top 3 or 4 inches in cultivated fields usually a little more sandy and less coherent than rest of the layer; 10 to 15 inches thick.
- 12 to 30 inches, light-brown or light grayish-brown loose loamy fine sand; contains much less organic matter than surface layer; 12 to 20 inches thick.
- 30 inches +, light-gray loose fine sand, a few to many feet thick.

Carbonate of lime is not concentrated in any layer of this soil but is scattered throughout in a finely divided form.

Included with this soil are a few small areas that have a fine sandy loam or fine sand surface soil. Also, in some places, scattered pebbles are in the soil and the parent material is gravelly loamy sand.

Use and management.—In spite of its low-lying position and smooth topography, this soil is of doubtful value for cultivated crops. It has medium to low water-holding capacity and a strong tendency to deteriorate and erode under cultivation.

About 40 percent of the soil is cultivated; the rest is used for pasture and hay. Corn, rye, and oats are the principal cultivated crops. Alfalfa is the main tame-hay crop. Crop yields vary according to season. In years when rainfall is high and favorably distributed, yields are almost as good as on the Rosebud and Tripp soils. In dry years the returns are low and failures are common.

The soil should be used mainly for pasture and hay. Small patches may safely be farmed as parts of larger fields, but extensive areas present difficulties. Stripcropping, stubble mulching, and use of long crop rotations consisting mostly of legumes and grasses will help to protect and to build up this soil.

Elsmere loamy fine sand (0 to 2 percent slopes) (E_A).—This dark-colored soil has formed in broad basins, in narrow valley floors, and on long gentle slopes in the sandhill region (fig. 14, A). The parent sands were brought in largely by wind, though in a few places they were first deposited by water and later reworked by wind. The soil is nearly level to gently sloping except where old stream channels run across it. It has a rank growth of prairie grasses. The dominant species, when the range is in good condition, are shown in table 4.

The most important soils that occur in association with Elsmere loamy fine sand are the Valentine, the Loup, and the mapping units

of Dune sand, stabilized. This soil is similar to the Loup soils but somewhat better drained.

Profile description :

- 0 to 9 inches, dark grayish-brown loose loamy fine sand that contains abundant organic matter; slightly acid to slightly alkaline; 8 to 12 inches thick.
- 9 to 14 inches, light grayish-brown loose fine sand; slightly acid to slightly alkaline; 4 to 6 inches thick.
- 14 inches+, light grayish-brown or light-gray loose fine sand or a mixture of sand and gravel; shows scattered dark-brown stains; may have a little free carbonate of lime in lower part; a few to many feet thick.

The soil absorbs water easily and quickly. Surface drainage channels are few, as most of the drainage is underground. As explained in the section, Physiography, Relief, and Drainage, the sheet of underground water in the sandhills is not stagnant. It moves out and away from this sandy region. The water that falls on this porous soil soaks down a few feet and then flows away with the underground water. In very wet seasons the water table approaches the surface; it seldom falls lower than 8 feet. In spite of the low position of some bodies of this soil on the bottom lands, they are seldom flooded.

Use and management.—In spite of its coarse texture, the surface layer has a fairly high water-holding capacity because it contains a large amount of decayed plant remains. Most bodies of the soil are protected from severe wind erosion because they occur in low positions. Nevertheless, this soil is not good for cultivated crops. After it is tilled for a few years, the supply of humus is largely exhausted, the water-holding capacity is reduced, and the susceptibility to wind erosion is greatly increased.

Some strips have been plowed, but almost all of the soil is used for hay. It is not likely that the soil will ever be used extensively for anything but grass. The high water table provides ample moisture for grasses in nearly every season, and the smooth surface makes mowing easy. Many ranchers have seeded timothy, redtop, and alsike or red clover in the native meadows. This seeding increases the yield about 50 percent and at the same time improves the quality of the hay.

Elsmere-Loup-Sarpy loamy fine sands (0 to 2 percent slopes) (EB).—This complex occurs east of Valentine on bottom lands of the Niobrara River. In this area sands were laid down by streams on their flood plains. Later, wind removed some of the topsoil in some places and redeposited it at others. At no place is the relief very great, and the land appears level when viewed from a short distance.

The wind erosion and deposition have produced low hummocks on which three kinds of sandy soil exist in a complex pattern. The higher places—the low ridges and mounds—are characterized by the light-colored Sarpy loamy fine sand; the level somewhat lower places are dark-colored Elsmere loamy fine sand; and the very low wet places are dark-colored Loup loamy fine sand. Individual areas of these soils are too small to map separately, so they have been mapped together in this complex. The profiles of the three soils are described elsewhere in this report.

The natural vegetation is big bluestem, western wheatgrass, and switchgrass, when the range is in good condition.

Surface drainage is not sufficient, or even lacking, in some parts of the area. The water table lies within 10 feet of the surface, and internal drainage is variable.

Use and management.—The greater part of this land is used for tame hay and forage. Sudangrass, millet, sweet sorghum, and rye are the principal crops. Yields are fair on the Loup and Elsmere soils but usually are poor on the Sarpy. The unstable sand composing these soils, the high water table, and the occasional floods make cultivation difficult and unprofitable.

Elsmere-Valentine loamy fine sands (0 to 3 percent slopes) (Ec).—This complex consists of small areas of Elsmere and Valentine loamy fine sands that are so intricately mixed that it was not practical to map them separately. The soils were derived from nearby sandy soils and from sandstone outcrops. The sand was deposited by wind and blown into many low mounds or hummocks separated by swales.

The complex occupies areas 10 to 300 acres in size in the Wood Lake and Evergreen precincts. Most of the areas are within large areas of typical Valentine soils. In this complex, the light-colored Valentine loamy fine sand is on the hummocks, and the dark-colored Elsmere loamy fine sand is in the swales. The mounds or hummocks are not more than 3 feet high or more than a few square rods in extent; the swales are generally less than 100 feet wide.

The grass on the hummocks is somewhat different from that in the swales. Valentine loamy fine sand, on the hummocks, has a thin cover of switchgrass, needlegrass, big bluestem, and weeds. Elsmere loamy fine sand, in the swales, has a rank cover that includes many tall species of grass.

Surface drainage of these soils is imperfectly developed or absent. The porous sands permit subsurface drainage.

Use and management.—The soils of this complex occur in such small patches that they cannot be managed separately. They are erodible and therefore better suited to grazing and hay crops than to cultivated crops.

This complex is used almost exclusively for native hay. The hay in the swales is coarser and less palatable than that on the mounds. Cuttings from the swales and mounds are mixed during harvest, so fairly good hay is the result. Ranchers seed timothy and clover on some of this land to improve the yield and quality of the hay.

Gannett fine sandy loam (0 to 1 percent slopes) (Ga).—This deep, wet soil occurs in basins, valleys, and swales in the sandhills. The lower parts of the depressions in which the soil has developed are commonly marshes, ponds, or lakes. Most areas are surrounded by Valentine soils or Muck.

This soil consists largely of sand deposited by wind in the same way as the sand of the Valentine soils and the units of Dune sand, stabilized. More grass grows in wet places, which is one reason why this soil of the depressions is darker and deeper than those surrounding it.

The soil has no surface drainage because the basins and valleys are entirely enclosed by higher land. Seepage from surrounding sandhills keeps it moist in nearly all seasons. The water table is within

6 feet of the surface at all times; during heavy rainfall it rises and temporarily waterlogs the entire soil.

The better drained places have a rank growth of tall grasses about like that on the Elsmere soils. Sedges and rushes predominate in wetter places.

Profile description:

- 0 to 11 inches, dark grayish-brown fine sandy loam of single grain or weak crumb structure; matted with grass roots and contains abundant organic matter; easily penetrated by roots, water, and air; neutral in reaction; 8 to 14 inches thick.
- 11 to 30 inches, grayish-brown or gray loose fine sand with many dark-brown streaks and spots; fewer roots and much less organic matter than in first layer; neutral to slightly alkaline; 15 to 25 inches thick.
- 30 to 34 inches, light bluish-gray or light greenish-gray plastic sandy clay, mottled with pale yellow and yellowish brown; neutral to slightly alkaline; moisture and roots penetrate with difficulty; 2 to 6 inches thick.
- 34 inches +, pale-brown or light yellowish-brown loose fine sand similar to that in the substratum of the mapping units of Dune sand, stabilized; this layer a few to many feet thick.

In a few small patches this soil has a very fine sandy loam surface layer.

Use and management.—With proper drainage, much of this soil might be used for cultivation, as it has good water-storage capacity, has a large supply of organic matter, is easily tilled, and lies in positions protected from the wind. Without drainage, cultivation is not practical. Drainage of many areas is not feasible.

Hay is the best natural crop and it is cut from almost all areas. Though of poor quality, the yield is good. Many ranches increase the yield and palatability of the wild hay by sowing tame grasses and legumes in their meadows. Phosphate fertilizer will increase yields of legumes.

Gannett loamy fine sand (0 to 1 percent slopes) (G_B).—Scattered small areas of this deep, dark soil occur throughout the sandhill region in enclosed wet basins, valleys, and swales. The soil is situated in level or nearly level slightly better drained sites around the edges of depressions. It is associated with Gannett fine sandy loam, Valentine soils, Peat, and Muck. It differs from Gannett fine sandy loam principally in the texture of its surface layer. Like the other Gannett soils, it has no surface drainage and is kept almost continuously moist by seepage from the surrounding sandhills.

This soil produces the same grasses as Gannett fine sandy loam. No areas are so wet as to be favorable for rushes.

Profile description:

- 0 to 10 inches, dark grayish-brown loose loamy fine sand, matted with grass and high in organic matter; easily penetrated by roots, water, and air; 8 to 14 inches thick.
- 10 to 30 inches, yellowish-brown loose fine sand, highly stained with dark-brown streaks and splotches; fewer roots and much less organic matter than in layer above; 15 to 25 inches thick.
- 30 to 34 inches, light greenish-gray or light bluish-gray plastic sandy clay not easily penetrated by plant roots or water; 2 to 6 inches thick.
- 34 inches +, pale-brown or light yellowish-brown loose fine sand like that underlying units of Dune sand, stabilized; layer is a few to many feet thick.

In places indicated on the map by special symbol, salts have accumulated at the surface and formed a 1- or 2-inch layer of gray, loose soil. The rest of the surface soil is dark grayish brown and cloddy. The salts injure plants, so the growth is normally sparse on these salt spots.

Use and management.—None of this soil is drained well enough for cultivation. Even if it were suitably drained, it would deteriorate rapidly because its loose sandy texture makes it unsuitable for cultivation. Nearly all areas are used for hay; a few are pastured. The soil yields nearly as much as Gannett fine sandy loam, but the quality of the hay is not so high unless tame grasses and legumes have been sown among the native grasses. Phosphate fertilizer would increase yields where legumes are seeded in hay meadows.

Gannett-Valentine loamy fine sands (0 to 3 percent slopes) (Gc).—Areas of this complex 10 to 300 acres in size occur in many places in the sandhills but are most numerous in the east-central part of the county. The complex is mapped where sand in the undrained sandhill valleys, basins, and pockets has been reworked by the wind into low hummocks, or mounds, that are separated by narrow swales. The light-colored Valentine loamy fine sand has developed on the mounds, and the dark-colored Gannett loamy fine sand in the low, wet swales. The two soils occur in so intricate a pattern that it is not practical to map them separately. Descriptions of the two soils are given in other parts of this report (pp. 51 and 69). This complex usually occurs within areas of Valentine soils and is associated with Gannett soils, Peat, and Muck.

Sand-loving grasses are dominant on both soils of this complex. The grasses growing in the low places are generally taller and more dense than those on the mounds, but they are not so palatable.

This complex has no outlets for surface drainage. The Gannett loamy fine sand has adequate subsurface drainage and is seldom waterlogged, though it is usually moist throughout the profile. The Valentine loamy fine sand is better drained, at least in the upper few feet.

Use and management.—Individual areas of the two soils of this complex are so small they cannot be managed and used separately. Since neither soil is well suited to cultivation because of poor drainage, droughtiness, and tendency to erode easily, the complex is used almost exclusively for hay. By mixing the grasses from the two soils, hay of fair quality is obtained. The practice of sowing timothy and clover in hay meadows produces more and better hay.

Goshen very fine sandy loam (0 to 2 percent slopes) (Gd).—This thick, dark, friable, nearly level soil occurs in swales, narrow valleys, and on slopes along or near the heads of small drainageways. It is confined to Irwin and Lavaca precincts in the northwestern part of the county. Usually it is within areas of Rosebud soils.

The soil has developed from material washed down from soils on the higher slopes nearby. This process still continues and is producing a soil with a thicker dark surface layer than is typical of soils on the high uplands in this county. Most of the soil is cultivated.

In most areas the slope is enough to give this soil good surface drainage. It absorbs water easily, and its internal drainage is good.

Profile description :

- 0 to 20 inches, grayish-brown or dark grayish-brown mellow very fine sandy loam of fine crumb structure; high in organic matter; easily penetrated by plant roots, air, and water; neutral in reaction; 15 to 30 inches thick.
- 20 to 32 inches, slightly lighter colored grayish-brown friable cloddy loam to light clay loam; moderately easy penetration by roots, air, and water; neutral to slightly alkaline; 10 to 20 inches thick.
- 32 inches+, light grayish-brown loose fine sandy loam to loam, usually slightly calcareous, at least in the lower part; a few to many feet thick.

In a few places the subsoil, the layer at depths of 20 to 32 inches, is distinctly lighter colored than the topsoil and has a fine or very fine sandy loam texture. Included with Goshen very fine sandy loam are a few patches of Goshen fine sandy loam.

