SOIL SURVEY OF

Dawson County, Nebraska

United States Department of Agriculture
Soil Conservation Service
In cooperation with
University of Nebraska Conservation and Survey Division

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1968-73. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service, the University of Nebraska Conservation and Survey Division, Dawson County, and the Central Platte Natural Resources District. It is part of the technical assistance furnished to the Central Platte Natural Resource District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Dawson County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Map Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the capabiilty unit, range site, and windbreak suitability group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, the range sites, and the windbreak suitability groups.

Foresters and others can refer to the section "Use of the Soils for Windbreaks," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife Habitat and Recreation."

Ranchers and others can find in the section "Management of Soils for Rangeland," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about soil formation and classification in the section "How the Soils of Dawson County Were Formed and How They are Classified."

Newcomers in Dawson County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "Environmental Factors Affecting Soil Use."

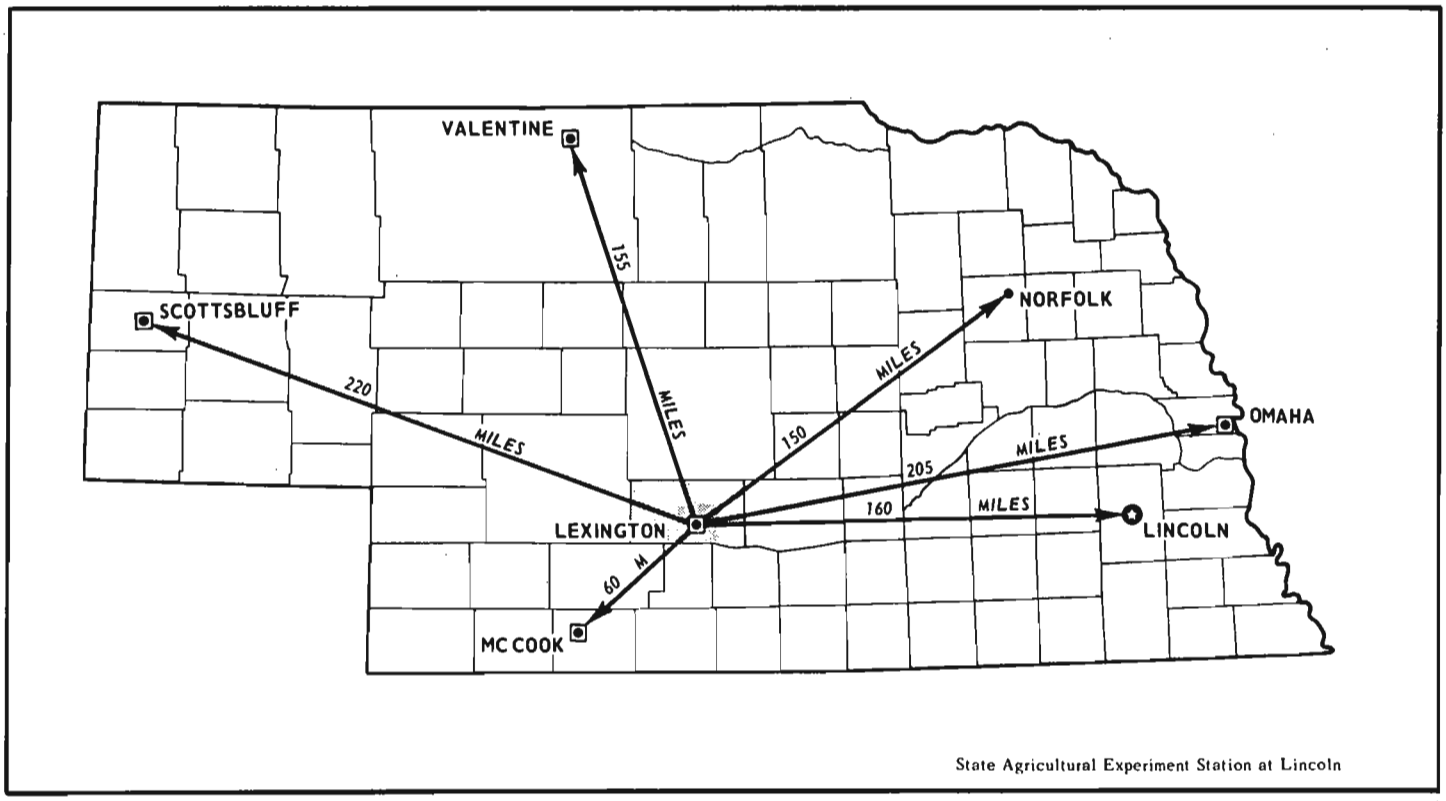
Cover: **Grassed waterways, a farmstead windbreak and development for irrigation are conservation practices on this Dawson County farm. It is mainly on Cozad silt loam.**

Contents

Issued May, 1978

Index to Map Units

Summary of Tables



Location of Dawson County in Nebraska.

SOIL SURVEY OF DAWSON COUNTY, NEBRASKA

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

DAWSON COUNTY is in the south-central part of Nebraska (see opposite page). It is almost rectangular in shape; 42 miles long and 24 miles wide. The total land area is approximately 624,256 acres, or about 975 square miles. According to the 1970 census, Dawson County had a population of 19,467. Lexington, the county seat and largest town, had a population of 5,618 in 1970. Cozad and Gothenburg each have a population of more than 3,000. The remaining incorporated towns are Eddyville, Farnam, Overton, and Sumner.

The location of the county in the Platte Valley made it a thoroughfare for the Pony Express, the Oregon Trail, and the Mormon Trail. A few wagon trains and mail coaches crossed the county before 1850. However, after the Civil War a heavy migration to California and other western states started. This traffic, however, had little effect on the settlement of the county. The first store was established by Daniel Freeman and was located across from the Pony Express station.

The coming of the railroad had a profound influence on the settlement of the county. It provided transportation for farm products moving out of the county and for manufactured supplies coming into the county. In 1866 the Union Pacific built the first station one mile east of the present site of Lexington.

Dawson County was organized in 1871. The first permanent settlement was made in 1872 by a colony from Philadelphia. They settled in the vicinity of Plum Creek, which was later changed to Lexington. The first school district and post office were started the same year. Later settlers came chiefly from Iowa, Missouri, Illinois, and other eastern states.

The most common method of obtaining land was by the Homestead Act of 1862. Other methods were by purchase or preemption under the Land Act of 1820 and the Timber Culture Act of 1873.

Dawson County is intersected by the Platte River. The area north of the river is part of the loess hills of central Nebraska, and the area south of the river consists of rolling plains and breaks. The Platte River Valley is 10 to 15 miles wide and consists of bottom land, well formed stream terraces, and adjacent foot slopes. The bottom land consists of moderately well drained to poorly drained soils that range from fine textured to coarse textured. The stream terraces and adjacent foot slopes consist of nearly level to gently sloping silty soils, but they also include a few small areas of undulating to rolling sandy soils. The uplands consist of medium textured to moderately fine textured soils that are somewhat excessively drained or well drained.

Farming is the principal enterprise in the county. According to the Conservation Needs Inventory of 1967, about 53 percent of the acreage is cropland, 40 percent is native grasses and pasture, and the remaining 7 percent is farmsteads, woodland, and urban land. The main crops are sold for cash. Corn, grain sorghum, and alfalfa are fed to livestock or are sold for cash. About two-thirds of the cropland is irrigated. Water for irrigation is diverted from the Platte River or pumped from wells. Most farms raise livestock and grow grain.

Through the Central Platte Natural Resources District, farmers and ranchers can receive technical assistance from the Soil Conservation Service in planning and applying soil and water conservation practices on the land.

A soil survey of Dawson County was published in 1925 by the Department of Agriculture in cooperation with the Nebraska Soil Survey (*4*).[1] This new survey was made to provide up to date information on the soils and on the advances that have been made in soil interpretations, engineering and soil classification since the earlier survey was published. The present survey provides additional information and larger maps that show the soils in greater detail.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Dawson County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and nature of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

[1]Italic numbers in parentheses refer to references, page 97.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Cozad and Holdrege, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Hall silt loam, 1 to 3 percent slopes, is one of several phases within the Hall series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called map units. On most maps detailed enough to be useful in planning the management of farms and fields, a map unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some map units are made up of soils of different series, or of different phases within one series. One such kind of map unit is shown on the soil map of Dawson County: soil complexes.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Coly-Hobbs silt loams, 2 to 60 percent slopes, is an example.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how the soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up to date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations but in different patterns.

A general soil map is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract, or a wildlife area or for broad planning of recreational facilities, community developments, and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey area have been grouped into general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in it are described on the following pages.

Texture in the soil associations refers to the surface layer unless otherwise stated.

Silty Soils on Uplands and Associated Soils on Bottoms of Narrow Drainageways

Three soil associations are in this group. They consist of deep, nearly level to very steep soils that are well drained or somewhat excessively drained.

1. *Holdrege-Hall*

Deep, nearly level to gently sloping, well drained, silty soils on uplands

This association is made up of nearly level to gently sloping soils on uplands. The soils formed in wind laid silty material.

The association makes up about 4 percent of the county. It is about 70 percent Holdrege soils, about 17 percent Hall soils, and 13 percent soils of minor extent.

Holdrege soils are deep and are nearly level to gently sloping. These soils are well drained. They have a surface layer of dark gray silt loam. The subsoil is grayish brown or light brownish gray light silty clay loam and silt loam. The underlying material, at a depth of 28 inches, is pale brown and white silt loam.

Hall soils are at a slightly lower elevation than Holdrege soils. They are deep and are nearly level or very gently sloping. These soils are also well drained. They have a surface layer of very dark grayish brown silt loam. The subsoil is dark grayish brown silty clay loam in the upper part and grayish brown silt loam in the lower part. The underlying material, at a depth of 40 inches, is very pale brown silt loam.

Among the minor soils are Uly, Coly, Hobbs, Hord, and Fillmore. Uly and Coly soils are on ridges and side slopes. They are steeper than the other minor soils. Hord soils are in areas that surround depressions, and Hobb soils are on the narrow bottoms of upland drainageways. Fillmore soils are in well defined depressions on the uplands.

Most farms in this association are used for growing grain that is marketed. Some of the grain, however, is used to fatten cattle while they are in dry lots. Wheat, corn, and grain sorghum are the main crops. Wheat is dryfarmed, but corn and grain sorghum are generally irrigated. Corn in dryfarmed areas is cut for silage during years when rainfall is below normal. A few acres of alfalfa are also grown, generally in dryfarmed areas. Gravity irrigation is important on the nearly level and very gently sloping soils. A few center pivot sprinkler systems provide irrigation water on very gently sloping and gently sloping soils.

Soil blowing and water erosion are the main hazards on these soils. During some years inadequate rainfall limits production in dryfarmed areas.

Farms in this association average about 400 acres in size. Gravel or improved dirt roads are on most section lines, but roads are not on all section lines. A few paved highways cross this association. Grain is sold for cash, mainly to elevators within the county or in adjacent counties. Fattened cattle are marketed through local auction sales to packers, or they are trucked to such larger terminals as Omaha.

2. *Uly-Coly*

Deep, strongly sloping to steep, well drained and somewhat excessively drained, silty soils on uplands

This association is made up of alternating ridges and side slopes that border intermittent drainageways on the uplands. The soils on the ridges are strongly sloping and moderately steep and those on the side slopes are moderately steep and steep (fig. 1).

The association makes up about 37 percent of the county. It is about 39 percent Uly soils, 34 percent Coly soils, and 27 percent soils of minor extent.

Uly soils are on both ridges and side slopes on the uplands. These soils are well drained and somewhat excessively drained. They have a surface layer of gray silt loam. The subsoil is grayish brown silt loam. The underlying material, at a depth of 15 inches, is light gray or white, calcareous silt loam.

The steepest Coly soils are on side slopes and the less steep Coly soils are on ridges. These soils are well drained and somewhat excessively drained. They have a thin surface layer of grayish brown silt loam. The underlying material, at a depth of 5 inches, is pale brown silt loam.