Use and management.—This soil is one of the best in the county from the standpoint of natural productivity, but it lacks agricultural importance because its area is too small. The soil is high in plant nutrients, is well drained, has excellent structure and a high water-holding capacity, is not especially erodible, and receives extra water that runs off surrounding higher land.

Nearly all of this soil is used for crops, principally corn, wheat, and oats. Yields of all the commonly grown crops are high. Crop yields will decrease if the soil is continuously cultivated for a number of years. Decline in productivity and loss of desirable structure can be checked if manure is added and a legume is occasionally plowed under.

Holt fine sandy loam, gently undulating (1 to 3 percent slopes) (Hd).—This dark-colored soil is confined to nearly level to gently undulating uplands of the Crookston-Springview plain. No area is very large, but there are many of them. The soil is associated with other members of the Holt series and with Rosebud, Canyon, and Valentine soils.

The soil has formed in material weathered from limy sandstone. The Rosebud soils, formed from the same kind of parent material, are lighter colored. The Canyon soil, from the same kind of material, is shallower and lighter colored. The Valentine soils, lighter colored than this soil, have formed from wind-deposited loose sands.

The natural vegetation consists of both tall and short grasses and weeds. The important species are blue grama, needlegrass, sand reedgrass, big and little bluestems, and western wheatgrass.

This soil is well drained everywhere. There is enough slope to permit runoff of excess water, but not enough to cause much water erosion. Water moves easily through this porous soil.

Profile description :

- 0 to 15 inches, dark grayish-brown porous friable fine sandy loam of fine crumb structure; contains a good supply of organic matter; neutral in reaction; 12 to 20 inches thick.
- 15 to 27 inches, brown or grayish-brown porous, friable, weak cloddy fine sandy loam; neutral to slightly alkaline; 8 to 16 inches thick.
- 27 to 34 inches, very light grayish-brown (in places almost white) friable, structureless fine sandy loam; contains much free carbonate of lime; fragments of parent sandstone numerous; layer is 6 to 12 inches thick.
- 34 inches+, partly weathered light-colored limy sandstone of the Ogallala formation.

The profile is shallowest on the shoulders of hills and in the more sloping positions where sandstone bedrock lies nearest to the surface.

Small fragments of incompletely weathered sandstone and bits of tubular concretions may occur in any part of the profile.

Included with this soil are a few small areas of Holt loamy fine sand and Holt very fine sandy loam.

Use and management.—This soil absorbs and holds large quantities of water. It is smooth enough to permit cultivation, easy to till, and never waterlogged. It holds together well under tillage but will lose fertility and become more susceptible to erosion if it is cropped year after year without replacing organic matter.

The soil is fairly well suited to most crops grown in the county. It is extensively farmed. The main crops, in order of acreage, are corn, oats, and rye. Smaller acreages of wheat and sweetclover are grown. In seasons of normal rainfall the soil is about as good for corn and rye as the less sandy upland soils, and in dry seasons it is even better. The soil is too sandy to produce high yields of oats. Yields of wheat or sweetclover are not especially good.

Manure, green-manure crops, and crop residues need to be added to the soil to replenish the organic matter that will prevent deterioration. Use of cover crops, stubble mulches, and stripcropping may be advisable if it appears that the soil is starting to blow. The soil should never be left bare, as this invites wind erosion.

Holt fine sandy loam, deep, level (0 to 1 percent slopes) (Hv).—This soil differs from Holt fine sandy loam, gently undulating, in having smoother relief and a deeper profile. It occurs in many upland areas on the Crookston-Springview plain, north of Crookston and Valentine. A large body lies just north of the Niobrara River, a short distance southwest of Crookston. Rosebud and Anselmo soils and Holt fine sandy loam, gently undulating, are associated with this soil.

This soil has a thick, dark surface layer and a deep profile. It has developed on nearly level uplands from material weathered from limy sandstone. The soil absorbs water easily, and internal drainage is good. A few shallow intermittent drainageways and some small depressions occur.

Profile description:

- 0 to 18 inches, dark grayish-brown, porous friable, fine sandy loam of fine crumb structure; contains abundant organic matter; neutral in reaction; 14 to 22 inches thick.
- 18 to 36 inches, grayish-brown to brown mellow, cloddy, heavy fine sandy loam, loam, or silt loam; neutral in reaction; 14 to 25 inches thick.
- 36 to 46 inches, very light grayish-brown, friable, massive fine sandy loam or loam; contains much free carbonate of lime; 8 to 12 inches thick.
- 46 to 60 inches, light grayish-brown, slightly coherent, friable, limy, fine sandy loam; contains many fragments of partly weathered sandstone.
- 60 inches +, light-colored limy parent sandstone of the Ogallala formation.

In some places the profile is as much as 10 feet deep to bedrock. The surface texture in a few places is a loam rather than a fine sandy loam.

Use and management.—This soil is one of the most productive in the county. It is naturally fertile, has a high water-holding capacity, and requires only good management. Conservation of crop residues to prevent wind erosion is an important part of good management.

Nearly all of this soil is cultivated. The chief crops are corn, oats, and wheat.

Holt fine sandy loam, colluvial, gently undulating (1 to 3 percent slopes) (H_A).—Extensive acreages of this deep dark soil occur as gently sloping patches and strips around the bases of hills, mostly in the northeastern part of the county. The soil has developed in many places below areas of Canyon soils and Rough broken land.

The parent material is a mixture of materials obtained in two ways: (1) by the weathering of Ogallala sandstone in place, and (2) by deposition of sands washed from light- and dark-colored soils and from sandstone outcrops lying at higher levels. Periodic overwashing in places at the bases of slopes has resulted in both parent material and soil that lack the uniformity of texture characterizing other Holt fine sandy loams.

The surface soil is friable, dark-colored, and, on the average, slightly thicker than that of Holt fine sandy loam, gently undulating. In some places it may be as much as 30 inches thick. Small areas may have a loamy sand or very fine sandy loam surface soil. The subsoil texture also varies; in some areas it is moderately heavy in the upper part and light-textured below; in others it may be loose and sandy throughout. Limy sandstone bedrock underlies all bodies of this soil.

This soil is well drained, both on the surface and internally. Its surface is smooth and nearly level to gently sloping. In places the areas somewhat resemble a stream terrace in shape and position. The grass cover is the same as that on Holt fine sandy loam.

Use and management.—This naturally productive soil is about equal to Holt fine sandy loam, gently undulating. Cultivation is difficult, however, because it occurs in small patches hard to reach with machinery. The few areas farmed are largely used for corn and alfalfa.

Holt fine sandy loam, undulating (3 to 5 percent slopes) (H_E).—This soil occurs chiefly in the northeastern part of the county. It differs from Holt fine sandy loam, gently undulating, in having a thinner dark surface layer and in being less deep to bedrock. It has developed in association with Rosebud and Canyon soils and with other Holt soils.

Short complex slopes, small gullies, and narrow ridges characterize this soil. Runoff is greater than for Holt fine sandy loam, gently undulating, and internal drainage is rapid. Native grasses do not grow so profusely as on the smoother uplands.

The dark grayish-brown surface soil and the subsoil are each about 9 inches thick. The subsoil and the layer of lime-carbonate accumulation are thinner than those in Holt fine sandy loam, gently undulating. The partly weathered limy sandstone beds lie 30 to 40 inches below the surface. Incompletely weathered fragments of sandstone commonly occur throughout the profile and are especially numerous on the shoulders of hills where the soil is thinnest.

Use and management.—This soil produces grasses well, but it is not good for farming because the rolling topography, gullies, and ridges make it hard to cultivate. A few areas are used for growing the forage crops needed to supplement grazing in nearby pastures. The soil is used principally for grazing livestock.

Holt loamy fine sand, gently undulating (1 to 3 percent slopes) (H_G).—This deep, inextensive dark soil has developed on undulating uplands in material weathered from light-colored limy sandstone.

It occurs on the Crookston-Springview plain, mainly in Sparks, Kewanee, and Military precincts. The areas are small and occur within scattered bodies of Holt fine sandy loams and Valentine and Canyon soils.

The slope is sufficient to insure good drainage; the soil is porous and absorbs water rapidly. Water erosion is no problem, but wind erosion may occur if the grass cover is destroyed. The native vegetation consists of tall, sand-loving prairie grasses.

Profile description:

- 0 to 12 inches, dark grayish-brown porous friable loamy fine sand; structureless or has a weak fine crumb structure; neutral in reaction; contains a moderate amount of organic matter; 10 to 15 inches thick.
- 12 to 22 inches, grayish-brown loose fine sand or loamy fine sand; neutral to slightly alkaline; 8 to 14 inches thick.
- 22 to 30 inches, very light grayish-brown or light-gray limy loose fine sand; contains numerous fragments of partly weathered sandstone.
- 30 inches +, partly weathered, light-gray, soft, limy sandstone of the Ogallala formation.

In places, pieces of partly weathered sandstone and tubular concretions that have weathered out of the sandstone occur throughout the soil.

Use and management.—The cultivation of this soil brings up the problems involved in farming any very sandy soil in this county—wind erosion, drought, and rapid decline in fertility under continuous cropping. If weather is favorable, crops yield almost as much as on heavier textured soils, but in average and dry years yields are low and failures are common. This soil is unstable and droughty, largely because it is so sandy. It is poor for cultivation.

Most areas of this soil have been plowed, usually during years when the rainfall was higher than normal. Most farmers let the soil go back to grass and weeds after its unstable nature was discovered. During the droughts of the 1930's, ranchers retired from cultivation much of this very sandy soil, and of other soils like it. Several years of favorable weather, at and preceding the time this survey was made, resulted in plowing of some areas again. It is not likely the plowed land will long remain in cultivation. The main crops being grown were corn, rye, and sweetclover.

Pasture and hay are the best uses for this soil. About the only protective measure needed under such use is control of grazing to preserve the grass cover.

Holt loamy fine sand, undulating (3 to 5 percent slopes) (HН).—This soil is situated mostly in the northeastern part of the county; it differs from the Holt loamy fine sand, gently undulating, principally in being more shallow. The topography is about the same as that of Holt fine sandy loam, undulating, except the hills are not quite so steep and the drainageways do not have gullied channels.

Surface drainage is no problem, since there is little runoff and slopes are sufficient to carry off any excess water. Rain is rapidly absorbed and moves easily through the soil. The soil profile is like that of Holt loamy fine sand, gently undulating, but all layers are thinner.

Use and management.—This rolling soil has the same weaknesses as Holt loamy fine sand, gently undulating, and, in addition, occurs on topography unsuited to cultivation. It is a good soil for pasture,

and most of it is used for grazing. Grass is cut for hay on a few areas but the yield is only fair. The usual suggestions for prevention of overgrazing and prairie fires apply.

Loup fine sandy loam (0 to 1 percent slopes) (L_A).—This dark-colored immature soil occupies broad basins, narrow valley floors, and long, very gentle slopes in sandhill areas. The generally level to very gently sloping surface is locally modified by low mounds, small shallow depressions, and shallow drainage channels. The most extensive areas occur along sandhill streams in association with Valentine and Elsmere soils. This soil, like others of its series, is wetter than Valentine or Elsmere soils. Gannett fine sandy loam, which resembles this soil, occurs in undrained basins and valleys and is consequently wetter.

The drainage of Loup fine sandy loam is adequate. There is little runoff because the soil soaks up water rapidly. The water table is high—2 to 4 feet below the surface during most of the year. The water table seldom drops as low as 6 feet, even in dry seasons. Plant roots can reach moist soil at all times.

The native vegetation is tall grasses and other herbaceous plants, including bluejoint reedgrass, prairie cordgrass, and small sedges and rushes.

Profile description:

- 0 to 8 inches, beneath a thin dark mulch of decomposed and partly decomposed plant remains, a dark grayish-brown friable fine sandy loam of soft crumb structure; contains abundant organic matter; 6 to 10 inches thick.
- 8 to 12 inches, slightly coherent grayish-brown loamy fine sand; contains much less organic matter than surface layer; 2 to 6 inches thick.
- 12 inches +, loose, light grayish-brown or light-gray fine sand or a mixture of sand and gravel; many dark-brown streaks and spots; a few to many feet thick.

In places the second layer is absent. A thin, gray limy layer sometimes occurs at the surface. This limy layer seems to appear and disappear according to rate of evaporation and movement of water in the soil, which, in turn, are regulated by weather. The rest of the soil profile usually contains very little lime, if any.

Small areas of Loup loam and Loup very fine sandy loam are included on the map with this fine sandy loam.

Use and management.—The water table rises so high during wet periods that cultivated crops drown out in most fields. Otherwise, more of the Loup fine sandy loam could be farmed, as it is easy to plow, has a good supply of plant nutrients, and stores large amounts of water.

Grass grows in a thick, luxuriant cover, and much of this soil is used for hay. The native hay is coarse and less nutritious than that cut from better drained upland soils. The common practice of sowing timothy, alsike clover, and red clover in meadows improves both the quality and yield of hay. Where alfalfa or clover is seeded in meadows, phosphate fertilizer will profitably increase the yield.

Muck (0 percent slopes) (M_A).—This is a dark-colored mixture of rotted and partly rotted plant remains and fine sand. It occurs in marshy places in the sandhills region, around the edges of lakes and ponds. Muck areas are usually fringed or surrounded by Gannett soils.

The sand part of the soil material was washed and blown into its present position. While the sand was accumulating, rushes, ferns, sedges, and willows contributed organic materials. The plant remains decomposed and produced dark-colored peat and humus. This mixture of equal parts of sand and organic matter is mapped as Muck.

There is no surface drainage in Muck areas. The water table is near the surface at all times, and in rainy season the entire soil is waterlogged.

Profile description:

0 to 6 inches, dark-brown fine sand and decomposed organic matter, mixed in about equal parts by volume; loose and easily penetrated by plant roots; 4 to 10 inches thick.

6 to 18 inches, brown fibrous peat and fine sand, mixed in about equal amounts by volume; 8 to 16 inches thick.

18 inches +, bluish-green loose fine sand; usually wet.

Use and management.—The wet, marshy places where Muck occurs cannot be cultivated and are not suitable for grazing. Native hay is best for these places if they are adequately drained. Although hay is produced in large quantities, it is coarse, unpalatable, and low in feeding value. Drained meadows that have had tame grasses and legumes sowed in them produce hay of much better quality. Unfortunately, not many marshes can be reclaimed economically.

Peat (0 percent slopes) (PA).—Thick deposits of dark-colored, spongy, partly decomposed remains of plants make up this soil, which occurs around lakes and along sluggish streams of poorly drained sections. Most of it is in the central part of Cherry County. The associated soils are chiefly members of the Gannett and Loup series.

The material composing Peat comes from dead rushes, sedges, ferns, grasses, and willows. It is only partly decomposed, and the plant tissues are still quite distinct.

There is no natural surface drainage. Peat is waterlogged during most of the year unless it has been artificially drained.

Profile description:

0 to 50 inches, dark-brown fibrous peat; very high water-holding capacity; easily penetrated by plant roots; 2 to 8 feet thick.

50 inches +, light grayish-brown or light-gray fine sand, streaked and spotted with dark brown.

In some places there are thin layers of light-colored fine sand in the peat.

Use and management.—Peat is generally too boggy for grazing, and too wet to cultivate unless it is artificially drained. If it is drained and seeded to timothy, redtop, alsike clover, and red clover, large yields of good quality hay can be produced. Garden and truck crops are grown successfully on a few of the drained areas.

Riverwash (0 to ½ percent slopes) (RA).—This land type consists of sandbars and islands in the Niobrara River (fig. 14, A). It is not a soil but a recent, unstable, and variable accumulation of sand. Its surface lies only a few inches above normal water level. During floods it is eroded and its boundaries are moved. As floods subside more sand is deposited and the boundaries change again. Riverwash contains a very small amount of organic matter, which comes from eroded soil areas and is deposited with the sand.

Riverwash is the first stage of development into an alluvial soil, such as Sarpy loamy fine sand. It now has an open growth of small willow and cottonwood trees. A soil will develop as these trees grow and grass comes in to add organic matter and further bind the surface layer.

Use and management.—Because of position, size of individual areas, and danger of flooding, none of the Riverwash is farmed. It is of little value even for pasture.

Rosebud fine sandy loam, gently undulating (1 to 3 percent slopes) (Rc).—This dark-colored moderately deep soil has developed on uplands (fig. 4). The parent material weathered from fine-grained limy sandstone of the Ogallala formation. The soil occurs in many places in the northern part of the county. The largest areas are just north of Crookston and on Pine Ridge in the extreme western part.

Associated with this soil are undulating to gently rolling Holt and Rosebud soils. The associated Holt soils, though darker colored, have about the same relief as this soil and have developed from the same kind of parent material. Also associated is Dawes very fine sandy loam, a dark-colored claypan soil that occurs in some flat, depressed areas. Finally, Canyon soil—shallow soil formed in weathered sandstone—is on rough, eroding areas bordering this Rosebud soil.

The soil is nearly level to gently undulating and has good but not excessive surface drainage. The sandy material permits good internal drainage without causing the soil to be very droughty. This is naturally a grassland soil. The important native species are little bluestem, prairie sandreed, and needlegrasses.

Profile description:

- 0 to 8 inches, grayish-brown friable nonlimy fine sandy loam; contains a good supply of organic matter; 1- or 2-inch surface part is mulchlike, but rest has weak crumb structure; all of layer easily penetrated by plant roots, air, and water; neutral in reaction; 6 to 10 inches thick.
- 8 to 16 inches, slightly lighter colored grayish-brown massive or cloddy fine sandy loam; slightly, if any, heavier than surface layer; usually not limy; neutral to slightly alkaline; 6 to 10 inches thick.
- 16 to 23 inches, very light grayish-brown or almost white friable cloddy fine sandy loam; contains abundant finely divided carbonate of lime that is mixed with the soil particles or appears as thin coatings on the surfaces of the clods; layer can be distinguished from underlying parent material only by its higher lime content.
- 23 inches +, partly weathered light-gray limy sandstone.

Fragments of incompletely weathered sandstone and bits of tubular concretions weathered out of the sandstone may occur in any part of the profile. Bedrock lies nearest the surface on the crests and shoulders of hills.

Small patches of Rosebud loamy fine sand and Rosebud very fine sandy loam were included with this soil in mapping. Larger areas of Rosebud loamy fine sand were mapped separately.

Use and management.—Rosebud fine sandy loam, gently undulating, absorbs moisture rapidly and has good water-storing capacity. The surface soil has structure favorable to growing plants and if well managed is stable enough to prevent excessive wind erosion. The relief of the soil and its texture make it easy to till. The natural fertility is fairly high.

This soil, about 95 percent of which is under cultivation, is well suited to the crops commonly grown in this region. The crops most

extensively grown are corn, oats, wheat, and rye. Yields are usually as high as those on less sandy soils of the well-drained uplands. In certain sections millet and sweet sorghum are grown. Most of the potatoes harvested in this county are grown on this soil. Potatoes yield especially well in the higher western part of the county where nights are cool. The soil is too sandy for growing wheat advantageously.

Commercial fertilizers are not necessary nor used at present, but the time may come when they may be needed to maintain yields on this soil and others like it. Preventing erosion and reducing crop losses caused by drought are the main problems. Farmers can do little to protect a crop from dry weather once it is planted, but they can improve the soil before planting.

This soil and others like it gradually lose organic matter under continuous cropping. With the organic matter they lose some of their ability to store moisture and to resist erosion. The naturally large amount of humus in this soil can be maintained by adding manure, turning under stubble and other crop residues, and occasionally plowing down a green-manure crop, preferably a legume. Giving the soil a rest—a chance to strengthen its structure and to increase its porosity—will also increase its productivity and resistance to erosion. All of these practices fit naturally into a crop rotation that emphasizes grasses and legumes. Greater use of long crop rotations will stabilize the soil and increase yields.

Rosebud fine sandy loam, undulating (3 to 5 percent slopes) (R_p).—The few small areas of this soil occur on the complex slopes of low hills and ridges. It is like Rosebud fine sandy loam, gently undulating, but shallower. On the tops and shoulders of hills it is thinnest and in these places often appears light-colored when cultivated. Steep and rough lands associated with areas of this soil are usually mapped as Rosebud fine sandy loam, gently rolling, or as Rough broken land, Canyon soil material.

Runoff from this undulating fine sandy loam is very rapid and produces numerous gullies. The grasses are the same as those on Rosebud fine sandy loam, gently undulating, but the stand is thinner.

The dark surface layer is about 7 inches thick, and the other layers are correspondingly thinner than those of Rosebud fine sandy loam, gently undulating. The total thickness of this soil ranges from 15 to 28 inches.

Use and management.—The undulating relief of this soil makes it difficult to cultivate and susceptible to erosion in rainy seasons. Its water-holding capacity is less than that of Rosebud fine sandy loam, gently undulating, and because of greater runoff, it absorbs less water.

This soil is used mostly for pasture, but to some extent for hay. It is not used for tilled crops. The hay is of good quality, but yields are only fair. The pasture has a fairly high carrying capacity. Prevention of overgrazing and control of gullies by filling them in and reseeded to grass are needed.

Rosebud fine sandy loam, gently rolling (5 to 8 percent slopes) (R_b).—This soil occupies a few areas on the high uplands. It differs from other soils of the Rosebud series because it occurs on rougher

topography and has less depth to the sandstone parent rock. Most of it lies above the general level of the tablelands—on high hills and ridges—in association with the Canyon soil and with other soils of the Rosebud series. Some areas are broken by gullies, and all the soil is more or less subject to accelerated erosion.

The soil profile looks about the same as those of the gently undulating and undulating phases of Rosebud fine sandy loam, except it is not so deep. The dark surface soil averages about 6 inches thick. The depths to slightly weathered sandstone bedrock range from 13 to 27 inches.

Runoff is high. Water easily soaks into and through the soil, but much less water gets into it than into similar soils on smoother slopes. The short and tall species of grass on this soil provide a moderately thin cover. Trampling and overgrazing by livestock quickly create bare spots that are eroded by wind and water.

Use and management.—This soil is too rough for cultivated crops or hay. It does produce a fair amount of good-quality grass, so it is valuable as pasture. Care must be taken not to damage the grass by overgrazing. Gullies should be filled in and reseeded to prevent them from growing larger.

Rosebud loamy fine sand, gently undulating (1 to 3 percent slopes) (R_F).—This dark-colored, deep soil is in the northern and central parts of the county. It has developed on level to gently rolling uplands, in material that weathered in place. The parent rock is limy sandstone of the Ogallala formation. Individual areas range from a few acres to about 300 acres in size.

Associated with this soil are other members of the Rosebud series, similar but darker colored bodies of Holt soils, and bodies of Anselmo soils, which are lighter colored and have developed on eolian deposits.

Surface drainage carries off the small amount of water not immediately absorbed by this porous soil. Water erosion is not a problem. The soil has rapid internal drainage and a fairly high water-storing capacity; it is not excessively droughty.

Profile description:

- 0 to 10 inches, grayish-brown friable loamy fine sand containing much organic matter; 1- or 2-inch upper part loose and mulchlike but the rest has a weak soft crumb structure; all of layer easily penetrated by air, water, and plant roots; neutral in reaction; nonlimy; 7 to 12 inches thick.
- 10 to 25 inches, slightly lighter colored grayish-brown weakly coherent loamy fine sand; usually not limy; neutral to slightly alkaline; 10 to 20 inches thick.
- 25 to 33 inches, very light grayish-brown friable weakly cloddy loamy fine sand; contains much free carbonate of lime, which is finely divided and well mixed with the soil material; 7 to 12 inches thick.
- 33 inches +, partly weathered light-gray limy sandstone.

The profile is much like that of Rosebud fine sandy loam, gently undulating, but coarser textured and less coherent. The surface soil in the eastern part is darker than anywhere else in the county. Small fragments of partly weathered sandstone may occur in any layer of the soil but are numerous only in the lower part.

Use and management.—Early homesteaders plowed a large part of this soil, but low yields and many crop failures demonstrated that it should be put back into grass. After a few years of tillage the soil

becomes too droughty and unstable to permit profitable cultivation, but it will produce good pasture or hay.

Much of the land originally cultivated was left idle. It grew up to weeds and grass. Some areas were reseeded to tame and native grasses. A small part of the soil is still cultivated, some is grazed, and hay is cut from a part. Corn, rye, and sweetclover are the main crops. Yields are low to very low in normal and dry years, but nearly as good as on the finer textured soils when the rainfall is exceptionally favorable.

This soil is best used for grazing or hay. Desirable areas may be included in cultivated fields of soils that have a finer texture. When the soil is cultivated, do not leave it smooth and bare at any time. Adding organic matter in the form of barnyard manure, green-manure crops, and crop residues will improve soil structure, water-holding capacity, and resistance to erosion. The use of long crop rotations and organic mulches is also desirable.

Rosebud loamy fine sand, undulating (3 to 5 percent slopes) (Rg).—Degree of slope differentiates this soil from Rosebud loamy fine sand, gently undulating. There are only a few areas of this soil, and they occur in the northern and central parts of the county, principally on Pine Ridge and on the Crookston-Springview tableland.

The soil profile does not appreciably differ from that of Rosebud loamy fine sand, gently undulating, but its thickness over bedrock is perhaps less uniform.

Runoff is slight, so few drainage channels have formed. Movement of air and water is rapid in this coarse-textured, loose soil.

Use and management.—This soil is not cultivated, because it is coarse-textured and has unfavorable topography. Grazing is good, but not quite so good as on less sandy soils of the rolling hills. Prevention of overgrazing and grass fires and the reseeded of bare spots are needed.

Rosebud loamy fine sand, gently rolling (5 to 8 percent slopes) (Re).—Hilly, rough, and broken areas on the high tablelands are occupied by this inextensive soil. It is mostly associated with Rough broken land, Canyon soil material. Some bodies are north of the Niobrara River near the eastern boundary of the county, and others are southwest of Crookston. The soil occurs on high hills and ridges, whereas Rough broken land, Canyon soil material, is on escarpments, or valley sides, that lead down to the bottom along the Niobrara River. This soil is more shallow than the gently undulating and undulating phases of Rosebud loamy fine sand.

Though this soil absorbs water rapidly, runoff is excessive and forms small gullies. Internal drainage is good above the sandstone beds.

The surface soil averages about 7 inches in thickness. Partly weathered soft sandstone beds lie 18 to 30 inches below the surface. The most shallow areas are usually on the crests and shoulders of hills. Sandstone crops out in a few places, and small sandstone fragments are rather numerous throughout the entire soil.

Use and management.—This soil is used only for pasture. It has a slightly lower carrying capacity than Rosebud fine sandy loam,

gently rolling. More careful control of grazing is required than on the gently rolling phase of Rosebud fine sandy loam or the undulating phase of Rosebud loamy fine sand.