Among the minor soils are Hobbs, Hord, and Holdrege. Hobbs soils are in narrow bottoms of small drainageways. Hord soils are very gently sloping or gently sloping and are on colluvial foot slopes. Holdrege soils are nearly level to gently sloping and are on ridgetops on the uplands.

This association consists mainly of livestock ranches and farms. The steepest areas are used mainly for rangeland for cow and calf herds. The wider alluvial drains and the less sloping ridges are commonly cultivated. The main crops are corn, grain sorghum, and alfalfa. Many acres of soils that were previously cultivated have been reseeded to native grass.

Maintaining and improving desirable grasses are the main concerns on rangeland. Proper use and a planned grazing system are needed. Water erosion, soil blowing, and drought are the main concerns on dryfarmed soils.

Ranches or farms in this association average about 900 acres in size. Gravel or improved dirt roads are common, but most section lines do not have roads. Most beef calves are marketed at auction sales within the county or adjacent counties. Crops are fed to cattle or sold to elevators in the county or in adjacent counties.

3. *Coly-Uly-Hobbs*

Deep, very gently sloping to very steep, well drained and somewhat excessively drained, silty soils on uplands and bottoms of narrow drainageways

This association is made up of alternating ridgetops, side slopes, and intermittent drainageways on uplands. The soils on the divides are moderately steep and steep, those on the side slopes are steep and very steep, and those on the drainageways are very gently sloping and gently sloping.

The association makes up about 7 percent of the county. It is about 54 percent Coly soils, 20 percent Uly soils, 15 percent Hobbs soils, and 11 percent soils of minor extent.

Coly soils are well drained and somewhat excessively drained. They are on the very steep side slopes, the upper part of the steep side slopes, and the steep divides. These soils have a thin surface layer of grayish brown silt loam. The underlying material, at a depth of 5 inches, is pale brown silt loam.

Uly soils are well drained or somewhat excessively drained. They are on ridges and the lower parts of side slopes. These soils have a surface layer of gray

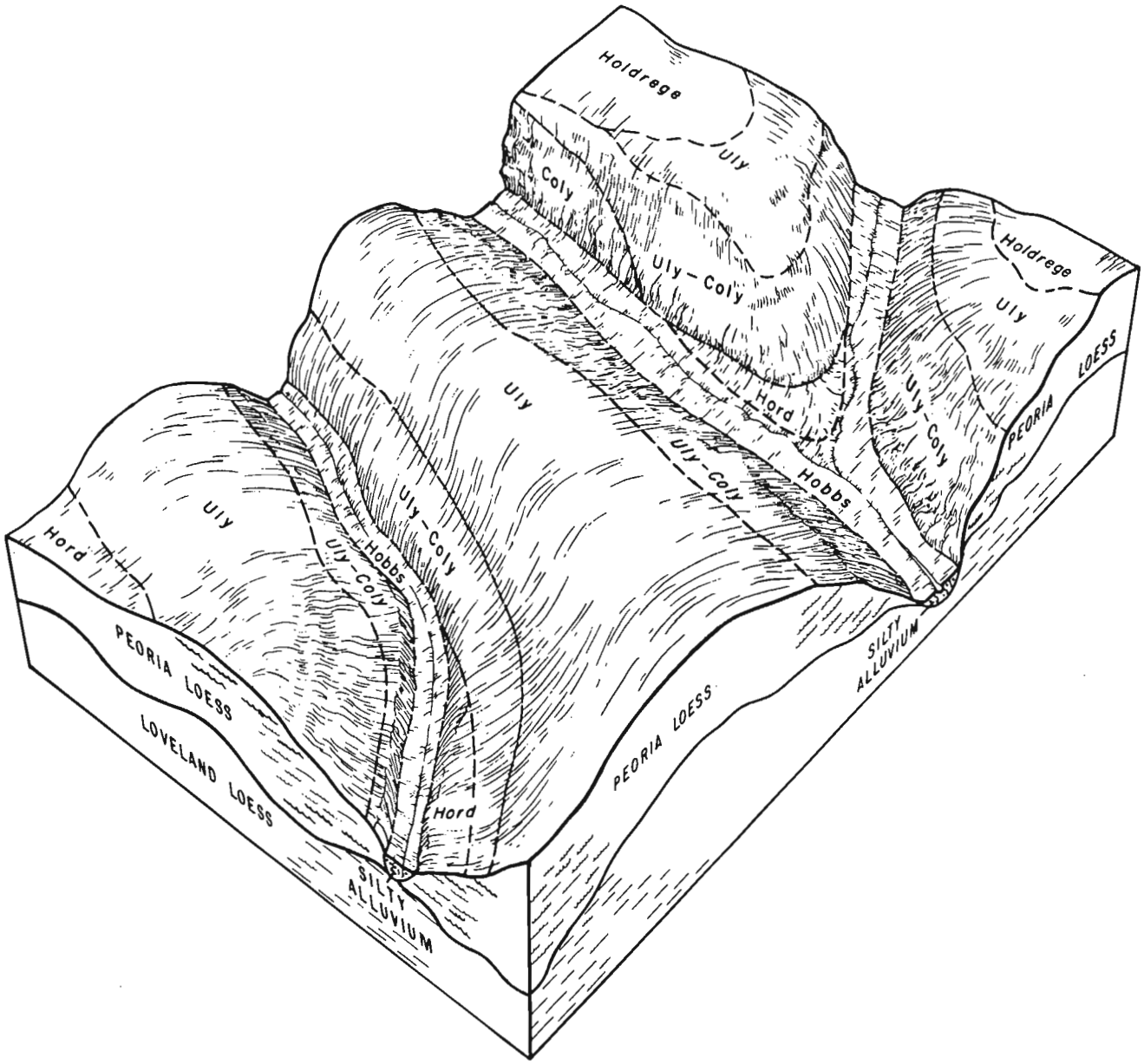

Figure 1.—**Relationship of soils and parent material in Uly-Coly association.**

silt loam. The subsoil is grayish brown silt loam. The underlying material, at a depth of 15 inches, is light gray and white silt loam.

Hobbs soils are occasionally flooded and are on the bottom land of narrow drainageways. These soils are very gently sloping and gently sloping. They have a surface layer of grayish brown silt loam. The underlying material, at a depth of 8 inches, is grayish brown silt loam that has thin layers of a darker color.

Among the minor soils are Holdrege and Hall. Holdrege soils are nearly level to gently sloping and Hall soils are nearly level and very gently sloping. These soils occupy the ridges.

This association is almost entirely used for rangeland for cow and calf herds. Maintaining or improving desirable grasses are the main concerns on rangeland. Proper use and a planned grazing system are needed on most ranches.

Irrigation water for soils in other associations is stored in several reservoirs within this one. These reservoirs are also used for fishing, boating, and other recreational activities.

Ranches and farms in this association average about 1,100 acres in size. Many acres are part of farms that have headquarters located in the Platte River Valley. There are few roads in this association. Most of the calves are marketed as feeders within the county or in adjacent counties. Some are kept as replacement stock.

Sandy and Loamy Soils on Uplands and Stream Terraces

Only one association is in this group. It consists of deep, nearly level to rolling soils that range from somewhat poorly drained to excessively drained.

4. Valentine-Anselmo-Elsmere

Deep, nearly level to rolling, excessively drained to somewhat poorly drained, sandy and loamy soils on uplands and stream terraces

This association is made up of nearly level to strongly sloping soils on stream terraces and rolling uplands. The soils formed in eolian sandy and loamy material that was deposited over loamy and sandy alluvium of the stream terraces (fig. 2). The drainage pattern is poorly defined. Also included in this association south of the Platte River is a transitional area of wind-laid silty and sandy material on strongly sloping uplands.

The association makes up about 3 percent of the county. It is about 41 percent Valentine soils, 23 percent Anselmo soils, 11 percent Elsmere soils, and 25 percent soils of minor extent.

Valentine soils are nearly level to gently sloping on stream terraces and are rolling on uplands. These soils are excessively drained. They have a thin surface layer of dark grayish brown loamy fine sand. Below this is a transition layer of grayish brown fine sand. The underlying material, at a depth of 10 inches, is pale brown fine sand.

Anselmo soils are nearly level to gently sloping on stream terraces and are strongly sloping on uplands. These soils are well drained. They have a surface layer of gray and grayish brown fine sandy loam and loam. The subsoil is pale brown fine sandy loam. The underlying material, at a depth of 27 inches, is light brownish gray loamy fine sand.

Elsmere soils are nearly level or very gently sloping on stream terraces. These soils are moderately well drained or somewhat poorly drained. They have a surface layer of dark grayish brown loamy fine sand. Below this is a transitional layer of grayish brown loamy fine sand. The underlying material, at a depth of 17 inches, is grayish brown loamy fine sand. Buried loamy soils are common.

Among the minor soils are Ovina, Gosper, Cozad, and Hord. Ovina and Gosper soils are moderately well drained in low areas of the stream terraces. Cozad soils are well drained and are at a slightly lower elevation

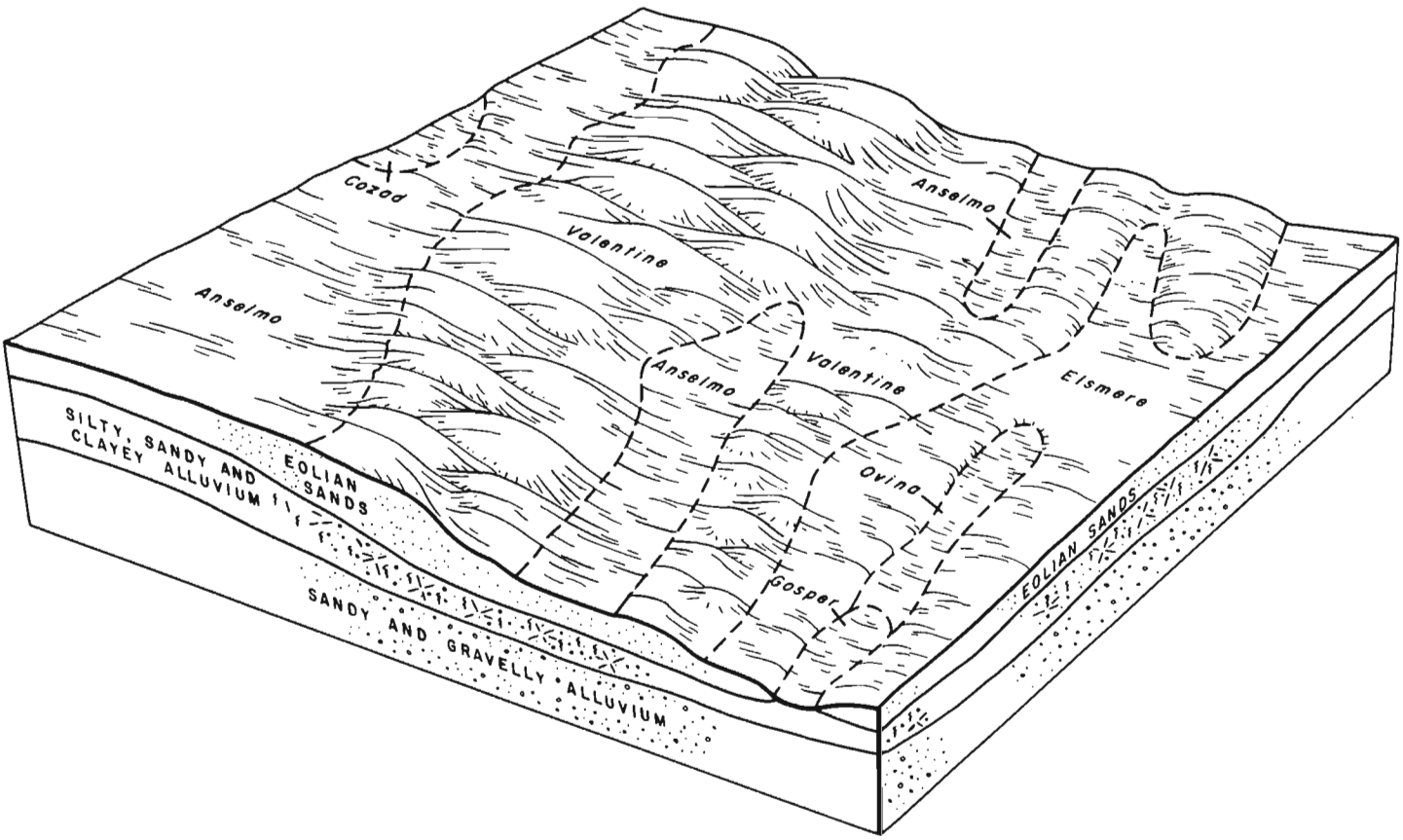

Figure 2.—Relationship of the soils and parent material in Valentine-Anselmo-Elsmere association.

than Anselmo soils. Hord soils are well drained and are on high stream terraces.