Rough broken land, Canyon soil material (20 to 40 percent slopes) (RH).—This miscellaneous land type occurs in strips, rarely more than a mile wide, that run almost continuously across the county on both sides of the Niobrara River. It covers a relatively large area and includes the physiographic division known as the Niobrara River breaks. The areas are steep or very steep and have formed on soft limy Tertiary sandstone. Narrow intermittent drainageways, gullies, sharp ridges, knolls, and bluffs characterize the landscape (figs. 3 and 14, A).

The slope of this land type is so great that no soil can develop. The rate of soil erosion equals or exceeds the rate at which the sandstone weathers.

Runoff is very rapid. In some areas nearly all the water runs off during heavy rains. The land absorbs only a little water, and that rather slowly. Water erosion is severe during nearly every rain. When the surface is not moist, wind erosion is active at all times.

Most of the land has an open stand of trees with an undercover of grasses. Western yellow pine predominates and there are some cedar, bur oak, and elm trees. Some of the trees are used for fence posts and fuel. Side oats grama and little bluestem predominate among the grasses.

A few patches included with Rough broken land have Canyon-like soils that have developed to depths of 12 to 15 inches. Most of this land type, however, has either bare rock exposures or a thin, light-colored accumulation of sand at the surface.

The term "Canyon soil material" is attached to the name of this land type because the sandstone from which it has formed is the same as that from which the parent material of the Canyon soil was derived. If the relief were a little less, Canyon soil would no doubt develop in areas mapped as Rough broken land, Canyon soil material.

Use and management.—This land type is used for grazing. It is too steep and cut up by erosion for cultivation, even if the soils were good. The farmer or rancher can do little to protect this land other than to control grazing and prevent grass fires. He can increase the amount of forage by following the practices set forth in the section on range management.

Rough broken land, sand material (20 to 35 percent slopes) (Rk).—This type of land occurs in strips $\frac{1}{3}$ to $\frac{1}{4}$ mile wide and several miles long on either side of Niobrara River in the western part of the county. Though similar in appearance to Rough broken land, Canyon soil material, the relief is not quite so great. The surface is loose sand, instead of sandstone bedrock covered with scattered small areas of soil. The land was formed when drifting sand from nearby dune areas partly covered ridges, knobs, and gullies that had already been carved out of sandstone.

Runoff is less rapid and erosion is not so severe as on Rough broken land, Canyon soil material, because the porous sands at the surface absorb water very rapidly.

The sand has been deposited so recently that no true soil has developed, except in small protected patches with a better than average grass cover. Even in these places, only the top few inches of sand are darkened with organic matter. This land has a thin cover of tall grasses and a few shrubs and trees.

Use and management.—None of this land is suitable for cultivation, and some is too steep and broken even for pasture. The carrying capacity on grazed areas averages lower than on Rough broken land, Canyon soil material. Each year some wood is cut for fuel and fence posts. The best management for this land is to prevent overgrazing and grass fires.

Sarpy loamy fine sand (0 to 1 percent slopes) (SA).—This light-colored sandy alluvial soil occurs as narrow strips, most of them 40 acres or smaller in extent, along the Niobrara River or the large streams. It has formed on sands recently brought down and deposited by streams on their flood plains. It is composed of the same materials as Riverwash.

The bottom lands are usually level. In places, old stream channels, low mounds, and shallow depressions mark their surfaces. Soils of several other series occur in association with the Sarpy. Among these, Elsmere loamy fine sand is darker and poorer drained, Dwyer loamy fine sand is light colored and lies on low, wind-reworked sandy terraces, and Muck occurs in marshy places.

Surface drainage is fair to poor. The land is occasionally flooded, but surplus water drains off or is absorbed by the porous sands soon after the streams subside. The water table, within 10 feet of the surface in most places, fluctuates with the stages of the adjacent river. In wet seasons the water table is high enough to produce temporary marshes in some of the low spots. Willow, cedar, and cottonwood trees and tall grasses grow on this soil.

Profile description:

- 0 to 5 inches, grayish-brown loose loamy fine sand; contains only a little organic matter; easily penetrated by air, water, and plant roots; medium water-holding capacity; neutral in reaction; 4 to 6 inches thick.
- 5 inches +, pale-brown, light grayish-brown, or light-gray incoherent loamy fine sand with many dark-brown stains and streaks; very low in organic matter; easily penetrated by roots, air and water; neutral to slightly alkaline; a few to many feet thick.

This soil is generally low in free carbonate of lime. If any carbonate exists, it is usually below a depth of 30 inches. In some places, the lower part of the soil is kept constantly moist by the high water table.

Use and management.—This soil is not good for cultivated crops because it is loose, sandy, and sometimes flooded. A few patches are used for corn, rye, and sweetclover, but the yields are low. Most of the land is in pasture or wooded. Trees are cut for fuel and fence posts, but the grazing capacity is only fair.

Sowing of tame grasses on the better drained, higher areas will improve the quality and increase the quantity of feed in the pastures. Artificial drainage would not be practical in most places. The prevention of fire and overgrazing will permit the soil to develop greater stability and productivity.

Simeon loamy fine sand (0 to 2 percent slopes) (S_B).—This young, light-colored soil is on level to undulating sandy and gravelly terraces on both sides of the Niobrara River. The terraces, or benches, stand 50 to 75 feet high above the flood plain.

Water that runs onto this soil is rapidly absorbed; consequently, there are few surface drainage channels. Water movement within the soil is rapid, and the water-storage capacity is low. Patches of this soil have a sparse growth of tall grasses.

Profile description:

- 0 to 6 inches, grayish-brown loose loamy fine sand; layer contains enough organic matter to be slightly darker colored than the rest of the soil; slightly to medium acid; 3 to 10 inches thick.
- 6 to 14 inches, somewhat lighter colored loose loamy fine sand with only faint traces of organic matter; slightly acid; 6 to 10 inches thick.
- 14 inches +, light grayish-brown loose loamy fine sand; slightly acid to neutral; a few to many feet thick.

Waterworn pebbles are scattered throughout the profile. Some of these pebbles are coated with lime carbonate, but the sand contains no free lime carbonate. The profile of this soil is difficult to differentiate from that of Valentine loamy fine sand, undulating; but this soil and others of the Simeon series occur on water-laid stratified sand, whereas the Valentine soils are on windblown deposits. Simeon soils generally occur on smoother topography than Valentine soils.

The surfaces of some of the benches on which this soil would normally occur have been reworked by wind. It is on these reworked benches that the complex of Valentine-Simeon loamy fine sands, undulating, occurs in an intricate pattern. On the upland side this Simeon soil is adjoined by Valentine fine sand, undulating, or the units of Dune sand, stabilized. At some places on the high benches, dark-colored soils, members of the Cody series, appear. A few patches of Simeon sand were included with Simeon loamy fine sand.

Use and management.—If Simeon loamy fine sand is not protected by a plant cover, it drifts badly with the wind. Its droughtiness also makes it unsuitable for cultivation. The soil is used for pasture and hay. The bare areas that develop from overgrazing or other causes should be reseeded. The soil should not be plowed.

Tripp fine sandy loam (0 to 2 percent slopes) (T_A).—This extensive soil is located along Minnechaduzza Creek and the Niobrara River, northwest of Crookston. It is a deep dark loamy soil situated on stream terraces that are nearly level and sloping. The terraces lie above the flood plain of the present streams. Before streams cut down to their present levels, these terraces were flood plains on which rivers and creeks deposited sand, silt, and clay. This loamy material deposited long ago on these terraces is the parent material of Tripp fine sandy loam. The mapping units of Dune sand, stabilized, and soils of the Valentine series occur on the upland side of these terraces. Light-colored Dwyer loamy fine sand may occupy parts of the same terraces, whereas adjoining flood plains commonly contain Elsmere and Loup soils.

Both surface and internal drainage of Tripp fine sandy loam are good but not excessive. The soil lies 20 to 50 feet above the bottom

lands along the streams and has enough slope to carry off excess water. Virgin areas have a good cover of western wheatgrass and big bluestem.

Profile description:

- 0 to 14 inches, grayish-brown friable fine sandy loam of fine crumb structure; contains abundant organic matter; high water-holding capacity; easily penetrated by plant roots, air, and water; neutral in reaction; 10 to 16 inches thick.
- 14 to 24 inches, light grayish-brown friable weak cloddy loam or heavy fine sandy loam; neutral in reaction; 8 to 14 inches thick.
- 24 to 34 inches, very light grayish-brown or nearly white friable massive loam or fine sandy loam; contains finely divided free lime carbonate; 8 to 14 inches thick.
- 34 inches +, very light grayish-brown slightly limy coherent fine sandy loam; 10 to 80 feet or more thick.

In a few places there was no free carbonate of lime in any layer. As mapped in this county, this soil includes a few small patches of Tripp loam and Tripp very fine sandy loam.

Use and management.—This highly fertile soil erodes little when cultivated. It is not droughty and is easy to till. It lies where runoff and seepage from higher land furnish some extra moisture, which is readily absorbed and stored. For these reasons this is one of the best soils for crops in the county.

Practically all areas are cultivated, and the crops commonly grown in this region yield well. More corn is grown than any other crop. Wheat, rye, barley, and alfalfa rank next in order of acreage.

Farmers will continue to crop this strong soil; therefore, attention should be given to replacing organic matter and strengthening soil structure. Adding manure, plowing under green-manure crops, and using a planned system of crop rotation would insure high productivity.

Valentine fine sand, undulating (2 to 8 percent slopes) (V_A).—This light-colored very sandy soil is the third most extensive in the county. It is exceeded in total area only by Dune sand, stabilized, rolling, and Dune sand, stabilized, hilly. It has formed in wind deposits on nearly level to rolling uplands (fig. 15). Some areas are on level, gently sloping, or undulating land, whereas others are on rounded hummocks and ridges 5 to 20 feet high that are separated by depressions. This soil occurs so extensively there is hardly another soil not somewhere associated with it. It appears around the edges of tablelands where Rosebud, Holt, and Anselmo soils are found, and also borders strips of Loup and Elsmere soils in basins and valleys.

The sand comprising this soil has the same origin as that in the sand dunes (fig. 16). It was blown out of river bottoms and from areas of sandstone and sandy soils and was redeposited; it then drifted and piled up. Any fine material, such as silt and clay, that may have been in the sandstone or eroded soil was separated and deposited farther away from the source.

There are no surface drainage channels because all water falling on this soil is absorbed almost immediately. Internal drainage is excessively rapid, so the soil is droughty.

Tall grasses provide a sparse cover. The dominant species are sand dropseed, big and little bluestems, and needlegrasses.



FIGURE 15.—Aberdeen-Angus cattle grazing in an area of Valentine fine sand southwest of Valentine. Dune sand, stabilized, hilly, is in the background.

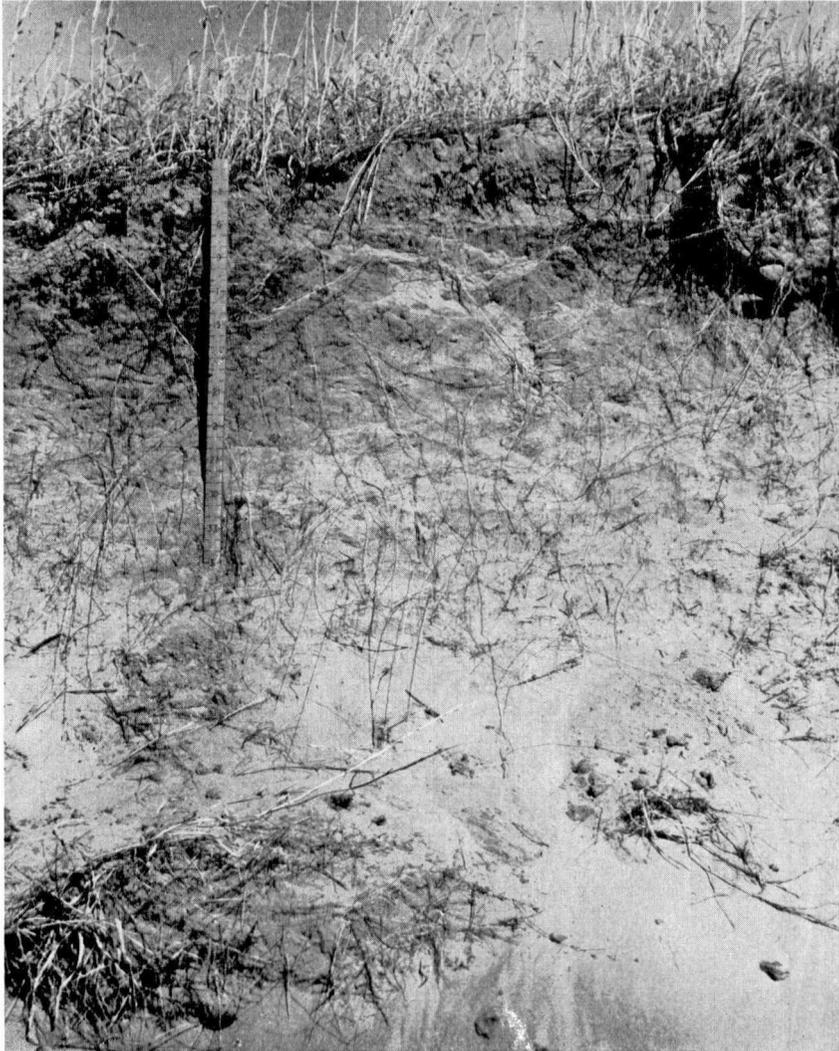


FIGURE 16.—Profile of Valentine fine sand a few miles southwest of Valentine.

Profile description:

- 0 to 4 inches, grayish-brown loose or slightly coherent fine sand containing little organic matter; easily penetrated by water, air, and plant roots; low water-holding capacity; neutral in reaction; 2 to 8 inches thick.
- 4 to 12 inches, light grayish-brown loose fine sand with little or no organic matter; 6 to 12 inches thick.
- 12 inches +, loose fine sand, slightly lighter colored than horizon above; 3 to many feet thick.

There is no free carbonate of lime in this soil.

Use and management.—This soil has little value for cultivated crops. It is droughty and blows severely when the grass cover is destroyed.

Grass is cut for hay on a few areas in sandhill valleys; the remaining areas are used for pasture. This soil is more valuable than the mapping units of Dune sand, stabilized, for both hay and pasture.

Blowouts develop quickly at places where the grass is killed by overgrazing and trampling. Such bare spots may spread and eventually involve many acres. It is therefore important to prevent overgrazing and to protect the grass cover around water tanks and wells. Blowouts that develop in spite of these precautions may be fenced, covered with straw, manure, or brush, and reseeded to grass. The necessity of preventing range fires is generally recognized, but some fires still occur.

Valentine loamy fine sand, undulating (2 to 8 percent slopes) (VB).—This soil occurs as scattered patches and strips throughout the county. It contains a little fine material, so it holds together better than Valentine fine sand, undulating; also, its dark surface layer is a little thicker.

This soil is associated with the same soils as Valentine fine sand, undulating, and occurs on the same kind of topography. Though it looks like Dwyer loamy fine sand, it lacks free lime carbonate.

Surface drainage channels are limited; runoff is scanty and lacking entirely in many areas. The soil absorbs water readily but can store only a little within reach of plant roots. The grass cover is better than that on Valentine fine sand, undulating. The same kinds of grasses dominate when the soil is under climax vegetation.

Profile description:

- 0 to 8 inches, grayish-brown loamy fine sand of soft weak crumb structure; contains a small to medium amount of organic matter; easily penetrated by air, water, and roots; moderate water-storage capacity; neutral in reaction; 6 to 12 inches thick.
- 8 to 16 inches, light grayish-brown loose fine sand or loamy fine sand; contains little organic matter; neutral in reaction; 6 to 12 inches thick.
- 16 inches +, loose fine sand; slightly lighter colored than layer above; 3 to many feet thick.

This soil contains no free lime carbonate. The wind has removed the topsoil in some spots and cultivated fields often show a surface pattern of light and dark patches because of wind erosion.

Some small areas of Thurman loamy fine sand and Thurman fine sandy loam, soils not mapped separately in this county, occur within areas of this soil in the eastern part of the county. If these included areas were larger, they would be shown separately on the map. Since they are not extensive and resemble this soil they were included. Thurman soils have dark grayish-brown surface layers (darker than the Valentine) about 7 inches thick; the lower horizons are essentially the same as those of the Valentine soils.

Use and management.—Valentine loamy fine sand, undulating, is droughty and low in fertility but it is the only soil that can be cropped with any success on some ranches. About half its total area in this county therefore is under cultivation. Corn and rye are the principal crops. Some alfalfa is grown, mainly where the water table is fairly high.

The best use of this soil is for grazing and hay. Overgrazing and prairie fires can be prevented. After the soil has been cultivated, special care should be taken to prevent blowing that will damage crops and remove soil material.

Valentine-Rosebud loamy fine sands, undulating (1 to 6 percent slopes) (Vc).—A number of small areas of this complex occur on the Crookston-Springview tableland, northeast of Valentine. The complex consists of small patches of light-colored and dark-colored soils arranged in an intricate pattern on gently rolling and hummocky high uplands. The underlying bedrock is Ogallala sandstone of Tertiary age.

One of the soils—Rosebud loamy fine sand—has developed in material weathered in place from the underlying sandstone. The other soil—Valentine loamy fine sand—is forming in wind-deposited sands, which probably were derived from nearby soils and sandstone outcrops. At a few places thin soils, more like the Canyon than the Rosebud, occur on steeper slopes. Individual areas of all these kinds of soils are too small to be considered separately, either in mapping or from the standpoint of agricultural use. They are therefore mapped together as a soil complex.

The drainage and vegetation for this complex vary according to the soil type. For information on these characteristics, and for profile descriptions, see discussions of the component soils (pp. 62, 69).

Use and management.—This complex of soils is not suited to farming because it is droughty, tends to erode, has unfavorable topography, and is made up of small areas of different kinds of soil. Some of it is used for hay, but most for pasture. The range management practices apply to the complex as well as to individual soils.

Valentine-Simeon loamy fine sands, undulating (1 to 6 percent slopes) (Vd).—This complex occurs along the sides of Niobrara River valley, mostly in the eastern part of the county. The two soils composing this complex are little different in appearance. Both have thin dark surface layers underlain by light-colored nonlimy loose fine sand. Simeon loamy fine sand occupies the more or less stratified alluvial deposits on rather smooth relief. Valentine loamy fine sand is on wind deposits and is hummocky or rolling.

The soils of the high benches in this complex normally occur in distinct bodies that can be shown separately on the map as mapping units of Simeon loamy fine sand, Valentine loamy fine sand, Valentine fine sand, or Cody fine sandy loam. This complex is mapped where wind has reworked the surfaces of these benches to produce a rolling to hummocky relief. As a result of wind action, the soils that normally can be mapped separately are in small patches and are therefore placed in this complex.

Surface drainage on the high benches is usually lacking because rain is absorbed as rapidly as it falls. Internal drainage is excessive, and the soils are droughty. The native vegetation consists of a rather sparse cover of tall grasses, including switchgrass, sand reedgrass, little bluestem, and sand bluestem. For more detailed descriptions of the component soils see discussions on pp. 44, 65, 66, 69.

Use and management.—The soils of this complex are too droughty and eroded for cultivation. More land is used for pasture than hay. Pastures have about the same carrying capacity as those on Simeon loamy fine sand.

Range management suggested for Valentine loamy fine sand, undulating, and Simeon loamy fine sand also apply to the soils of this complex.

AGRICULTURE

Some of the early settlers plowed sandy soils that should have been left in pasture and planted them to corn, wheat, and oats. On the uplands the grains were so damaged by drought, insects, and shifting sand that yields scarcely warranted the expense and labor of harvesting. In the low wet valleys in the sandhill region, yields were also low. The soils were fertile but did not have satisfactory drainage.

The settlers soon learned that only the finer textured, more stable soils of the uplands and the better drained soils of the lowlands were suitable for cultivation. They confined their plantings to these favorable areas and allowed the sandy and poorly drained soils to go back to grass. They concentrated on livestock raising because a large part of their land was suitable only for pasture and wild hay.

The agriculture of the county, now as in the past, centers about the production and sale of livestock, principally beef cattle. The hay and grain grown are marketed indirectly by feeding to livestock. Livestock is the principal source of cash income. In 1949 the total value of livestock and livestock products marketed was more than five times the value of all crops.

LIVESTOCK

Table 6 shows the number of livestock on farms and ranches of Cherry County in stated census years. Cattle far outnumber other livestock, but a few hogs, sheep, and chickens are raised, as well as saddle stock and work horses.

Cattle.—The cattle are mainly high quality, locally raised beef animals. Grade Herefords predominate, though some Aberdeen Angus are also raised (fig. 17). Nearly all the ranchers use purebred bulls, and some have purebred herds. Many cull their herds annually and sell old and inferior animals.

Dairy cattle are of minor commercial importance. Nearly all farmers and ranchers keep a few milk cows of mixed breeds. Surplus cream and butter are sold at local markets. The pure dairy breeds used are Shorthorn, Holstein, Jersey, and Guernsey.

Ranchers usually run beef cattle on the open range the entire year. Nearly all the range is fenced, and most of it is privately owned.

TABLE 6.—*Number of livestock and poultry on farms in Cherry County, Nebr., in stated years*

Livestock	1930	1940	1950
Cattle.....	252,396	¹ 205,060	268,456
Swine.....	30,850	² 8,270	7,196
Horses.....	24,647	¹ 17,404	9,642
Mules.....	1,178	¹ 137	174
Sheep.....	5,908	³ 6,647	884
Chickens.....	¹ 61,158	² 53,731	² 40,331
Other poultry.....	⁴ 22,378	² 5,289	⁵ 2,425

¹ Over 3 months old.

² Over 4 months old.

³ Over 6 months old.

⁴ Turkeys, ducks, and geese raised, 1929.

⁵ Turkeys and ducks raised, 1949.



FIGURE 17.—Hereford cattle in the sandhills southeast of Valentine. Valentine fine sand in foreground; Gannett soil in basin in left background; and Dune sand, stabilized, in far background.

School lands and lands taken over by the county for tax delinquency are leased, normally to the individuals owning adjoining property.

In winter, hay, cottonseed cake, or both, are fed to supplement the range forage. From 1 to 2 tons of hay per animal is fed in winter, the amount depending on the severity of the weather. When cake is fed, the rate is about 1 pound per head per day. During cold and snowy weather the amount is increased.

Most ranchmen market their cattle as 2- or 3-year olds or yearlings. Some sell spring calves in the fall to feeders, who fatten them for sale as "baby beef." Other operators ship in yearlings for summer grazing and sell them in fall. A yearling animal will gain about 200 pounds between May 15 and November 15. Few animals are fattened in the county because of the scarcity of locally grown corn.

The ranchers are aware of the need for conserving their native grass pastures. Most of them are protecting grass and soil by practicing controlled grazing. Overgrazing is most common close to windmills and watertanks and ponds. The range has not always been kept in good condition, mainly because the ranchers do not know just how much grass their range will produce. They estimate that 10 to 18 acres of range will carry a cow for a year if conditions are normal. This kind of estimate does not take into account differences in range sites and frequently leads to overgrazing and poor quality pastures. By considering the differences in range sites and carefully controlling grazing, many ranchers could produce one-half to one-third more beef from their pastures (see *Range Management*, p. 33).

Sheep.—Raising of sheep is of minor importance. Few if any purebred animals are kept. Most of the sheep are western quarter-bloods. Sheep raising is curtailed because the animals damage the pastures by grazing too close and because they are defenseless against coyotes.

Hogs.—A few hogs are kept on nearly all the farms where corn or alfalfa is grown. Few farmers have large herds because most of the grain grown is needed to feed cattle. In the sandhills, where corn is scarce, the ranchers do not raise enough pork to meet their own needs. Most of the hogs are of the Hampshire, Duroc-Jersey, or Poland China breeds. There are few purebred herds, but all the animals are of good quality.

Poultry.—Most ranchers and farmers keep chickens. Local demand for poultry is good, and the flocks receive considerable attention. Flocks range from 50 to several hundred birds. Plymouth Rock, Rhode Island Red, and Leghorn are the main breeds. Some of the farmers and ranchers maintain their flocks by raising baby chicks bought from commercial hatcheries.

Some ranchers raise several hundred turkeys every year for the fall and winter markets. Turkeys are fed some milk and grain but subsist largely on insects. They do well in the sandhills, provided they are protected from coyotes.

CROPS

Dryland diversified farming is practiced almost exclusively in crop production. The main cultivated crops are corn, oats, and rye. Small

acres of wheat, barley, potatoes, alfalfa, clover, cane, Sudangrass, millet, and grain sorghums are also grown.

The soils used for farming are mainly fine sandy loams and loamy fine sands of the Rosebud, Holt, Goshen, Anselmo, Tripp, and Cody series. See the section, Major Suitability Classes, for a rating of soils according to their relative suitability for agriculture.

Crops on the fine sandy loams resist droughts well. The loamy fine sands must be protected from blowing. All the soils farmed are productive enough to produce good yields without commercial fertilizer, provided moisture is sufficient.

Corn.—This crop leads all other cultivated crops in acreage. In 1949 about 54 percent of the land used for cultivated crops was in corn. Adapted varieties of hybrid seed are used by all farmers who plant corn. The land is disked and harrowed before listing. Planting is normally done the last week in May or the first in June. In July and August, hot winds and 3- to 5-week droughts are the rule rather than the exception. Yields vary a great deal from year to year, depending on the time and amount of rainfall. Average yields are low. Most of the corn is fed to beef cattle in winter.

Oats.—Among the grain crops, oats rank second to corn. Only a few of the soils are well suited to this crop, but it is grown because feed for work horses and young stock is needed. Much of the acreage in oats is planted to early maturing varieties. Land for oats is generally disked and seeded with a press drill late in March or early in April. Early seeding usually brings the highest yields. Oats mature in July and are cut with a binder or combine. A few farmers cut the oats for hay, especially if the stand is poor and weedy. During winter, cattle and horses are fed oat straw or oat hay, which are almost as nutritious as prairie hay.

Rye.—This crop is now grown more extensively than wheat. The crop is planted in the same way as oats, but usually in fall. Fall planting enables the crop to make a good growth before heavy frosts come. The rye remains dormant during winter, resumes growth early in spring, and matures in July. The crop is harvested like oats. Some rye is planted as temporary fall or spring pasture.

Barley and wheat.—These crops are grown only in a few fields on the finer textured soils. All the barley and most of the wheat are planted in spring in the same way as oats. Practically all the wheat is sold, but the barley is fed on the farm.

Hay.—The acreage of tame hay, though smaller than that of wild hay, has greatly increased since 1919. The increase results largely from the demand for hay of better quality than that provided by the rank-growing wild grasses harvested in moist places. Most of the tame hay is mixed timothy and clover. A few farmers have pure stands of red, white, and alsike clovers, sweetclover, or alfalfa.

Alfalfa is grown mainly in small scattered fields on the terraces, in the better drained parts of the bottom lands along the Niobrara River, and along some of the larger creeks. The varieties grown are among the most hardy that can be obtained. Common, Grimm, and Cossack, all of which are resistant to winterkilling, are among the varieties used.