Farming in this association is diversified. It consists of growing cash crops; feeding livestock, mainly cattle; and herds of cows and calves on range. A few farmers raise hogs. Most of the nearly level to gently sloping soils are cultivated. The main crops are corn, grain sorghum, and alfalfa, which are generally irrigated. Alfalfa is an important crop where the water table is above a depth of 15 feet, because the roots can obtain moisture from this source. The hummocky and rolling sandy soils are used mainly for rangeland.

Soil blowing is the main hazard on these soils. Maintaining fertility and efficiency of water application are important concerns under irrigation management. Many of the low areas are too wet in spring for early and timely tillage. Maintaining or improving desirable grasses is the main concern on rangeland.

Farms in this association average about 450 acres in size. Gravel or improved dirt roads are on most section lines. Most of the cultivated crops are used to fatten cattle, generally in other parts of the county. Crops grown for cash are sold to local elevators or to local farmers and ranchers for feed. Fattened cattle are marketed through local auction sales to packers, or they are trucked to such larger terminals as Omaha. Hogs are either fattened for market or sold directly to commercial feeders or through local auction sales.

Silty Soils on Stream Terraces and Foot Slopes

Two associations are in this group. They consist of deep, nearly level to gently sloping soils that are moderately well drained or well drained.

5. *Cozad-Hord*

Deep, nearly level to gently sloping, well drained, silty soils on stream terraces and foot slopes

This association is made up of broad, nearly level to gently sloping soils on stream terraces and foot slopes on the uplands. It occupies a large part of the Platte River Valley and all of the Wood River Valley (fig. 3).

The association makes up about 33 percent of the county. It is about 55 percent Cozad soils, 33 percent Hord soils, and 12 percent soils of minor extent. About 2 percent of these soils is saline-alkali. These affected soils are in Platte River Valley.

Cozad soils are on stream terraces where water has deposited silty sediment derived mainly from loess. These soils are deep and well drained. They have a sur-

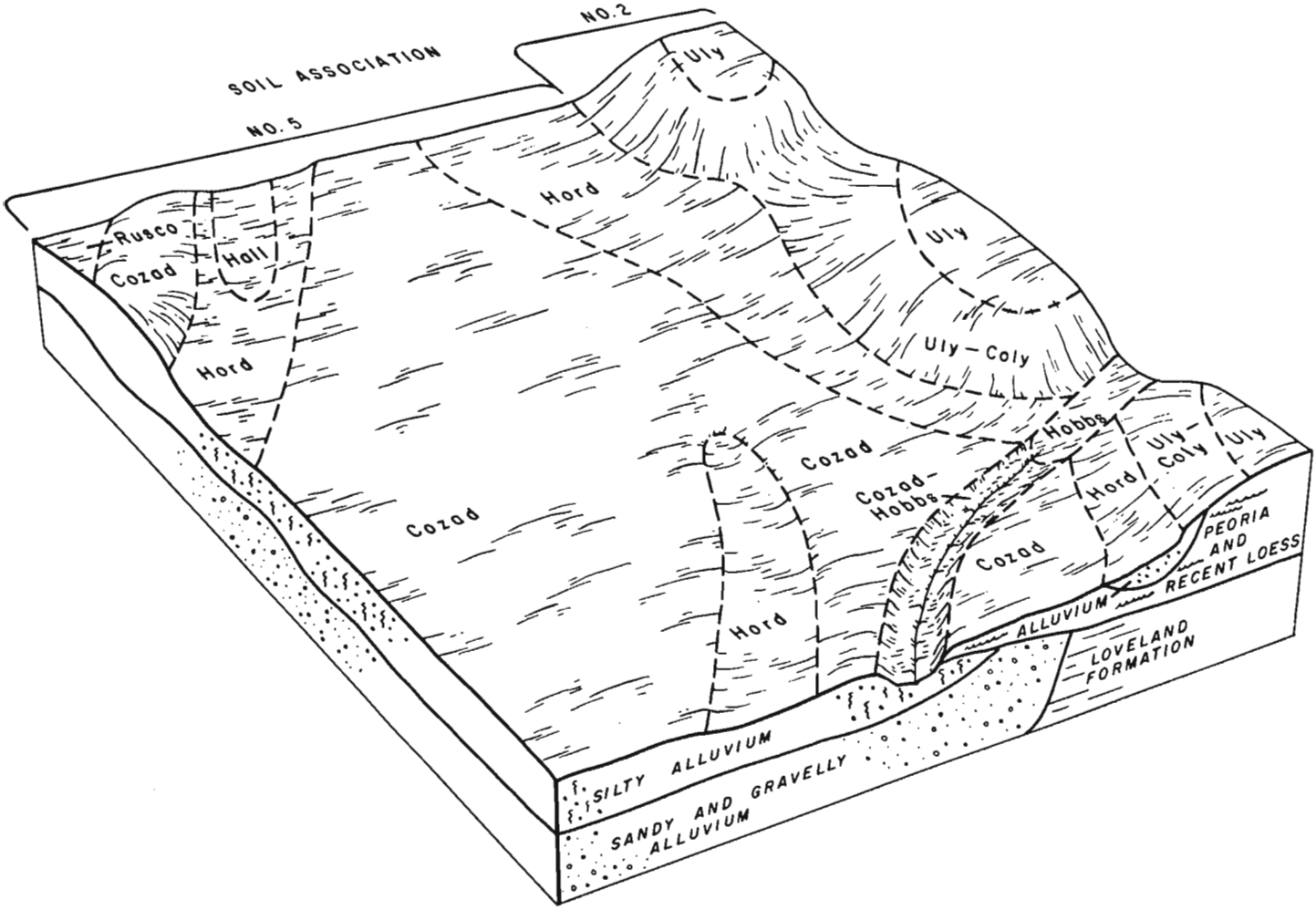

Figure 3.—Relationship of soils and parent material in Cozad-Hord association and adjoining part of Uly-Coly association.

face layer of very dark grayish brown silt loam. The subsoil is grayish brown silt loam. The underlying material, at a depth of about 24 inches, is light gray silt loam.

Hord soils formed from older deposits on stream terraces and foot slopes. These soils are well drained. They have a surface layer of very dark grayish brown to grayish brown silt loam, silty clay loam, and fine sandy loam. The subsoil is dark grayish brown to pale brown silt loam. The underlying material, at a depth of 43 inches, is very pale brown silt loam.

Among the minor soils are Hall, Anselmo, Hobbs, and Rusco. Hall and Rusco soils are nearly level in areas that are slightly lower in elevation than the surrounding soils. The loamy Anselmo soils have very gentle, convex slopes. They are slightly higher in elevation than the surrounding soils. The silty Hobbs soils are on bottoms that are occasionally flooded.

In the Platte River Valley, many areas have a water table that is above a depth of 15 feet.

Production of alfalfa, fattening of cattle, and growing grain that is marketed are the main farming operations. A few farmers raise hogs or grow sugar beets. Many acres of alfalfa are leased by dehydrating plants that are located within the county. Most of these acres are in areas where the water table is above a depth of 15 feet. Alfalfa benefits from subirrigation on these soils. Corn and grain sorghum are the main cereal crops and are irrigated by water from wells or canals.

Maintaining fertility and operating an efficient irrigation system are the main concerns on these soils. During most years inadequate rainfall limits production in dryfarmed areas.

Farms in this association average about 300 acres in size. The soils are some of the most intensively farmed in the county. Gravel or improved dirt roads are on most section lines. Many paved highways intersect this association. Corn and grain sorghum are fed to cattle as grain or silage. Some grain, however, is sold for cash to elevators within the county. Fattened cattle and hogs are marketed through local auction sales to packers, or they are trucked to such larger terminals as Omaha.

6. *Wood River-Rusco-Cozad*

Deep, nearly level, moderately well drained and well drained, silty soils on stream terraces

This association is made up of nearly level soils on stream terraces of the Platte River Valley (fig. 4).

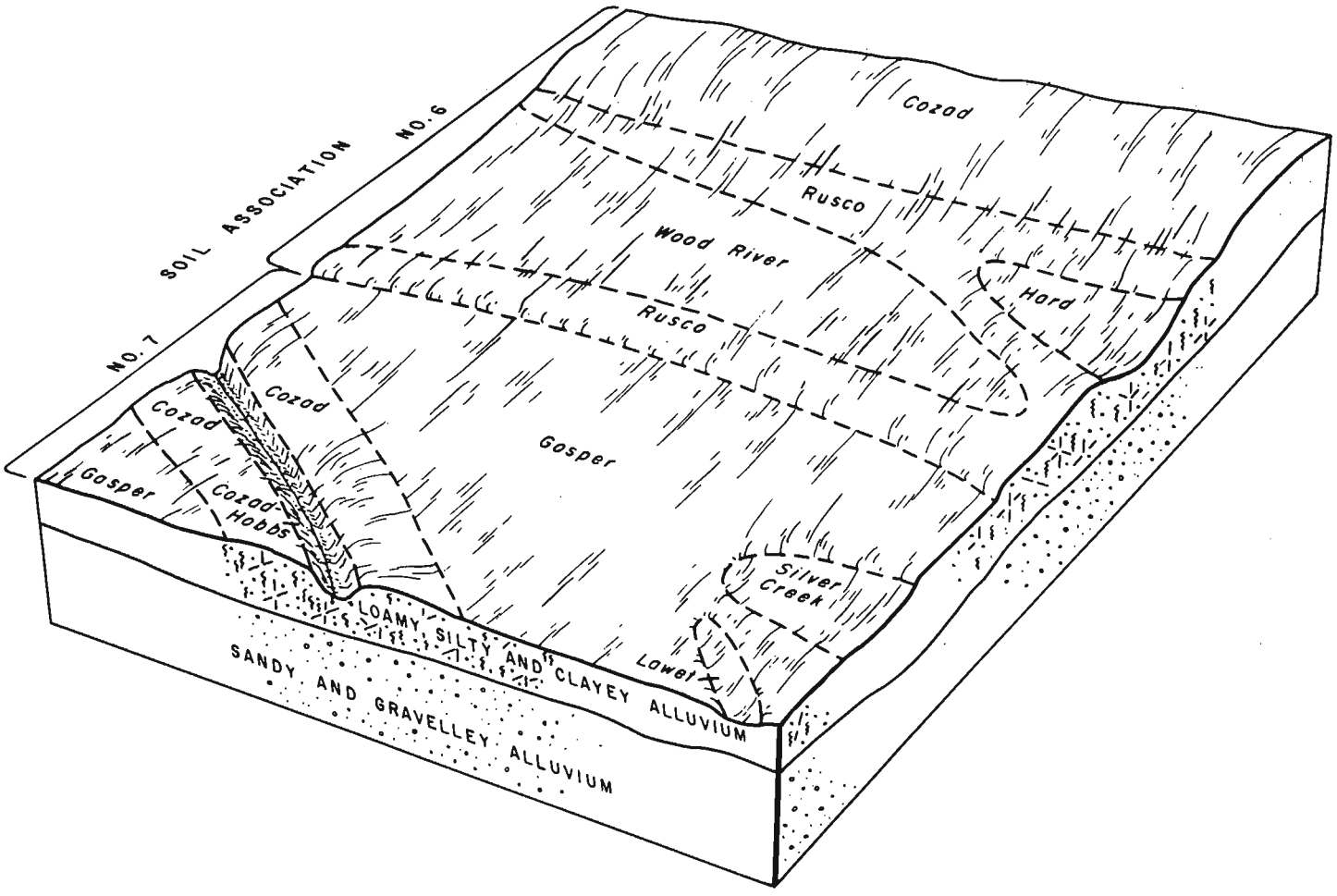

Figure 4.—Relationship of soils and parent material in Wood River-Rusco-Cozad association and part of adjoining Gosper-Cozad-Silver Creek association.