Thorough seedbed preparation is important in obtaining a good stand of alfalfa. In most places, early plowing is followed by disking, by harrowing, and by rolling to compact the soil.

About 15 pounds of good seed per acre is planted by broadcasting or drilling. When the seed is broadcast, it is covered by a harrow. A stand of alfalfa is normally left as long as it yields profitably. The crop is cut two or three times during the growing season. Some farmers pasture hogs in the alfalfa fields during part of the summer.

The meadows of wild hay can be improved by overseeding with tame grasses and legumes. Some ranchers have improved the quality and yield of hay by sowing timothy and clover among the wild grasses. Studies of prairie hay in north-central Nebraska made by research workers of the Nebraska Agricultural Station have shown that seeding of legumes increases the protein content of hay.⁷ A report on their studies states:

"In one instance medium red clover increased the yield of a meadow 143.0 percent and the total amount of protein in the hay 279.7 percent; in a second meadow an increase in yield of 34.0 percent brought about an increase of 77.4 percent in the amount of protein. Mammoth red clover in two meadows increased the yields of hay 243 and 38.9 percent, and of protein 407.6 and 112.8 percent respectively. Alsike, sweet, and white clover brought about similar increases in the yield of protein."

Hay harvest requires 2 to 8 weeks, depending on the weather, the quantity of tame hay in the meadows, and the availability of labor. Haying ordinarily begins the latter part of July in the meadows that contain a high proportion of tame grasses and ends some time in September in the meadows composed largely of native grass. Practically all the hay is stacked in the field. Some is later baled and hauled to Wood Lake, Irwin, and other local points for shipment. The un-baled hay is fed to cattle and horses during winter.

TENURE AND SIZE OF FARMS

In 1950, 80.1 percent of the land in this county was held by full owners or part owners; tenants accounted for 17.6 percent; and managers, 2.3 percent. Part owners usually have some land of their own and rent additional acreage.

The share-rental type of tenancy is dominant. The tenant furnishes all implements, feed and livestock, seed, and labor and takes care of the buildings and farm. He receives two-thirds to three-fifths of the crop. Pasture is generally rented for cash by the square mile. The owner normally supplies fences and wells for the pasture. Some cattle are pastured by the month or season at the rate of 35 to 75 cents a head. The Forest Service charges 18 cents a head on the Nebraska National Forest, which occupies 115,843 acres. This National Forest is used chiefly for grazing cattle; only a small area has been planted to trees. On the forest reserve the renter furnishes wells, fences, and upkeep of both, and looks after his own cattle.

About 70 percent of the farms were more than 1,000 acres in size in 1950. Only 30 farms had less than 100 acres. The average size of ranches has been increasing steadily. Many of the small ranchers have had financial reverses brought about by unsteadiness of the cattle market and difficulty in obtaining credit.

⁷ KEIM, F. D., FROLIK, A. L., and BEADLE, G. W. STUDIES OF PRAIRIE HAY IN NORTH CENTRAL NEBRASKA. Nebr. Agr. Expt. Sta. Bul. 60, 54 pp., illus. 1932.



FIGURE 18.—Farm buildings in area of Rosebud, Holt, and Dawes soils north of Crookston.

FARM LABOR, EQUIPMENT, AND CONVENIENCES

Only a few farmers hire help the year around. Much of the work is done by exchanging labor with the neighbors. Many men are hired during the haying season. The labor supply is usually drawn from local sources.

Many tractors are used in cultivating land for crops and in harvesting hay. The number of horses has decreased almost half since 1940, mainly because of mechanization. In 1950 the 866 farms in the county reported 1,397 tractors, 823 trucks, and 1,054 automobiles.

Used on the better farming land are gang and sulky plows, disks, harrows, drills, listers, corn planters, potato diggers, grain binders, and other necessary harvesting and planting equipment. Mowers, rakes, buckrakes powered by old stripped-down automobiles, hay sleds, and balers are common. Only the more expensive implements are sheltered.

Farm buildings are adequate in size and number; they are painted and kept in good repair (fig. 18). Barns and other outbuildings are usually large enough to store all the crops except hay, which is stacked in the field. Many of the rural homes have modern conveniences, including modern heating plants, running water, bathtubs, and washing machines. In 1950, 508 rural homes were equipped with private electric plants and 45 had electricity from a power line. Telephones serve the greater part of the county, but many of the lines are privately maintained and not so dependable as in more thickly populated areas. The larger ranches in the sandhills have more improvements than those in other parts of the county.

Most of the farms and ranches are fenced, usually with barbed wire. The larger ranches have board corrals, branding chutes, dipping vats, and other labor-saving devices needed in raising livestock.

DRAINAGE AND IRRIGATION

Drainage in this county consists chiefly of removing or diverting water from poorly drained basins, lakes, and marshes so they can be used for growing mixed native and tame grasses for hay. Most of the artificial drainage is done in the western and northwestern parts, along the headwaters of Dry, Leander, and Gordon Creeks and along the Middle Loup River. The larger drainage districts are the Horseshoe Lake and the Coffee Lake drainage and irrigation districts.

Draining lowers the water table only in the immediate vicinity of the ditches. Although well records are few, it is the opinion of careful observers that surface drainage has little or no effect elsewhere. The height of the water table varies with the amount of rainwater each year and over periods of years. During cycles of low rainfall the water table generally drops about 6 feet. According to the State water survey, the water table in the well north of Kilgore fluctuated 4.15 feet in the period 1935-39. The well at Eli showed a fluctuation of 3.42 feet in the same period, and the one near United States Highway No. 20, just south of Irwin, showed a fluctuation of 2.43 feet.

In many places in the sandhills short lateral ditches have been dug to connect one lake, pond, or marsh with another, or to drain onto a

meadow below. Many of these ditches are merely high-water drains; they were built to drain water only when the basins would otherwise fill and overflow onto the surrounding hay meadows. A few short ditches have been dug to carry water from marshes to loose, porous, sandy areas where it can seep away slowly.

According to the 1950 Federal census, there were 1,323 acres of irrigated cropland in the county. Practically all of this was in hay meadows. Most of the irrigated land is in the northwestern and central parts of the county, along Bear and Gordon Creeks and the headwaters of the Loup River. Here, several ranchers with water rights have irrigated their hay meadows. This is done by damming the creeks, building lateral ditches toward the outer edges of the valleys, and allowing the water to spread over the hay meadows. Before haying, the dams are opened, the water drains off the fields, and the meadows become dry enough for harvesting. After haying, if necessary, the dams are closed again. Gardens are irrigated from springs in a few places along the Niobrara River.

ADDITIONAL FACTS ABOUT CHERRY COUNTY

TRANSPORTATION AND MARKETS

Rail facilities are not well distributed. The main line of the Chicago and Northwestern Railroad extends east-west across the northern part of the county and furnishes good shipping connections for the towns through which it passes. Ranches in the southern part of the county are closer to the Chicago, Burlington, and Quincy Railroad Company line in the northern parts of Grant, Hooker, Thomas, and Blaine Counties.

All the improved roads are in the northern half of the county. One paved east-west road, United States Highway No. 20, parallels the Chicago and Northwestern Railroad through Wood Lake, Valentine, Cody, and Merriman. The only north-south paved road is United States Highway No. 83, in the eastern part. A few partly graveled roads lead into South Dakota.

Most roads on the tablelands follow section lines, but in the rougher parts they conform to the topography. They are generally in fair repair.

Except in certain favored localities, it is impractical to establish roads on section lines in the sandhills. The terrain is uneven and extremely sandy, and the amount of traffic is too small. Most sandhill roads are simply trails that follow conveniently located valleys. Travel over the loose steep dune sands that separate the valleys is laborious. The more important sandhill roads, including mail routes, cross fences through auto gaps, but along most other roads there are only gates in the fences.

Minor farm and ranch products—chiefly milk, eggs, and poultry—are marketed locally. Beef cattle, the principal source of income, are shipped to outside markets, mostly to Omaha, Nebr., Sioux City, S. Dak., or to eastern feeders.

The establishments for processing or handling agricultural products are a flour mill and creamery, both at Valentine, and grain elevators in several towns along the railroad.

SCHOOLS AND SOCIAL FACILITIES

The school system is adjusted to the large size of the county and its small population. Six districts offer a 4-year high school course, and seven others a 2-year high school course. A number of grade schools are distributed throughout the county. In some districts a school may stay closed for years at a time because there are not enough children of school age to make operation of a school economical. The ranchers in such districts normally send the few children of school age to another district and pay their tuition. Many ranches are a great distance from any school.

There are a few public libraries in towns in the northern part of the county. All the principal towns support one or more churches, and there are several rural churches in the county.

WATER SUPPLY

Water is easily obtained from wells in most parts of the county. In the northeast the water is somewhat hard, but in most other sections it is of good quality. Well water is difficult to obtain in the Niobrara River breaks, where Brule clay outcrops. On the Crookston-Springview tableland, well water is commonly reached at 80 feet, though some wells go as deep as 125 feet. In the sandhills region good well water is usually reached at depths of 29 to 90 feet.

There are a few flowing wells 30 to 800 feet deep. The water-bearing formation for flowing wells are Pleistocene and Tertiary sandstones, sands, and gravels. The shallower wells flow only during winter.

In the eastern part of the county, in the Niobrara River valley, springs and seeps occur along most of the streams at or near the contact of the Brule clay with the higher lying formations. Elsewhere, springs and seeps occur in and near depressional areas that lie below the general water level.

WILDLIFE

This county supports a great variety of big game animals, fish, waterfowl, upland birds, small fur bearers, rodents, and fish. Ducks, herons, coots, terns, cranes, killdeers, and sandpipers live in and along the lakes and marshes. The uplands are the habitat of the horned lark, lark sparrow, meadowlark, and the upland game birds—ring-necked pheasant, prairie sharp-tailed grouse, greater prairie chicken, eastern bobwhite, and mourning dove.

The sandhill lakes and marshes have thousands of muskrats, which are trapped for their pelts. Mink, skunk, raccoon, and beaver also live along the streams and lakes. Rabbits, ground squirrels, mice, and many other small mammals abound on the uplands.

Deer run in the rough broken land along the Niobrara River, antelope prefer the open prairie, and coyotes thrive almost everywhere.

The population of birds and animals on the uplands has increased since prairie fires have become less frequent and severe. Farmers have become more careful, grass does not grow so high because livestock keep it cropped, and improved communications allow people to fight fires more quickly.

The Fort Niobrara Game Refuge, the Valentine Lakes Migratory Waterfowl Refuge, and a State fish hatchery are located in the county. The game refuge, covering 18,960 acres, is used to preserve big game, chiefly buffalo, elk, and deer. The waterfowl refuge, occupying 74,240 acres, is used for the protection and propagation of migratory game birds. The fish hatchery, covering 480 acres, supplies small fish for stocking streams and lakes in Nebraska.

Perch, crappies, bluegills, bullheads, catfish, and trout live in the lakes and streams. The headwaters and many small tributaries of the Snake, North Loup, and Middle Loup Rivers have water suitable for trout. The North and Middle Loup Rivers are well stocked with catfish. The lakes amply fed by seeps or springs are best for perch, crappies, bluegills, and bullheads. It is necessary to restock the lakes whenever dry cycles occur, as the water level drops so low that the fish are killed.

GENESIS, CLASSIFICATION, AND MORPHOLOGY OF SOILS

FACTORS OF SOIL FORMATION

Soil is formed through the interaction of climate, living organisms, parent materials, topography, and time. The nature of the soil at any point on the earth depends upon the combination of the five factors at that point. All five of these factors come into play in the genesis of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. But it is the past combination of the five major factors that is of first importance in determining the present nature of every soil. The five factors are next discussed as they relate to the soils of Cherry County.

PARENT MATERIAL

Cherry County is in north-central Nebraska, in the northern part of the High Plains section of the Great Plains province. Most of it lies within the region known as the sandhills of Nebraska.

Before Tertiary time, the part of the North American continent that now includes Cherry County was covered several different times by ocean waters in which great thicknesses of sandstone, shale, and limestone were deposited. The mineral material from which the soils of the county have developed were derived almost entirely from limy Tertiary sandstone (Ogallala group) that has been reworked by wind and water. The small areas not derived in this way are on tablelands (Pine Ridge and the Crookston-Springview plain) where most of the soils have formed from material derived from Ogallala sandstone that weathered in place (fig. 10).

In the sandhills region the parent materials of the soils are eolian sands, or locally, sandy alluvium along flood plains and terraces (fig. 9). In some places, this alluvium has been whipped about by wind. Small patches of alluvial-colluvial material occur at the bases of hills and ridges.

The sands of this county and general region are mostly arkosic, rather than quartzitic. The sands derived from sandstone that weathered in place are calcareous. In contrast, the eolian and alluvial sands are generally noncalcareous or only slightly calcareous.

CLIMATE

This county has a microthermal subhumid to semiarid climate characterized by extremes of summer and winter temperatures and deficiency of moisture in all seasons. At Valentine, in the northeastern part of the county, the average annual precipitation is 18.2 inches, the average annual temperature is 47.9° F., and the average number of days without killing frost is 151. At Gordon, Sheridan County, a few miles west of the Cherry County line, the average annual temperature is 46.1°, the average annual precipitation is 17.3 inches, and on the average there are 119 days without killing frost. At both places winter temperatures well below zero and summer temperatures above 100° are common. Nearly half the total annual precipitation at both places falls during May, June, and July.

RELIEF AND DRAINAGE

The sandhills region is characterized by dunes, hills, and ridges, of about the same height, separated by swales, valleys, and basins. The surface drainage pattern is weakly developed or absent in many areas because sandy soils absorb most of the rain and snow. Underdrainage is good, and most of the excess water is carried off by subsurface flow.

The land on Pine Ridge and the Crookston-Springview plain, both in the northern part of the county, ranges from nearly level to rolling and hilly. Most of it is smooth enough to permit cultivation. Drainage is fairly well established. The Niobrara River and its tributaries carry off excess water.

The largest body of rough land in the county is that known as the breaks along the Niobrara River and some of its tributaries. This land is steep, rough, broken, and eroded. Drainage is excessive.

VEGETATION

The vegetation consists primarily of grasses. Only a few areas have trees, and the stand is usually thin. Tall coarse grasses predominate on very sandy soils; mixed tall and short species grow on loamy soils of the higher uplands (tablelands). In marshy places around lakes and ponds, sedges and rushes are dominant. Pines and cedars grow mostly on the rough land along Niobrara River and its tributaries and the deciduous trees on the bottom lands of streams. Nowhere have trees exerted a strong effect on soil characteristics.

The soils in Cherry County are typical grassland soils. Decayed plant remains are responsible for the dark color of the surface layers of many soils. The soils with light-colored surface layers are those on which vegetation is sparse and erosion is severe, so that the accumulation of organic matter is very slow.

TIME

The soils vary in age from very young to old. Not only do they differ in actual years of age, but in apparent age, as is indicated by their degree of development. The units of Dune sand, stabilized, for instance, are young soils for two reasons: (1) the time that has elapsed

since the sand was stabilized is short; and (2) the steeply sloping loose, porous sandhills support only a sparse vegetation, so soil development proceeds slowly. Riverwash is an example of material deposited so recently that no true soil has had time to develop. Areas of Rough broken land have had time enough for development of soils, but erosion is so severe that weathered materials and organic matter cannot accumulate.

The youngest soils are those in the sandhills; and within this group Dune sand, stabilized, rolling, is the youngest. Valentine soils are somewhat older, and the Gannett soils probably the oldest of the group.

Among the soils developed directly in weathered sandstones, Dawes very fine sandy loam is apparently the oldest; it may even be a "fossil" soil, a soil that developed in some preceding geologic period. Holt and Rosebud soils are of comparable age, but climate and topographic differences have affected their development.

The apparent age of soils on terraces depends on the age of the terrace itself; the recent changes that have affected it (such as wind and water erosion and deposition), and the nature of the terrace deposits. Tripp fine sandy loam is a mature terrace soil; Simeon soils are much younger.

CLASSIFICATION OF SOILS

The soil series of Cherry County are classified by great soil group as shown in table 7, and the parent material, relief, and drainage are given for each series. Climate and vegetation, the two remaining factors of soil formation, are not shown in this table because they are relatively uniform throughout the county and therefore cannot account for broad differences among the soils.

MORPHOLOGY OF SOILS REPRESENTING THE GREAT SOIL GROUPS

CHERNOZEM

The Chernozems in this county are members of the Holt series. The following describes a typical profile of Holt fine sandy loam, taken in section 10, Township 34 North, Range 25 West:

- A₁₁ 0 to 2 inches, dark grayish-brown⁸ (10YR 4/1, dry) to black (10YR 2/1, moist) friable mulchlike fine sandy loam containing many partly decomposed grass remains; noncalcareous.
- A₁₂ 2 to 4 inches, dark grayish-brown (10YR 4/1, dry) to black (10YR 2/1, moist) friable fine sandy loam of weak platy structure; noncalcareous.
- B₁ 4 to 14 inches, dark grayish-brown (10YR 4/1, dry) to black (10YR 2/1, moist) friable loam of weak crumb structure; noncalcareous.
- B₂ 14 to 30 inches, grayish-brown (10YR 5/2, dry) to dark grayish-brown (10YR 3/2, moist) friable heavy loam of medium prismatic structure; clods may be broken to crumbs and the crumbs to single grains; crushed aggregates are slightly lighter colored than intact aggregates; noncalcareous.
- Cc 30 to 44 inches, white (2.5Y 8/2, dry) to light brownish-gray (2.5Y 6/2, moist) calcareous fine sandy loam containing fragments of weathered sandstone.
- C 44 to 60 inches, white (5.0Y 8/2, dry) to pale-olive (5.0Y 6/3, moist) calcareous fine-grained soft sandstone.

⁸ Provisional Soil Survey color names as established in 1947, based on Munsell color charts. Figures in parentheses are Munsell color notations.

The Holt soils in this county occur along the transitional area between the Chernozem and Chestnut great soil groups. In this transition area neither Chernozems nor Chestnut soils predominate. Soils of the two groups interfinger in a complex pattern. The soil-forming processes that produce Holt soils act similarly on Rosebud soils. The Holt soils have darker, somewhat thicker A horizons than the Rosebud because they receive a greater amount of organic matter, get a larger effective amount of precipitation, lose less water as runoff, have a heavier plant cover, and are subject to less active oxidation within the soil mass. The calcification process is expressed in many morphological characteristics of the Holt soils besides the color of surface horizon. The structure of the soil material in A and B horizons, the presence of a horizon of carbonate accumulation, the soil reaction, and the absence of a marked textural profile all reflect the influence of that combination of climatic and biologic forces that results in the soil-forming process called calcification.

CHESTNUT

Six of the soil series in this county are Chestnut soils, the Rosebud, Tripp, Anselmo, Cody, Goshen, and Elsmere. A good example of a Chestnut soil is Rosebud fine sandy loam, a profile of which is described as follows:

- A₁ 0 to 7 inches, grayish-brown (10YR 4/2, dry) to dark grayish-brown (10YR 2.5/2, moist) loam of medium crumb structure; soft when dry, very friable when moist; top 3 inches matted with grass roots; neutral in reaction.
- A₂ 7 to 18 inches, grayish-brown (10YR 5/2, dry) to dark grayish-brown (10YR 3/2, moist), changing gradually to light brownish-gray (10YR 6/2, dry) at bottom of horizon; fine sandy loam of medium prismatic to fine subangular blocky structure; slightly hard when dry, very friable when moist; many grass roots, particularly along vertical structural faces; mildly alkaline.
- A₃ 18 to 24 inches, pale-brown (10YR 6/3, dry) to brown (10YR 5/3, moist) weakly coherent fine sandy loam; soft when dry, very friable when moist; grass roots numerous, but somewhat fewer than in horizon A₂; mildly alkaline.
- B₁ 24 to 30 inches, light-gray (10Y 7/2, dry) to brown (10Y 5/3, moist) massive very strongly calcareous heavy loam; hard when dry, friable when moist; contains a few resistant calcareous sandy concretions 1 inch in diameter and 2 to 3 inches long; fewer grass roots than in horizon A₃; strongly alkaline.
- C₁ 30 to 48 inches, light-gray (10YR 7/2, dry) to pale-brown (10YR 6/3, moist) weakly coherent calcareous heavy fine sandy loam; very soft when dry, very friable when moist; contains a few small soft fragments of sandstone; very few grass roots; strongly alkaline.
- C₂ 48 to 60 inches, white (5Y 10/2, dry) to pale-yellow (5Y 8/3, moist), hard, calcareous sandstone; grass roots form a mat one-eighth inch thick on surface of the rock.

Brief profile descriptions of the other Chestnut soils are given in the section, Soil Types and Phases. A similarity exists among profiles of Rosebud, Tripp, Cody, and Anselmo soils. The Tripp soil is much like the Rosebud soils; it differs in parent material and in its physiographic position, as it is on terraces. The solums of the Tripp and Rosebud soils are nearly indistinguishable.

The Cody and Anselmo are typical Chestnut soils in that they have no horizon of lime carbonate accumulation. In fact, they lack free

TABLE 7.—*Soil series of Cherry County, Nebr., classified by great soil group, and the parent material, relief, and drainage of each*

Great soil group and series	Parent material	Relief position	Drainage
Chernozem: Holt.....	Weathered, limy, fine-grained Tertiary sandstone.	Nearly level to hilly uplands.....	Good.
Chestnut: Anselmo.....	Eolian noncalcareous loamy sands.	Nearly level to gently undulating uplands.	Good.
Cody.....	Noncalcareous sandy alluvium..	Nearly level to gently undulating high terraces.	Good.
Elsmere.....	Eolian sands and wind-reworked alluvial sands.	Nearly level and depressed to gently sloping swales, basins, and valleys.	Poor externally; moderately high water table.
Goshen.....	Alluvial-colluvial sandy loams...	Nearly level to gently sloping swales and drain heads.	Good.
Rosebud.....	Weathered, limy, fine-grained Tertiary sandstone.	Nearly level to hilly uplands.....	Good.
Tripp.....	Calcareous loamy alluvium.....	Nearly level, gently undulating, and sloping terraces.	Good.
Solonetz: Dawes.....	Weathered, limy, fine-grained Tertiary sandstone.	Level and depressional.....	Poor externally; slow internally.
Humic Gley: Gannett.....	Eolian sands.....	Nearly level and depressed.....	None externally; very slow in- ternally; ponded.
Loup.....	Eolian sands.....	Level to very gently sloping basins, valleys floors, and sandhill slopes.	Poor externally; water table high.
Bog: Muck.....	Alluvial and eolian sands and decayed plant remains.	Level and depressional.....	Very poor; ponded.
Peat.....	Decayed plant remains.....	Level and depressional.....	Very poor; ponded.

Lithosols:			
Canyon-----	Weathered, limy, fine-grained Tertiary sandstone.	Rolling to hilly and steep uplands.	Excessive externally; good internally.
Alluvial soils:			
Sarpy-----	Recent alluvial sands-----	Nearly level-----	Fair to poor externally; moderately high water table.
Sands, dry:			
Dune sand, stabilized--	Eolian noncalcareous sands-----	Rolling to steep dunes and ridges--	Excessive.
Dwyer-----	Eolian calcareous sands-----	Nearly level to gently sloping-----	Good to excessive.
Simeon-----	Sandy and gravelly alluvium-----	Level to undulating stream terraces.	Little surface drainage; excessive internal drainage.
Valentine-----	Eolian noncalcareous sands-----	Nearly level to rolling-----	Same.

lime carbonate in both the solum and the parent material. The Anselmo soils have developed in sandy noncalcareous eolian material on high upland areas. The Cody soils are on sandy high terraces along streams.

The Goshen soils form in calcareous alluvial-colluvial materials in narrow drainage heads and basins and around the bases of slopes. In these positions they receive runoff, seepage, and soil material from higher levels. They therefore have thicker A horizons than the associated Rosebud soils, and their lime carbonate is leached to greater depths.

The Elsmere are immature Chestnut soils occurring in moderately well drained basins, valley floors, and on long, very gentle sandhill slopes. Their A horizons are somewhat darker and thinner than those of the Chestnut soils on well-drained uplands. They have formed in eolian sands under the conditions that exist where there is a relatively high water table.

SOLONETZ

The Dawes series, represented in this county by one mapping unit, is considered to be solodized-Solonetz. The following description of a profile of Dawes very fine sandy loam was taken in section 32, Township 35 North, Range 29 West:

- A₁ 0 to 2 inches, grayish-brown (10YR 4.5/2, dry) to dark grayish-brown (10YR 2.5/2, moist) light very fine sandy loam of medium fine granular structure; soft when dry, very friable when moist; matted with grass roots; neutral in reaction.
- A₂ 2 to 10 inches, grayish-brown (10YR 4/2, dry) to very dark-brown (10YR 2/2, moist) medium prismatic to fine subangular blocky very fine sandy loam; hard when dry, very friable when moist; grass roots very numerous, especially on vertical faces of aggregates; neutral in reaction.
- B₁ 10 to 14 inches, grayish-brown (10YR 5/2, dry) to dark grayish-brown (10YR 3/2, moist) light clay loam of medium prismatic to fine subangular blocky structure; hard when dry, very friable when moist; grass roots fewer than in horizon A₂; neutral in reaction.
- B₂ 14 to 23 inches, grayish-brown (10Y 4.5/2, dry) to dark grayish-brown (10Y 2.5/2, moist) strong prismatic to blocky clay; very hard when dry, firm when moist, sticky and plastic when wet; few grass roots; neutral in reaction.
- B₃ 23 to 27 inches, yellowish-brown (2.5Y 5.5/3, dry) to dark yellowish-brown (2.5Y 3.5/3, moist) medium prismatic to fine subangular blocky calcareous clay loam; hard when dry, friable when moist, and plastic when wet; few grass roots; mildly alkaline.
- C₁ 27 to 36 inches, light-gray (10YR 7/2, dry) to brown (10YR 5/3, moist) massive calcareous gritty fine sandy loam; hard when dry, friable when moist; very few grass roots; numerous hard fragments of weathered sandstone about the size of very coarse sand; strongly alkaline.
- C₂ 36 inches +, unweathered or only slightly weathered hard white calcareous sandstone.

The Dawes soil occurs in level, slightly depressional, places on uplands; it is associated with Rosebud soils. The process of development responsible for its characteristics is not entirely clear. Many soil scientists believe that the Dawes soils developed under the influence of sodium salts, which have subsequently been leached from the soil. This point of view leads to the conclusion that the claypan layer in the Dawes soil is becoming more friable; or in other words, that the Dawes is becoming more like the Rosebud soils.

Other scientists think that the Dawes soil is very old—that perhaps it developed before extensive wind erosion and deposition produced the sandhills. They believe that the present soil once may have been covered with loess or sand, or both, and uncovered in recent times; or that an old soil was partly eroded and the present Dawes soil developed in remnants of the old one. These ideas are based on the theory that the claypan in the Dawes soil must have formed through leaching and weathering of soil materials over long period of time—a much longer time than that during which more friable soils of the county developed. From this point of view, Dawes soil may be expected to develop an even stronger, denser claypan than it now has.