The association makes up about 3 percent of the county. It is about 41 percent Wood River soils, 26 percent Rusco soils, 17 percent Cozad soils, and 16 percent soils of minor extent. About 44 percent of the soils in this association is affected by alkalinity or salinity.

Wood River soils are nearly level in low areas. Micro depressions are common, and these areas are strongly saline-alkali. These soils are deep and moderately well drained. They have a surface layer of dark gray silt loam. The subsoil is dominantly very dark grayish brown to pale brown silty clay loam. The underlying material, at a depth of 42 inches, is very pale brown silt loam.

Rusco soils are at slightly higher elevations than Wood River soils. These soils are deep and moderately well drained. They have a surface layer of very dark grayish brown silt loam. The subsoil is brown or pale brown silty clay loam and silt loam. The underlying material, at a depth of 31 inches, is pale brown to light gray silt loam or loam.

Cozad soils are at the highest elevations within the association. These soils are deep and moderately well drained or well drained. They have a surface layer of very dark grayish brown silt loam. The subsoil is grayish brown silt loam. The underlying material, at a depth of 24 inches, is light gray silt loam.

Among the minor soils are Hall, Hord, Silver Creek, and Gosper. Hall and Hord soils are at slightly higher elevations than Rusco and Wood River soils. Silver Creek and Gosper soils are at the lowest elevations within the association.

Production of alfalfa, fattening of beef cattle, and growing grain are the main farming operations. Many acres of alfalfa are leased by dehydrating plants that are located along the nearby railroad line. Some alfalfa is fed to cattle as hay or silage. The water table is generally at a depth of 4 to 15 feet. Dry gravel below a depth of 5 feet, however, prevents alfalfa from being subirrigated in some areas. Alfalfa is generally dryfarmed, however, and supplemental water is added in some areas. Corn and grain sorghum are the main cereal crops and are irrigated by water from wells or canals. A few farmers grow sugar beets.

Salinity and alkalinity in some soils and poor surface drainage are the main limitations to growing crops on these soils. Balancing and maintaining fertility is important. Most areas have been land leveled, which improves surface drainage and irrigation efficiency. Heavy applications of manure from nearby feedlots improves productivity of the soils, especially in the saline-alkali areas.

Farms in this association average about 320 acres in size. Gravel or improved dirt roads are on most section lines. U.S. Highway 30 crosses this association in several areas. Grain for cash is sold mainly to elevators within the county. Fattened cattle are marketed through local auction sales to packers, or they are trucked to such larger terminals as Omaha.

Loamy and Silty Soils on Stream Terraces

Only one association is in this group. It consists of deep, nearly level soils that range from somewhat poorly drained to well drained.

7. *Gosper-Cozad-Silver Creek*

Deep, nearly level, somewhat poorly drained to well drained, silty and loamy soils on stream terraces

This association is on nearly level stream terraces within the Platte River Valley (see figure 4).

The association makes up about 6 percent of the county. It is about 59 percent Gosper soils, 24 percent Cozad soils, 8 percent Silver Creek soils, and 9 percent soils of minor extent. About 35 percent of these soils is affected by moderate or strong alkalinity or moderate salinity.

Gosper soils are at intermediate elevations in this association. These soils are deep and moderately well drained. They have a surface layer of dark gray loam or fine sandy loam. The subsoil is brown sandy clay loam or loam. The underlying material, at a depth of 31 inches, is pale brown sandy loam. Mixed sand and gravel is between depths of 40 and 60 inches.

Cozad soils are at the highest elevations within the landscape and are adjacent to drains. These soils are deep and moderately well drained or well drained. They have a surface layer of very dark grayish brown silt loam. The subsoil is grayish brown silt loam. The underlying material, at a depth of 24 inches, is light gray silt loam.

Silver Creek soils are at a slightly lower elevation than Gosper soils. These soils are somewhat poorly drained or moderately well drained. They have a surface layer of grayish brown silt loam or silty clay loam. The subsoil is very dark gray to grayish brown heavy silty clay loam. The underlying material, at a depth of 33 inches, is gray loam. Mixed sand and gravel is between depths of 40 and 60 inches.

Among the minor soils are Rusco, Wood River, Lex, Lawet, and Hobbs. Rusco and Wood River soils are at higher elevations than the major soils, and Lex and Lawet soils are at lower elevations than the major soils. Hobbs soils are in the narrow bottoms adjacent to stream channels.

Production of alfalfa, fattening of cattle, and growing cultivated crops are the main farming operations. A few farmers raise hogs and feed them until they are market size. Corn is the main cereal crop and it is irrigated by wells. A few acres of sugar beets are grown. Many acres of alfalfa are leased by dehydrating plants that are located along the nearby railroad line. Several hundred acres are in native grass and are used by farmers who have cow and calf herds.

The saline-alkali condition of many areas is a limitation to growing cultivated crops. Dry sand and gravel above the water table prevents alfalfa from being subirrigated during late summer in some areas. Irrigating alfalfa increases its productivity. Soils in native grass are affected by salinity and alkalinity. Each year some of these areas are land leveled and developed for irrigating crops, which improves surface drainage and lessens the salinity and alkalinity problems.

Farms in this association average about 240 acres in size. Many people who work in the nearby towns,

however, own or rent small acreages. Gravel or improved dirt roads are on most section lines. Parts of most paved highways in the county cross the area. About 40 percent of the population in the county lives within this association and the towns of Lexington and Cozad are mainly within its limits. Grain for cash is sold mainly to elevators within the county. Fattened cattle are marketed through local auction sales to packers, or they are trucked to such large terminals as Omaha. Calves are either fattened in their own feedlots or marketed as feeders within the county.

Loamy, Silty, and Sandy Soils on Bottom Land

Two associations are in this group. They consist of deep to very shallow soils over mixed sand and gravel that are poorly drained or somewhat poorly drained.

8. Lex-Lawet-Gibbon

Deep and moderately deep over sand and gravel, nearly level, somewhat poorly drained and poorly drained, loamy and silty soils on bottom land

This association is made up of nearly level soils on the bottom land of the Platte River Valley (fig. 5).

The association makes up about 3 percent of the county. It is about 32 percent Lex soils, 21 percent Lawet soils, 13 percent Gibbon soils, and 34 percent soils of minor extent and small ponds. About 17 percent of the soils are affected by excess alkalinity or salinity.

Lex soils are moderately deep over gravelly sand and are in the lowest areas of the association. These soils are somewhat poorly drained. They have a surface layer of very dark gray to gray loam. Below this is a transitional layer of gray loam. The underlying material, at a depth of 22 inches, consists of stratified loamy and silty material. Gravelly sand is at a depth of 29 inches.

Lawet soils are at intermediate elevations of the association. These soils are deep and poorly drained. They have a surface layer of very dark gray or dark gray silt loam or loam. The subsoil is gray loam. The underlying material, at a depth of 25 inches, is grayish brown loam. Mixed sand and gravel is between depths of 40 and 60 inches.

Gibbon soils are at the highest elevations in this association. These soils are deep and somewhat poorly drained. They have a surface layer of dark gray loam. The transition layer is gray clay loam. The underlying material, at a depth of 19 inches, is grayish brown and light brownish gray clay loam. Coarse sand is between depths of 40 and 60 inches.

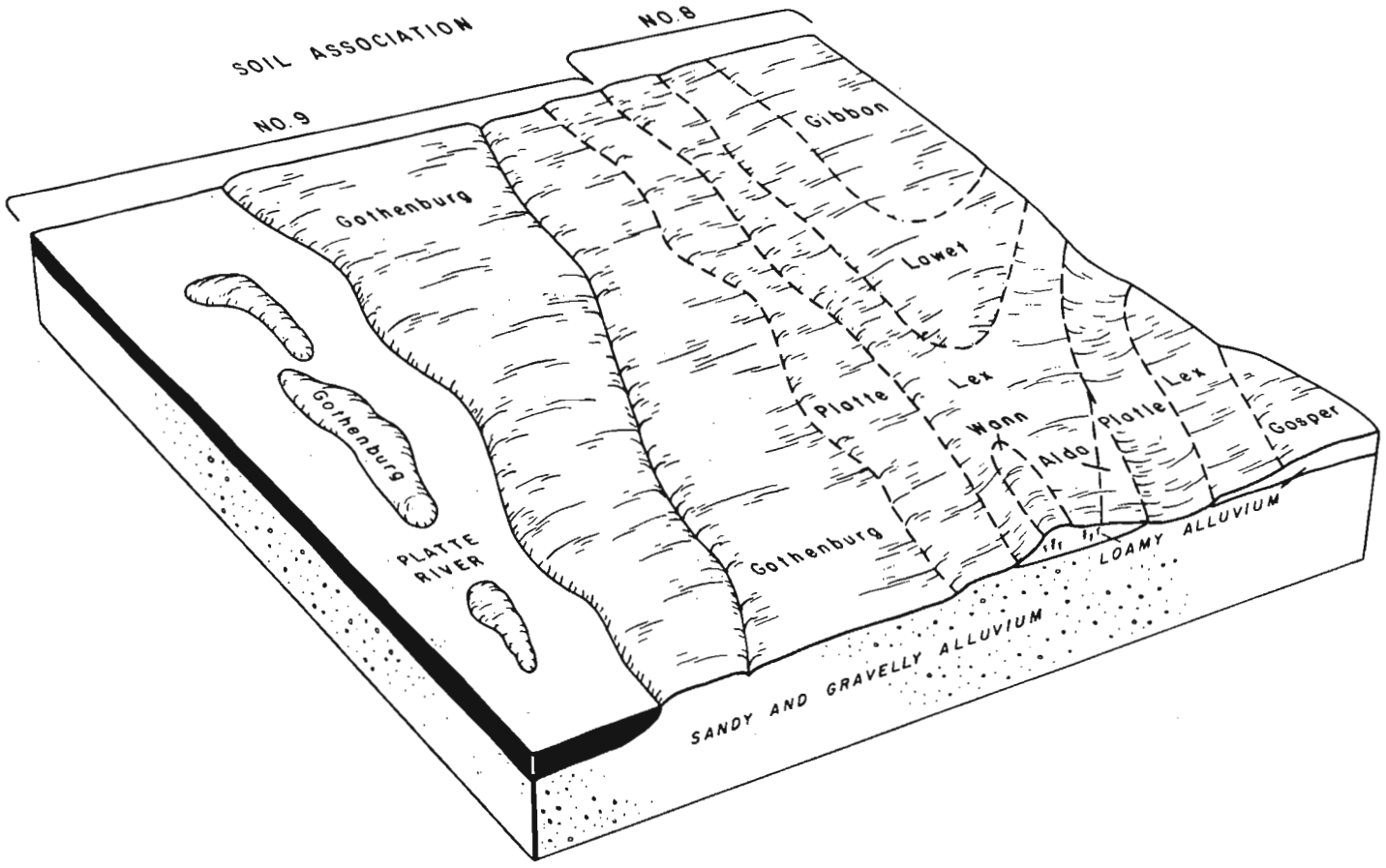

Figure 5.—**Relationship of soils and parent material in Lex-Lawet-Gibbon association and adjoining Gothenburg-Platte association.**

Among the minor soils are Platte, Alda, Wann, and Gosper. Platte soils are shallow over mixed sand and gravel and are in the lowest area of the landscape. Alda soils are slightly higher than Platte soils. Gosper soils are moderately well drained and are in the highest areas of the landscape.

Farms in this association are diversified. Many have small cow and calf herds and cattle are fattened in many feedlots. The wetter areas are grazed or used as native hayland. Soils that occupy the higher, better drained areas are cultivated. The main crops are alfalfa and corn. Corn is generally irrigated and most of the alfalfa is dryfarmed. Wells provide water for irrigation. Gravity irrigation is the most commonly used. Several center pivot systems, however, have been installed in recent years. Native prairie hay is used as winter feed for cattle.

Wetness in spring interferes with timely seedbed preparation. The saline-alkali condition in many areas limits crop growth and the choice of plants and influences management practices. Balancing and maintaining fertility is an important concern of management on cultivated soils. Maintaining desirable grasses and proper grazing use are important on rangeland.

Farms in this association average about 500 acres in size. Gravel or improved dirt roads are not located at every section line. Most tracts of land, however, have access roads. Several paved highways intersect the association. Corn grown for cash is marketed at local elevators or sold to other farmers for livestock feed. Farmers who own feedlots generally cut some of the corn for silage. Most of the alfalfa is fed on the farm, but some is sold to dehydrator plants. Fattened livestock are sold at local auctions or hauled to larger terminals.

9. *Gothenburg-Platte*

Shallow and very shallow over sand and gravel, nearly level, poorly drained and somewhat poorly drained, loamy and silty soils on bottom land

This association is made up of nearly level soils on the bottom land at the lowest elevations of the Platte River Valley. Most areas are intersected by braided channels of the Platte River to form islands. Shallow intermittent stream channels are also common. Some areas are covered with grass and willows, and other areas are barren (see figure 5).

The association makes up about 4 percent of the county. It is about 70 percent Gothenburg soils, 17 percent Platte soils, and 13 percent soils of minor extent and sand pits.

Gothenburg soils are very shallow over sand and gravel and are adjacent to channels of the Platte River. These soils are poorly drained or somewhat poorly drained. They have a surface layer ranging from loam to loamy sand. Beneath this layer is light gray coarse sand or mixed sand and gravel.

Platte soils are shallow over gravelly sand and are at slightly higher elevations than Gothenburg soils. These soils are poorly drained or somewhat poorly drained. They have a surface layer of dark gray loam. The underlying material, at a depth of 7 inches, is light gray very fine sandy loam. Depth to gravelly sand ranges from 10 to 20 inches.

The minor soils in this association are in the Lex series. They are at the highest elevations within the association. Small ponds and pits and dumps are also small inclusions.

Nearly all of the area is used as range. Some areas, however, are used as native grass hayland and a few of the better drained areas are cultivated under sprinkler irrigation systems. Corn and alfalfa are the main crops. Eastern cottonwood and willow trees are the main vegetation on the very poorly drained areas.

Farms in this association average about 800 acres. Most of these farms, however, are part of larger operations that have headquarters in adjacent associations. Sand and gravel are mined for road construction and maintenance. Ground water that is ½ foot to 5 feet below the surface fills the excavated areas. These areas are then used for fishing and other recreational activities. Some of these ponds are state owned and are open to the public. Wooded areas provide habitat for deer, and the Platte River is a resting and feeding area for migrating ducks.

Paved roads intersect this association at five locations in the county. Most of the privately owned rangeland is accessible by improved roads. Interstate Highway 80 is in some of the areas of the association.

Descriptions of the Soils

This section describes the soil series and map units in Dawson County. A soil series is described in detail, and then, briefly, each map unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the map units in that series. Thus, to get full information about any one map unit, it is necessary to read both the description of the map unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. Reaction was determined by the calcium carbonate method. The profile described in the series is representative for map units in that series. If the profile of a given map unit is different from the one described for the series, these differences are stated in describing the map unit, or they are differences that are apparent in the name of the map unit.

Preceding the name of each map unit is a symbol. This symbol identifies the map unit on the detailed soil map. Listed at the end of each description of a map unit is the capability unit, range site, and windbreak suitability group in which the map unit has been placed. The page for the description of each capability unit, range site, windbreak suitability group, or other interpretative group can be found by referring to the

"Guide to Map Units" at the back of this survey.

The approximate acreage and proportionate extent of each map unit are shown in table 1. Many of the terms used in describing soils can be found in the "Glossary" at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).

A given soil series in this county may be identified by a different name in a recently published soil survey of an adjacent county. Some soil boundaries may not match adjoining areas. Such differences result from changes in concepts of soil classification that have occurred since publication.

Alda Series

The Alda series consists of somewhat poorly drained, nearly level soils that are moderately deep over coarse sand or mixed sand and gravel. These soils formed in alluvium on bottom land. Most years the water table fluctuates between depths of 2 to 3 feet in spring and recedes to a depth of about 5 feet late in summer.

In a representative profile the surface layer is friable, dark gray loam 7 inches thick. A 4-inch transitional layer of pale brown fine sandy loam is between the surface layer and the underlying material. The underlying material is very pale brown loamy fine sand over light brownish gray loam that extends to a depth of 25 inches. Below this is white sand and very pale brown gravelly sand to a depth of 60 inches or more.

Permeability is moderately rapid in the upper part of the profile and very rapid in the mixed sand and gravel material. The available water capacity is low. Natural fertility is medium, and content of organic matter is moderately low.

Alda soils are suited to cultivated crops under dryland and irrigated soil management. They are suited to grass, trees, and shrubs, and they are suitable for recreational uses and the production of habitat for wildlife.

Representative profile of Alda loam, 0 to 2 percent

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Alda loam, 0 to 2 percent slopes	970	0.2	Holdrege silt loam, 3 to 6 percent slopes, eroded	7,400	1.2
Anselmo fine sandy loam, 0 to 1 percent slopes	2,250	.4	Hord fine sandy loam, 0 to 3 percent slopes	650	.1
Anselmo fine sandy loam, 1 to 3 percent slopes	4,100	.7	Hord silt loam, 0 to 1 percent slopes	59,000	9.5
Anselmo fine sandy loam, 3 to 6 percent slopes	1,150	.2	Hord silt loam, 1 to 3 percent slopes	13,100	2.1
Anselmo fine sandy loam, 6 to 11 percent slopes	440	.1	Hord silt loam, 3 to 6 percent slopes	3,750	.6
Anselmo loam, 0 to 1 percent slopes	380	(1)	Hord silt loam, wet substratum, 0 to 1 percent slopes	5,300	.9
Coly silt loam, 6 to 11 percent slopes, eroded	20,500	3.3	Hord silty clay loam, 0 to 1 percent slopes	1,300	.2
Coly silt loam, 11 to 20 percent slopes, eroded	29,750	4.8	Hord silty clay loam, wet substratum, 0 to 1 percent slopes	880	.1
Coly-Hobbs silt loams, 2 to 60 percent slopes	29,000	4.6	Lawet loam, ponded, 0 to 2 percent slopes	770	.1
Cozad fine sandy loam, 0 to 1 percent slopes	780	.1	Lawet silt loam, drained, 0 to 2 percent slopes	2,200	.4
Cozad silt loam, 0 to 1 percent slopes	79,000	12.7	Lawet silt loam, saline-alkali, 0 to 2 percent slopes	2,100	.3
Cozad silt loam, 1 to 3 percent slopes	15,200	2.4	Lex loam, 0 to 2 percent slopes	5,400	.9
Cozad silt loam, 3 to 6 percent slopes	7,600	1.2	Lex loam, saline-alkali, 0 to 2 percent slopes	1,250	.2
Cozad silt loam, 6 to 11 percent slopes, eroded	2,700	.4	Ovina fine sandy loam, 0 to 3 percent slopes	1,700	.3
Cozad silt loam, saline-alkali, 0 to 1 percent slopes	8,200	1.3	Platte loam, 0 to 2 percent slopes	6,600	1.1
Cozad silt loam, wet substratum, 0 to 1 percent slopes	10,600	1.7	Rusco silt loam, 0 to 1 percent slopes	7,400	1.2
Cozad silt loam, wet substratum, 1 to 3 percent slopes	680	.1	Silver Creek silt loam, 0 to 2 percent slopes	1,750	.3
Cozad silty clay loam, 0 to 1 percent slopes	4,250	.7	Silver Creek silty clay loam, 0 to 2 percent slopes	770	.1
Cozad-Hobbs silt loams, 2 to 30 percent slopes	10,200	1.6	Silver Creek complex, 0 to 2 percent slopes	1,850	.3
Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes	1,100	.2	Uly silt loam, 11 to 15 percent slopes	36,000	5.7
Elsmere loamy fine sand, saline-alkali, 0 to 3 percent slopes	1,250	.2	Uly-Coly silt loams, 15 to 30 percent slopes	98,500	15.8
Fillmore silt loam, 0 to 2 percent slopes	950	.2	Uly-Holdrege silt loams, 6 to 11 percent slopes	13,400	2.2
Fillmore silt loam, drained, 0 to 2 percent slopes	380	(1)	Uly-Holdrege-Coly silt loams, 6 to 11 percent slopes, eroded	3,600	.6
Gibbon loam, 0 to 2 percent slopes	2,250	.4	Valentine loamy fine sand, 0 to 3 percent slopes	2,750	.4
Gosper fine sandy loam, 0 to 2 percent slopes	210	(1)	Valentine loamy fine sand, 3 to 6 percent slopes	2,400	.4
Gosper loam, 0 to 2 percent slopes	16,400	2.6	Valentine loamy fine sand, rolling	2,650	.4
Gosper loam, saline-alkali, 0 to 2 percent slopes	9,600	1.5	Wann fine sandy loam, saline-alkali, 0 to 2 percent slopes	296	(1)
Gothenburg soils, 0 to 2 percent slopes	19,000	3.0	Wann loam, 0 to 2 percent slopes	570	.1
Hall silt loam, 0 to 1 percent slopes	4,100	.7	Wood River silt loam, 0 to 1 percent slopes	1,100	.2
Hall silt loam, 1 to 3 percent slopes	1,850	.3	Wood River complex, 0 to 2 percent slopes	7,940	1.3
Hall silt loam, terrace, 0 to 1 percent slopes	9,000	1.4	Gravel pits	1,400	.2
Hall silt loam, wet substratum, 0 to 1 percent slopes	1,500	.2	Spoil banks	310	(1)
Hobbs silt loam, 0 to 2 percent slopes	11,000	1.8	Water areas less than 40 acres each	380	(1)
Holdrege silt loam, 0 to 1 percent slopes	7,800	1.3			
Holdrege silt loam, 1 to 3 percent slopes	13,700	2.2	Total land area	624,256	100.0
Holdrege silt loam, 3 to 6 percent slopes	1,950	.3	Water areas more than 40 acres each	4,300	

[1]Less than 0.05 percent.

slopes, in native grass, 125 feet east and 800 feet north of the southwest corner of sec. 33, T. 11 N., R. 24 W.:

A1—0 to 7 inches; dark gray (10YR 4/1) loam, dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; violent effervescence (9 percent CaCO3); mildly alkaline; clear wavy boundary.

AC—7 to 11 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; violent effervescence (6 percent CaCO3); mildly alkaline; clear smooth boundary.

C1—11 to 20 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; many medium distinct brown (7.5YR 4/4 moist) mottles; massive; soft, very friable; violent effervescence (4 percent CaCO3); mildly alkaline; abrupt smooth boundary.

C2—20 to 25 inches; light brownish gray (2.5YR 6/2) loam, grayish brown (2.5Y 5/2) moist; many medium distinct brown (7.5YR 4/4 moist) mottles; massive; slightly hard, friable; violent effervescence (5 percent CaCO3); mildly alkaline; abrupt smooth boundary.

IIC3—25 to 41 inches; white (10YR 8/2) medium and coarse sand, light brownish gray (10YR 6/2) moist; single grained; loose; neutral; abrupt smooth boundary.

IIC4—41 to 60 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; free water at a depth of 51 inches; neutral.

The A horizon ranges from 6 to 10 inches in thickness and is very dark grayish brown to gray. Texture is dominantly loam, but is very fine sandy loam in a few places. The soil is mildly alkaline or moderately alkaline above the mixed sand and gravel material. Stratified layers of loamy fine sand, fine sandy loam, very fine sandy loam, and loam are common in the C1 and C2 horizons. Depth to coarse sand or to mixed sand and gravel is between 20 and 40 inches.

Alda soils in Dawson County have a thinner A horizon than is defined in the range for the series. This difference, however, does not alter the use or behavior of the soils.