It is possible that both theories may be necessary to explain the morphology of the Dawes soil. It may have been a sodium-Solonetz soil during some earlier geologic time, and through subsequent leaching, burial, and re-exposure, could have attained its present distribution and profile characteristics.

HUMIC GLEY

Humic Gley (meadow soils) are represented by two soil series, the Gannett and Loup. Representative of the Humic Gley group is the following profile description of Gannett fine sandy loam taken in section 17, Township 31 North, Range 27 West:

1. 0 to 9 inches, dark-gray (10YR 4/1, dry) to black (10YR 2/1, moist) loose fine sandy loam; matted with grass roots; neutral in reaction.
2. 9 to 15 inches, grayish-brown (10YR 4.5/2, dry) to very dark brown (10YR 2.5/2, moist) loose loamy fine sand; streaks of dark color penetrate this horizon from the one above; mildly alkaline.
3. 15 to 19 inches, grayish-brown (10YR 5/2, dry) to dark grayish-brown (10YR 3/2, moist) loose fine sand; few grass roots; mildly alkaline.
4. 19 to 24 inches, gray (10YR 5/1, dry) to very dark-gray (10YR 2.5/1, moist) massive light sandy clay loam; very hard when dry, plastic when wet; neutral in reaction.
5. 24 to 34 inches, gray (10YR 4.5/1, dry) to very dark-gray (10YR 3/1.5, moist) loose fine sand; few grass roots; mildly alkaline.
6. 34 to 42 inches, grayish-brown (2.5Y 5/1.5, dry) to very dark-gray (2.5Y 3.5/0.5, moist) massive light sandy clay; faintly mottled with brown around root channels; very hard when dry, plastic when wet; very few grass roots; mildly alkaline.
7. 42 to 60 inches +, light brownish-gray (10YR 6.5/1.5, dry) to gray (10YR 5/1, moist) loose fine sand; no grass roots below 50 inches; neutral in reaction.

The Gannett soils have developed in sand occupying enclosed basins, valleys, and swales in the sandhills. The water table is ordinarily within a few feet of the surface, and in wet seasons it rises and temporarily waterlogs the entire soil. Internal drainage is slowed also by the clay layer of the lower subsoil. The resulting excessive moisture and deficient aeration tend to produce dark surface soils high in organic matter and mottled subsoils and substrata.

The Loup soils have developed under conditions of slightly better surface drainage and a lower water table than the Gannett; consequently, their surface layers are a little thinner and their substrata are less mottled. Furthermore, a clayey gley horizon is less regularly a feature of the profiles of Loup than of the Gannett soils.

BOG SOILS

Two Bog soils are recognized in the county, Peat and Muck. Both occur in marshy places around lakes, ponds, and along streams. The

predominant plants are rushes, sedges, and ferns. The water table is usually slightly lower in Muck than in Peat, but occasionally it at least reaches the surfaces of both.

The surface few inches of Peat consist of moderately well-decomposed plant remains; the rest of the profile, to depths of 2 to 8 feet, is dark-brown, fibrous, only slightly decomposed plant tissue. The lesser decomposition of the lower layers is caused by poorer aeration that, in turn, results from excessive moisture.

Muck occurs in boggy places where there is a mixture consisting of about equal parts by volume of sand and peat. The dark-brown mucky layer is 1 to 2 feet thick and overlies mottled loose fine sand. The organic matter is usually more decomposed in Muck than in Peat, primarily because Muck is better aerated. The sand composing a part of Muck may be deposited in two ways: By water, during flood periods; and by wind, in almost any season.

LITHOSOLS

Canyon soils are the only Lithosols in this county. The following describes a profile of Canyon fine sandy loam as found in section 35, Township 35 North, Range 30 West.

1. 0 to 5 inches, grayish-brown (10YR 4.5/2, dry) to dark grayish-brown (10YR 2.5/2, moist) fine sandy loam of very weak crumb structure; soft when dry, very friable when moist; top 3 inches matted with grass roots; contains a few hard calcareous sandstone concretions $\frac{1}{2}$ to 1 inch in diameter; mildly alkaline.
2. 5 to 10 inches, pale-brown (10YR 5.5/3, dry) to brown (10YR 4/3, moist) calcareous fine sandy loam of very weak crumb structure; soft when dry, very friable when moist; grass roots numerous; contains many calcareous sandstone concretions $\frac{1}{2}$ to $1\frac{1}{2}$ inches in diameter; mildly alkaline.
3. 10 to 16 inches, white (2.5Y 8/2, dry) to light brownish-gray (2.5Y 6.5/2, moist) horizon consisting mostly of hard calcareous concretions from 1 to 3 inches in diameter; loose loamy fine sand fills spaces between concretions; very few grass roots; mildly alkaline.
4. 16 to 32 inches, light-gray (2.5Y 7.5/2, dry) to pale-olive (5Y 6.5/3, moist) weakly coherent calcareous fine sand; contains a few soft fragments of weathered sandstone; soft when dry, very friable when moist; mildly alkaline.
5. 32 inches +, massive soft calcareous sandstone of the same color as horizon 4.

In several properties this soil and Rosebud fine sandy loam are similar. Both soils develop in weathered Ogallala sandstone, have dark-colored surface layers, and are calcareous. Canyon soils, however, are more shallow and are commonly limy in all horizons. Rosebud soils are usually noncalcareous above the horizon of carbonate accumulation. Canyon soils lack a textural profile and their structural development, particularly in the subsoil, is weak or lacking.

The differences between Canyon and Rosebud soils result primarily because Canyon soils occur on steeper relief. The steeper slopes result in sparser vegetation, more runoff and erosion, and less leaching. Consequently, the Canyon soils have less organic matter, thinner horizons, a more shallow profile, and less horizon differentiation.

ALLUVIAL SOILS

The Sarpy series is representative of the great group of Alluvial soils—soils developed in recently deposited alluvium and characterized

by weak profile development. The following describes a profile of Sarpy loamy fine sand taken along the Niobrara River, in section 33, Township 33 North, Range 28 West:

1. 0 to 5 inches, grayish-brown (10YR 5/2, dry) to dark grayish-brown (10YR 3.5/2, moist) loamy fine sand of weak crumb structure; soft when dry, very friable when moist; top 2 inches matted with grass roots; mildly alkaline.
2. 5 to 26 inches, light brownish-gray (10YR 6/2, dry) to grayish-brown (10YR 4/2, moist) calcareous loamy fine sand of very weak crumb structure; grass roots numerous; numerous light-colored krotovinas; strongly alkaline.
3. 26 to 30 inches, light brownish-gray (2.5Y 6.5/2, dry) to grayish-brown (2.5Y 4/2, moist) massive strongly calcareous very fine sandy loam; slightly hard when dry, friable when moist; many fine grass roots; strongly alkaline.
4. 30 to 50 inches +, very pale-brown (10YR 7/3, dry) to pale-brown (10YR 5.5/3, moist) loose calcareous fine sand; very few grass roots; strongly alkaline.

The Sarpy soil is in a very early stage of development. Aside from the fact it is forming in recent deposits, it is a young soil supporting very little vegetation, which is the source of organic matter. The water table is high and impedes internal drainage. The material in which the soil is forming is low in colloids. The surface of the soil is built up or eroded by occasional floods. The Sarpy soil is a little more stable than Riverwash and has developed a thin dark topsoil. In other characteristics it is the same as Riverwash.

DRY SANDS

Dry sands are a group of very weakly developed soils forming in well-drained sandy deposits. They make up the largest part of Cherry County. The mapping units of Dune sand, stabilized, are most extensive in the group; members of the Valentine, Dwyer, and Simeon series are also included. It is difficult to select a typical profile of any of these soils because there is great variation in thickness of the dark surface layers, in the thickness, color, and texture of subsurface layers, and in amount of free lime carbonate. The following description of Valentine loamy fine sand is representative of a large number of profiles that occur in the sandhills:

1. 0 to 4 inches, grayish-brown (10YR 4.5/2, dry) to dark grayish-brown (10YR 3/2, moist) weakly coherent loamy fine sand; soft when dry, very friable when moist; top 2 to 3 inches matted with grass roots; neutral in reaction.
2. 4 to 13 inches, brown (10YR 5.5/3, dry; 4/2.5, moist) weakly coherent loamy fine sand; soft when dry, very friable when moist; few grass roots; neutral in reaction.
3. 13 to 27 inches, pale-brown (10YR 6/3, dry) to brown (10YR 5/3, moist) loose sand; very few grass roots; neutral in reaction.
4. 27 to 60 inches +, very pale-brown (10YR 7/3, dry) to pale-brown (10YR 6/3, moist) loose sand; no grass roots seen in this horizon; neutral in reaction.

A very little gravel, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, is scattered throughout the profile.

Valentine soils, like the mapping units of Dune sand, stabilized, and the Dwyer soil, are forming in eolian sands. Valentine soils occur in nearly level to undulating and gently sloping places, and also on some low, rounded hummocks and ridges. Their surface horizons are thicker than those of Dune sand, stabilized, which occurs on higher,

steeper hills and ridges. The Dwyer soil is calcareous but otherwise is ordinarily indistinguishable from Valentine soils. The Simeon soils, where they were originally established in Wisconsin, are considered weakly developed Prairie soils. In this county and in adjacent parts of Nebraska, however, the Simeon soil has characteristics more like those of Dry sands than of Prairie soils. The Simeon soil occurs on level to gently undulating sandy and gravelly high benches. Its profile resembles those of Valentine and Dwyer soils and differs chiefly in being more acid.

SOIL SURVEY METHODS AND DEFINITIONS

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

Field study.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers, and is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by chemical tests.

Classification.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

As an example of soil classification, consider the Rosebud series of Cherry County. This series is made up of two soil types, subdivided into phases, as follows :

<i>Series</i>	<i>Type</i>	<i>Phase</i>
Rosebud-----	{ Fine sandy loam-----	{ Gently undulating. Undulating. Gently rolling.
	{ Loamy fine sand-----	{ Gently undulating Undulating. Gently rolling.

Soil type.—Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

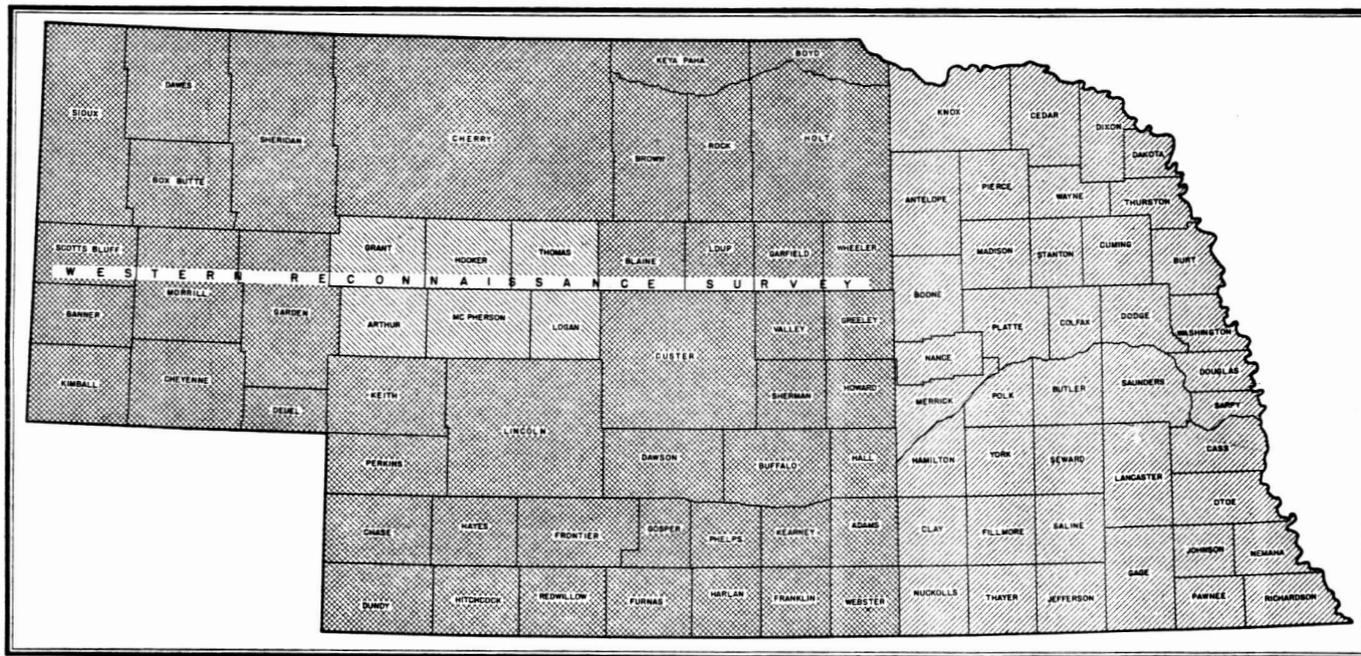
Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified more easily than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture, but are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Miscellaneous land types.—Fresh stream deposits or rough, stony, and severely gullied lands that have little true soil are not classified into types and series but are identified by descriptive names, such as Riverwash, or Rough broken land, sand material.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. Gannett-Valentine loamy fine sands is a soil complex mapped in this county.



Areas surveyed in Nebraska shown by shading. Detailed surveys shown by northeast-southwest hatching; reconnaissance surveys shown by northwest-southeast hatching; crosshatching indicates areas covered by both detailed and reconnaissance surveys.

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.

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. 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 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.

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