In the landscape, Alda soils are near Lawet, Lex, Wann, and Platte soils. They are coarser textured below the upper part of the C horizon than Lex and Lawet soils. Alda soils are shallower to coarse sand or mixed sand and gravel than Lawet and Wann soils, but are deeper to coarse material than Platte soils.

Ad—Alda loam, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Areas range from 20 to 100 acres in size. In some areas the soil lacks a transitional layer between the surface layer and the underlying material. It is strongly alkaline and slightly affected or moderately affected by excess soluble salt in the surface layer and upper part of the underlying material in 5 to 10 percent of the acreage.

Included with this soil in mapping are small areas of Lex loam. Areas of Platte soils are common in shallow drains that dissect the map unit.

Wetness in spring commonly delays tillage. The soil also warms up more slowly than better drained soils. Late in summer when the water table is lowest, the soil is droughty under dryland management. Flooding is also a hazard after heavy rain, especially in the many narrow drainageways that dissect areas of this unit. Available phosphate is low, because excess lime causes phosphate to be unavailable to plants. Runoff is slow.

Most of the acreage of this soil is in native grass, mainly because it is commonly adjacent to larger areas of less productive soils. The main cultivated crops are corn, alfalfa, and grain sorghum. Most areas are irrigated. Capability units IIIw-4 dryland, IIIw-7 irrigated; Subirrigated range site; windbreak suitability group 2.

Anselmo Series

The Anselmo series consists of deep, well drained soils that are nearly level to strongly sloping. These soils formed in wind deposited loamy and sandy material on stream terraces and uplands.

In a representative profile the surface layer is very friable, gray and grayish brown fine sandy loam 12 inches thick. The subsoil is very friable, pale brown fine sandy loam 15 inches thick. The underlying material is light brownish gray loamy fine sand to a depth of 42 inches, light brownish gray very fine sandy loam to a depth of 48 inches, and pale brown loamy fine sand to a depth of 60 inches or more.

Permeability is moderately rapid, and the available water capacity is moderate. Content of organic matter is moderately low, and natural fertility is medium. These soils release moisture readily to plants.

Anselmo soils are well suited to cultivation and respond well to irrigation. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Anselmo fine sandy loam, 1 to 3 percent slopes, in a cultivated field, 240 feet south and 1,200 feet west of the northeast corner of sec. 19, T. 12 N., R. 24 W.:

Ap—0 to 8 inches; gray (10YR 5/1) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A12—8 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

B2—12 to 27 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, very friable; neutral; clear smooth boundary.

C1—27 to 42 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grained; soft, very friable; neutral; clear smooth boundary.

C2—42 to 48 inches; light brownish gray (10YR 6/2) very fine sandy loam; grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; neutral; clear smooth boundary.

C3—48 to 60 inches; pale brown (10YR 6/3) loamy fine sand, grayish brown (10YR 5/2) moist; single grained; soft, very friable; neutral.

The A horizon is 7 to 20 inches in thickness and ranges from gray to dark grayish brown. It is dominantly fine sandy loam and loam. The B horizon ranges from 8 to 18 inches in thickness and from pale brown to grayish brown. The C horizon is mainly loamy fine sand and fine sandy loam, but very fine sandy loam and loam are common below a depth of 40 inches.

In the landscape, Anselmo soils are near Valentine, Cozad, and Ovina soils. Unlike Valentine soils, Anselmo soils have a B horizon and, in addition, have less sand in the layer directly below the A horizon. Anselmo soils have more sand and less silt in the B horizon than Cozad soils and are better drained than Ovina soils.

An—Anselmo fine sandy loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces. Areas range from 5 to 500 acres in size. The soil has the profile described as representative of the series, except the surface layer and subsoil are slightly thicker. Areas of a buried silty soil between a depth of 2 and 5 feet make up about 20 percent of the unit.

The main concerns of management are controlling soil blowing, maintaining the content of organic matter and improving fertility. Runoff is slow.

Nearly all the acreage of this soil is cultivated. A large part is irrigated. Corn, alfalfa, grain sorghum, and wheat are the main crops. Capability units IIe-3 dryland, IIe-8 irrigated; Sandy range site; windbreak suitability group 3.

AnB—Anselmo fine sandy loam, 1 to 3 percent slopes. This gently undulating soil is mainly on stream terraces. A few small areas are on uplands. Areas range from 5 to 700 acres in size. The soil has the profile described as representative of the series. Areas of a buried silty soil between a depth of 2 and 5 feet make up about 15 percent of the unit. Also included are areas that have a silt loam subsoil.

The main concerns of management are controlling soil blowing, maintaining the content of organic matter, and improving fertility. Runoff is slow.

Nearly all the acreage of this soil is cultivated. A large part is irrigated. The gently undulating slopes, however, make designing a gravity irrigation system difficult and expensive to install. Some areas are irrigated by a sprinkler system. Corn, alfalfa, grain sorghum, and wheat are the main crops. Capability units IIe-3 dryland, IIe-8 irrigated; Sandy range site; windbreak suitability group 3.

AnC—Anselmo fine sandy loam, 3 to 6 percent slopes. This gently sloping soil is on stream terraces. Areas range from 5 to 500 acres in size. The soil has the profile described as representative of the series, but the surface layer is lighter colored and slightly coarser in texture. Areas of a buried silty soil between a depth of 2 and 5 feet make up about 10 percent of the unit and occupy the lower part of the landscape.

Where the surface is not adequately protected, soil blowing is the main hazard. Water erosion is also a hazard. Maintaining the content of organic matter and improving fertility are other management concerns. Runoff is medium.

Most of the acreage of this soil is cultivated, but a small part is in native grass. Corn, grain sorghum, and alfalfa are the main crops. The soil, however, is suited to most commonly grown crops. Less than one-third of the cultivated acreage is irrigated. Sprinkler irrigation is mainly used. Trees are successfully grown in windbreaks. This soil also provides habitat for wildlife. Capability units IIIe-3 dryland, IIIe-8 irrigated; Sandy range site; windbreak suitability group 3.

AnD—Anselmo fine sandy loam, 6 to 11 percent slopes. This strongly sloping soil occupies ridges and side slopes. It is on stream terraces and breaks between the silty uplands and stream terraces. Areas range from 10 to 300 acres in size. The soil has the profile described as representative of the series, except the surface layer is lighter colored and in places it is slightly coarser textured. This is a result of soil blowing that has removed part of the organic matter and also some of the finer textured soil material.

Included with this soil in mapping are small areas of Uly and Holdrege soils adjacent to the silty uplands.

Where the soil is cultivated, soil blowing is the main hazard. Areas of light colored soils have low fertility. Water erosion is also a hazard, especially on long slopes adjacent to the silty uplands. Small gullies are common, but are generally plowed in with each successive tillage. Runoff is medium.

About 50 percent of the acreage of this soil is cultivated. The main crops are corn, grain sorghum, wheat, and alfalfa. Only a few areas are irrigated. More than 50 percent of the acreage in permanent grass has been previously cultivated. Capability units IVe-3 dryland, IVe-8 irrigated; Sandy range site; windbreak suitability group 3.

Ap—Anselmo loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces and is lower in elevation than the surrounding soils. Areas range from 5 to about 75 acres in size. The soil has the profile described as representative of the series, except the surface layer is loam in texture and is slightly thicker. The surface layer is very fine sandy loam in some places. Areas of a buried silty soil between a depth of 2 and 5 feet make up about 20 percent of the unit.

Soil blowing is the main hazard. The soil is well suited to irrigation and it is easily worked. Maintaining fertility and efficient management of water are also concerns of management. Runoff is slow.

Almost all the acreage of this soil is cultivated and a large part is irrigated. The main crops are corn, grain sorghum, and alfalfa. Capability units IIc-1 dryland, I-8 irrigated; Sandy range site; windbreak suitability group 4.

Coly Series

The Coly series consists of deep, well drained and somewhat excessively drained soils that are strongly sloping to very steep (fig. 6). These soils are weakly developed and formed in loess on uplands.

In a representative profile the surface layer is friable, grayish brown silt loam 5 inches thick. The underlying material, to a depth of 60 inches, is pale brown silt loam.

Permeability is moderate, and the available water capacity is high. Content of organic matter and natural fertility are low.

If cultivated, Coly soils are highly susceptible to water erosion. The strongly sloping soils are suited to limited use for cultivated crops. Because of the very severe hazard of erosion, the moderately steep, steep, and very steep soils are not suited to cultivation. These soils are suited to grass, and they are suitable for recreational uses and the production of habitat for wildlife. Where the slope is less than 15 percent, the soils can be used for trees and shrubs.

Representative profile of Coly silt loam in an area of Uly-Coly silt loams, 15 to 30 percent slopes, in a

Figure 6.—Profile of Coly silt loam, a deep, weakly developed soil that formed in loess.

field of native grass, 2,400 feet east and 2,500 feet north of the southwest corner, sec. 16, T. 11 N., R. 21 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

C1—5 to 15 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; weak subangular blocky structure; slightly hard, friable, violent effervescence (3 percent CaCO3); mildly alkaline; gradual smooth boundary.

C2—15 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; violent effervescence (3 percent CaCO3); mildly alkaline.

The A horizon ranges from 3 to 6 inches in thickness. It is mainly grayish brown, but is light gray in eroded areas. A transitional layer between the A and C horizons is present in some areas. The C horizon ranges from light gray to pale brown. Depth to lime is less than 10 inches.

In the landscape, Coly soils are near Uly and Holdrege soils. They have a thinner A horizon than Uly or Holdrege soils, and they have lime higher in the profile than those soils. Unlike the nearby soils, Coly soils lack a B horizon.

CoD2—Coly silt loam, 6 to 11 percent slopes, eroded. This strongly sloping soil occupies short hillsides and narrow, rounded ridgetops of the loessial uplands. Areas range from 10 to 500 acres in size. The soil has the profile described as representative of the series, except the surface layer is lighter colored and is mildly alkaline.

Included with this soil in mapping are areas of Uly and Holdrege soils, which make up about 25 percent of the area locally, but not more than 10 percent of the total acreage. Also included are small areas of moderately steep Coly silt loam.

Water erosion is the main hazard if this soil is cultivated. Where the surface is not adequately protected, soil blowing is a hazard. Small gullies are common. Some plant nutrients, mainly phosphorus, are low where the soil is calcareous at the surface. The soil is also low in nitrogen. Where crops are irrigated, efficient water management and control of erosion are important concerns in management. Runoff is rapid.

More than 50 percent of the acreage of this soil is cultivated. Only a few areas are irrigated. Corn, grain sorghum, wheat, and alfalfa are the main crops. Some areas have been reseeded to native grass. Capability unit IVe-9 dryland, IVe-6 irrigated; Limy Upland range site; windbreak suitability group 5.

CoE2—Coly silt loam, 11 to 20 percent slopes, eroded. This moderately steep soil is on side slopes of intermittent drainageways and on ridgetops of the loessial uplands. Areas range from 10 to about 500 acres in size. The soil has the profile described as representative of the series, except the surface layer is lighter colored and is mildly alkaline.

Included with this soil in mapping are small areas of strongly sloping Coly silt loam. Small areas make up less than 20 percent of the mapping unit. Also included are areas of Hobbs silt loam on the bottoms of narrow drainageways of the uplands.

Water erosion and the resulting siltation downstream are very severe hazards if this soil is cultivated. Maintaining desirable grasses is a concern in management on reseeded areas. Runoff is rapid.

Nearly all the acreage of this soil is presently cultivated or has been cultivated. Because of the severe hazard of erosion, this soil is not suited to the commonly grown crops, and each year additional areas are seeded to native grass. Capability unit VIe-9 dryland; Limy Upland range site; windbreak suitability group 10.

CpG—Coly-Hobbs silt loams, 2 to 60 percent slopes. In this map unit, the Coly soil is on side slopes and ridges where slopes range from 20 to 60 percent. The Hobbs soil is on the bottom land of narrow drainageways where slopes range from 2 to 6 percent. The side slopes commonly have a succession of short, vertical exposures or "cat steps." The occasionally flooded bot-

tom land ranges from 30 to 200 feet wide. Areas range from 15 to several thousand acres in size.

About 65 percent of this unit is Coly soil and 20 percent is Hobbs soil. The Coly soil in this unit has the profile described as representative of the Coly series, except the surface layer is thinner, is lighter colored, and has slightly less clay throughout the profile. The Hobbs soil has the profile described as representative of the Hobbs series, except a 1- to 3-inch, pale brown, calcareous layer of silt loam is on the surface.

Included with this unit in mapping were small areas of moderately steep Uly soils on ridges. Reddish brown loess is exposed at the base of the hills in a few places.

Water erosion is a very severe hazard. The narrow bottoms of the drainageways are flooded for short periods. The steep and very steep topography makes uniform distribution of grazing difficult. Runoff is very rapid.

Practically all of the acreage of this mapping unit is in native grass and is used as rangeland. Most of the acreage is too steep for cultivation. Areas of Hobbs soil on the bottoms could be cultivated, however, if the areas are large enough. A few trees grow in scattered areas. Capability unit VIIe-7 dryland; windbreak suitability group 10. Coly soil in Thin Loess range site and Hobbs soil in Silty Overflow range site.

Cozad Series

The Cozad series consists of deep, well drained and moderately well drained soils that are nearly level to steep. These soils formed in loess and alluvium on stream terraces and foot slopes.

In a representative profile the surface layer is friable, very dark grayish brown silt loam 15 inches thick. The weakly developed subsoil is friable, grayish brown silt loam about 9 inches thick. The underlying material, to a depth of 60 inches, is light gray silt loam. Lime occurs below a depth of 24 inches.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. These soils release moisture readily to plants. In the saline-alkali soil permeability is moderately slow, and the available water capacity is moderate. Content of organic matter is moderately low, and natural fertility is low.

Cozad soils are suited to cultivated crops and to trees and shrubs where the slope is less than 11 percent. The hazard of erosion is too severe on steeper slopes for these uses. Crops can be grown under both dryland or irrigation management. These soils are also suited to grass, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Cozad silt loam, 0 to 1 percent slopes, in a cultivated field 150 feet north and 1,400 feet east of the southwest corner of sec. 31, T. 9 N., R. 21 W.:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A12—7 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; neutral; gradual wavy boundary.

B2—15 to 24 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable; mildly alkaline; gradual wavy boundary.

C1—24 to 35 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—35 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, friable; violent effervescence; mildly alkaline.

The A horizon ranges from 7 to 16 inches in thickness and from very dark grayish brown to grayish brown. It is neutral or slightly acid. The B horizon is 6 to 10 inches in thickness and is grayish brown or light brownish gray. Depth to lime ranges from 20 to 50 inches. A buried dark colored soil and a thin sandy layer are common between a depth of 3 and 5 feet.

In the landscape, Cozad soils are near Rusco, Hall, and Hord soils. Cozad soils have a B horizon that is not as fine textured as the B2 horizon in Rusco or Hall soils. The B horizon in Cozad soils is also lighter colored than at comparable depths in Hall and Hord soils.

Cr—Cozad fine sandy loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces on the north side of the Platte River. Most years the water table fluctuates between a depth of 8 to 10 feet in spring and to a depth of about 15 feet late in summer. Areas range from 10 to 200 acres in size. The soil has the profile described as representative of the series, except the surface layer is typically fine sandy loam.

Included with this soil in mapping are areas of soils that have a loamy fine sand surface layer that make up about 30 percent of the unit. Also included are small nearly level areas of Anselmo fine sandy loam and Cozad silt loam.

Soil blowing is the main hazard. Maintaining the content of organic matter and fertility are important concerns in management. The coarser textured and lightest colored areas of this soil have low fertility. Runoff is slow.

Nearly all the acreage of this soil is cultivated and developed for irrigation. Alfalfa and corn are the main crops. Alfalfa, trees, and other deep rooted plants obtain moisture from the water table. Capability units IIe-3 dryland, IIe-5 irrigated; Silty Lowland range site; windbreak suitability group 3.

Cs—Cozad silt loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces along the major streams in the county. Areas range from 10 to 1,000 acres in size. The soil has the profile described as representative of the series. Typically, the soil is silt loam. Along Stump Ditch, however, areas of very fine sandy loam are more common. Areas where the water table is as high as 8 to 15 feet below the surface are in the Platte River Valley.

Included with this soil in mapping are small areas of Cozad silt loam, wet substratum, and the very gently sloping Cozad silt loam.

Lack of sufficient moisture is the main limitation in dryfarming areas. Where the surface is not protected, soil blowing is a hazard. Land leveling has exposed the

light colored underlying material in some areas, and these areas are low in fertility unless properly fertilized. Runoff is slow.

Nearly all the acreage of this soil is cultivated and irrigated. This is one of the best soils in Dawson County for growing the commonly cultivated crops. Most of the irrigated land has been leveled. Some small or odd shaped areas are in grass or are farmed under dryland management. Corn, grain sorghum, and alfalfa are the main crops. Alfalfa and trees obtain moisture where the water table is above a depth of 15 feet. Capability units IIc-1 dryland, I-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

CsB—Cozad silt loam, 1 to 3 percent slopes. This very gently sloping soil is on stream terraces along major streams in the county. It occupies long narrow tracts that range from 10 to 300 acres in size.

Included with this soil in mapping are a few small areas of nearly level and gently sloping Cozad silt loam and very gently sloping Hord silt loam. Also included are areas of soils, mainly near or adjacent to Anselmo and Valentine soils, that have a fine sandy loam or loamy fine sand surface layer.

If the surface is not adequately protected, soil blowing is a hazard. Land leveling generally is needed for proper irrigation management. Leveling has exposed the light colored underlying material in some areas, and these areas are low in fertility unless properly fertilized. Water erosion is a minor problem. Runoff is slow.

Nearly all the acreage of this soil is cultivated and developed for irrigation. Corn, grain sorghum, and alfalfa are the main crops. Some small or odd shaped areas are in grass or are farmed under dryland management. Capability units IIe-1 dryland, IIe-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

CsC—Cozad silt loam, 3 to 6 percent slopes. This gently sloping soil has convex slopes. It is on stream terraces, breaks to stream terraces, and foot slopes. Areas are long and narrow and range from 5 to 80 acres in size. The soil has the profile described as representative of the series, except the surface layer and subsoil are slightly thinner. In some areas the light colored subsoil or the underlying material is exposed at the surface or is mixed with the darker surface layer.

Included with this soil in mapping are small narrow areas of Hobbs silt loam in bottoms of drainageways that are occasionally flooded.

Water erosion is the main hazard in cultivated areas. Where the surface layer is not adequately protected, soil blowing is also common. Areas that are lightest in color have low fertility. These soils are easy to work. Runoff is medium.

Most of the acreage of this soil is cultivated, and some areas are irrigated. Corn, grain sorghum, and alfalfa are the main crops. A few areas are in native grass or have been reseeded to tame grass. Capability units IIIe-1 dryland, IIIe-6 irrigated; Silty range site; windbreak suitability group 4.

CsD2—Cozad silt loam, 6 to 11 percent slopes, eroded. This strongly sloping soil is on short side slopes of drainageways that cross stream terraces or on long, narrow ridges on stream terraces. Areas range from 5 to 600 acres in size. The soil has the profile described as representative of the series, except the surface layer and subsoil are thinner. In places, the subsoil or underlying material are exposed at the surface as a result of water erosion. In some areas the soil has a very fine loam profile and thin layers of fine sandy loam in the underlying material. In some areas north of the Platte River a few places where the water table is between a depth of 4 and 8 feet are present.

Included with this soil in mapping are small narrow areas of Hobbs silt loam in bottoms of drainageways.

Water erosion is a very severe hazard in cultivated areas. Runoff is rapid or medium depending on the vegetative cover. Areas that are lightest in color have low fertility.

Most of the acreage of this soil is cultivated, and a few areas are irrigated. Irrigated areas are generally part of a larger field of other soils. Corn, grain sorghum, alfalfa, and wheat are the main crops. A few areas are in native grass or have been reseeded to tame grass. Capability units IVe-1 dryland, IVe-6 irrigated; Silty range site; windbreak suitability group 4.

Ct—Cozad silt loam, saline-alkali, 0 to 1 percent slopes. This nearly level, moderately well drained soil is on stream terraces in the Platte River Valley. Many small depressions are in areas of native grass. Alkali sacaton and inland saltgrass are dominant in the depressions. These areas are higher in salinity and alkalinity than higher areas outside the depressions. Cultivated areas have a scabby appearance. When dry, those areas that are highly saline and alkaline are cloddy and light gray in color. Some areas are barren. Areas range from 10 to 1,000 acres in size. The soil has the profile described as representative of the series, except it is affected by varying amounts of soluble salts and alkalinity and some areas have a thinner surface layer.

In cultivated areas, about 70 percent of the acreage is free of excessive salts and crops show little or no evidence of injury. The water table is at a depth of 4 to 6 feet in spring and ranges to a depth of 15 feet late in summer. The remaining 30 percent contains enough excess salts, from .15 to .65 percent soluble salts or strongly alkaline, to restrict the growth of most crops (fig. 7). In these areas, the highest concentration of soluble salts is in the upper 16 inches of the soil. Some areas remain in native grass, and saline-alkali soils in these areas range from 30 to 65 percent.

Included with this soil in mapping were small areas of nearly level Wood River silt loam, Gosper loam, and very gently sloping areas of Cozad silt loam.

Runoff is slow or very slow. The salt-affected areas of this soil contain excess salts in amounts that are detrimental to most cultivated crops. The soil absorbs moisture slowly and commonly has poor tilth. Areas free of excess salts have few limitations when irrigation is used. Soil blowing is a hazard if the surface is not protected. If cultivated, both areas of this soil are managed as one, except that amendments of barn-

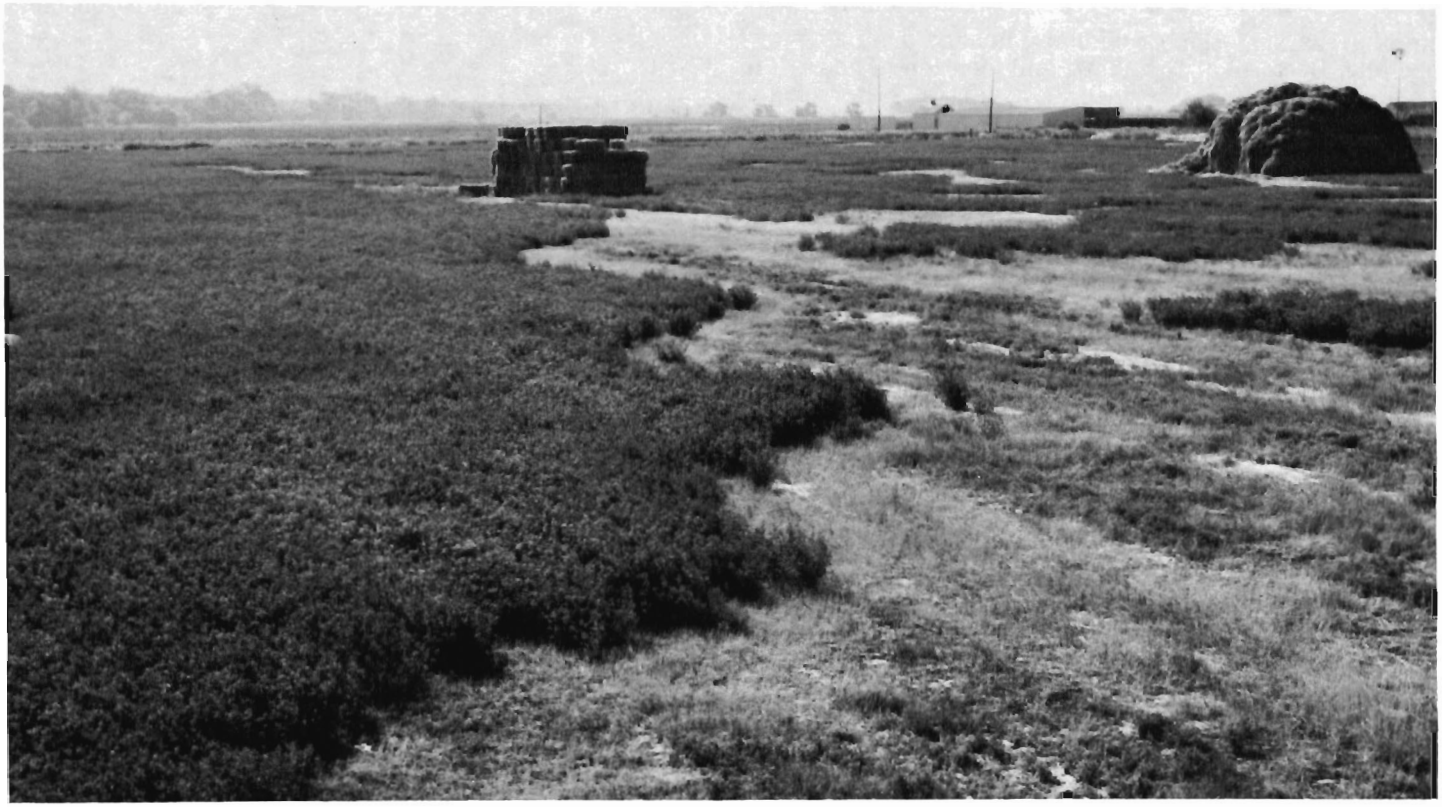

Figure 7.—Alfalfa on Cozad silt loam, saline-alkali, 0 to 1 percent slopes. The most strongly affected areas are barren.

yard manure and fertilizer are applied more heavily to the saline-alkali areas.

Most of the acreage of this soil is cultivated and irrigated. Corn, sugar beets, and alfalfa are the main crops. Some areas are in native grass. Capability units IVs-1 dryland, IIIs-6 irrigated; Saline Lowland range site; windbreak suitability group 8.

Cv—Cozad silt loam, wet substratum, 0 to 1 percent slopes. This nearly level, moderately well drained soil is on stream terraces in the Platte River Valley. Areas range from 10 to 800 acres in size. The soil has the profile decribed as representative of the series, except the water table is higher. Most years it ranges from a depth of 3 or 4 feet early in spring to a depth of 8 feet late in summer. Depth to lime is typically 8 inches, but ranges from the surface to a depth of 15 inches. About 40 percent of this map unit has a silty clay loam subsoil that is 2 to 6 inches thick.

Included with this soil in mapping are areas of well drained Cozad silt loam on higher elevation of the landscape and Gosper loam on lower elevations. Small saline or alkali areas are shown on the detailed map by special spot symbols.

Wetness in spring delays farming operations and is the main hazard. Alfalfa, trees, and other deep rooted plants obtain moisture from the water table.

Nearly all the acreage of this soil is cultivated and developed for irrigation. Alfalfa, corn, and grain sorghum are the main crops. Most of the small or odd shaped areas are in grass or are dryfarmed. Capability units IIw-4 dryland, IIw-6 irrigated; Subirrigated range site; windbreak suitability group 2.

CvB—Cozad silt loam, wet substratum, 1 to 3 percent slopes. This very gently sloping, moderately well drained soil is on side slopes of drainageways that cross stream terraces and on breaks to stream terraces in the Platte River Valley. Areas are long and narrow and range from 5 to 200 acres in size. The soil has the profile described as representative of the series, except the water table is higher. Most years it is at a depth of 3 or 4 feet early in spring and ranges to a depth of 8 feet in fall. The soil in the bottom of drains has a surface layer more than 20 inches thick. In spring, areas where salt accumulates on the surface are common. Depth to lime is typically about 8 inches, but ranges from surface level to a depth of 15 inches.

Included with this soil in mapping are areas of well drained Cozad silt loam that is on the higher elevations of the landscape and on side slopes of drainageways.

Water flows in the drainageways during some years and interferes with farming operations. Wetness in spring is also a hazard. Alfalfa, trees, and other deep rooted plants, however, obtain moisture from the water table. This is especially beneficial in dry years. Runoff is slow.

Most of the acreage of this soil is cultivated. A large part of the acreage is developed for irrigation. Alfalfa,

corn, and grain sorghum are the main crops. Some small areas near the occasionally flooded drainageways are idle. Because of the shape and location of these idle areas, much of it is farmed as a part of other larger mapping units. Capability units IIIw-4 dryland, IIIw-6 irrigated; Subirrigated range site; windbreak suitability group 2.

Cx—Cozad silty clay loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. Areas range from 10 to 300 acres in size. The soil has the profile described as representative of the series, except the surface layer is silty clay loam. The water table is at a depth of 8 or 10 feet in spring and is at a depth of 15 feet late in summer.

Included with this soil in mapping are areas of nearly level Hord silty clay loam.

Lack of sufficient moisture is the main limitation in dryfarmed areas. When moist, the soil is somewhat difficult to till because the surface layer is sticky. Water stands in some areas after heavy rain and delays cultivation. Runoff is slow.

Nearly all the acreage of this soil is cultivated. A large part of the acreage has been developed for irrigation. Corn, alfalfa, and grain sorghum are the main crops. Alfalfa, trees, and other deep rooted plants commonly obtain moisture from the water table. Capability units IIc-1 dryland, I-3 irrigated; Silty Lowland range site; windbreak suitability group 1.

CyF—Cozad-Hobbs silt loams, 2 to 30 percent slopes. In this map unit, the moderately steep and steep Cozad soil is on side slopes of streams that cross stream terraces and the nearly level to gently sloping Hobbs soil is on adjacent bottom land.

Where the streams are deeply entrenched, the Cozad soil makes up as much as 60 percent of this map unit. However, where slopes are short, it makes up as little as 25 percent. The Hobbs soil makes up the remaining 40 to 75 percent. The Cozad soil has the profile described as representative of the series. The Hobbs soil has the profile described as representative of the series, except the stratified layers are thicker and lighter in color.

The Hobbs soil in this complex generally has a water table below a depth of 7 feet. In some areas where these soils intersect stream terraces in the Platte River Valley, however, the water table is at a depth of 3 to 8 feet. Lime is above a depth of 3 feet and a few "salty spots" are common on soils that have the higher water table.

Water erosion is the main hazard of the sloping Cozad soils. Because of the hazard of flooding on the bottom land, the hazard of erosion on side slopes, and inaccessibility to areas by machinery, cultivation of these soils is difficult or is generally not feasible. The bottom land is flooded at a frequency of about 1 to 5 years. Runoff is rapid on the side slopes and slow or medium on the bottom land.

This map unit is nearly all in native grass and trees. Areas are used for range and also provide natural shelter for livestock. These areas are also suited for use as habitat for wildlife and for recreational uses. Capability unit VIe-7 dryland; windbreak suitability group 10. Cozad soil in Silty range site and Hobbs soil in Silty Overflow range site.

Elsmere Series

The Elsmere series consists of deep, moderately well drained and somewhat poorly drained soils that are nearly level or very gently sloping. These soils formed in wind-deposited sandy material that was deposited over loamy alluvium on stream terraces. Most years the seasonal water table ranges from a depth of 2 or 3 feet in spring to a depth of 6 feet late in summer.

In a representative profile the surface layer is dark grayish brown loamy fine sand 11 inches thick. Below this is a transitional layer of grayish brown loamy fine sand about 6 inches thick. The underlying material is grayish brown loamy fine sand to a depth of 36 inches, grayish brown loam to a depth of 41 inches, gray fine sandy loam to a depth of 59 inches, and pale brown loamy fine sand to a depth of 60 inches or more.

Permeability is rapid in the sandy upper part of the underlying material and moderately rapid in the loamy part. In the saline-alkali soil, it is moderately rapid throughout the profile. The available water capacity is moderate. Natural fertility is low, and content of organic matter is moderately low.

Elsmere soils are suited to both dryland and irrigated crops. They are suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes, in a cultivated field, 1,300 feet north and 1,300 feet west of the southeast corner, sec. 8, T. 9 N., R. 22 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark brown (10YR 2/2) moist; weak fine granular structure; loose; medium acid; abrupt smooth boundary.

A12—7 to 11 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose; medium acid; clear smooth boundary.

AC—11 to 17 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; loose; slightly acid; clear smooth boundary.

C1—17 to 36 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; violent effervescence (2 percent $CaCO_3$); mildly alkaline; abrupt smooth boundary.

IIC2—36 to 41 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable; violent effervescence (5 percent $CaCO_3$); mildly alkaline; clear smooth boundary.

IIAb—41 to 59 inches; gray (10YR 5/1) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; violent effervescence (7 percent $CaCO_3$); mildly alkaline; clear smooth boundary.

IIC3—59 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; many medium distinct strong brown (7.5YR 5/6 moist) mottles; single grained; loose; violent effervescence (1 percent $CaCO_3$); free water at a depth of 6½ feet; neutral.

The A horizon ranges from very dark gray to grayish brown and is 10 to 20 inches in thickness. The AC horizon ranges from 3 to 10 inches in thickness and ranges from medium acid to neutral in reaction. The lower part of the C horizon is mainly loam or fine sandy loam, but

in places is loamy fine sand, sandy clay loam, or clay loam. Strong brown or brown mottles are at a depth of 40 to 60 inches.

Elsmere soils in Dawson County have a loamy texture in the lower part of the substratum, which is not typical of the series. They are also more acid and lack mottles to a depth of 40 inches as defined in the range of the series. These differences, however, do not alter the use or behavior of the soils.

In the landscape, Elsmere soils are near Anselmo, Ovina, and Valentine soils. They are more poorly drained than Anselmo and Valentine soils. They have a thicker and slightly darker colored surface layer than Valentine soils. Elsmere soils are coarser textured above a depth of 30 inches than Anselmo and Ovina soils.

Em—Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes. This deep, moderately well drained soil is on stream terraces in the Platte River Valley. Areas range from 15 to 100 acres in size. The soil has the profile described as representative of the series. The loamy underlying material is typically at depths between 30 and 60 inches. About 15 percent of the acreage is loamy between a depth of 10 and 30 inches and 20 percent is loamy below a depth of 60 inches. The water table is commonly at a depth of 5 feet early in spring, but is below a depth of 8 feet in some places during dry seasons, generally late in summer.

Included with this soil in mapping are small areas of nearly level to gently sloping Valentine loamy fine sand on higher elevations and Ovina fine sandy loam.

Wetness in low areas is a hazard during wet seasons. The water table, however, commonly benefits alfalfa, trees and other deep rooted plants. Unless the surface is protected, soil blowing is a hazard. Natural fertility is particularly low in places where land leveling has removed the surface layer. Land leveling is necessary, however, for gravity irrigation.

Most of the acreage of this soil is cultivated and a large part is irrigated. Corn, grain sorghum, and alfalfa are the main crops. A few inaccessible areas on islands in the Platte River are in native grass. This soil is used as feeding areas for some kinds of waterfowl. Capability unit IVw-5 dryland, IVw-11 irrigated; Subirrigated range site; windbreak suitability group 2.

Es—Elsmere loamy fine sand, saline-alkali, 0 to 3 percent slopes. This deep soil is nearly level and very gently sloping on stream terraces in the Platte River Valley. Most years the water table is at a depth of about 3 or 4 feet in spring and at about a depth of 7 feet late in summer. Cultivated areas have a scabby appearance. In the parts that are highest in salinity and alkalinity, the soil is cloddy when dry and light gray in color on the surface. In rangeland, these highly saline-alkali areas can be identified by a stand of alkali sacaton and inland saltgrass. Areas range from 20 to 700 acres in size.

The soil has the profile described as representative of the series, except the surface layer and upper part of the underlying material are mildly alkaline or moderately alkaline over about 50 percent of each mapped area. The remaining 50 percent is strongly or very strongly alkaline. Salinity is slight to moderate, from .15 to .35 percent. The upper part of the underlying material is mainly loamy fine sand. Layers of fine sandy loam and loam, however, are common below a depth of 2 feet. The lowest elevations have a slightly higher water table than other areas. Included in mapping are small areas of Valentine loamy sand on higher elevations.

The excess soluble salts and strong alkalinity are toxic to many crops. As a result, the saline-alkali feature of the soil limits use and management. Moisture is readily absorbed into the soil where alkalinity is highest. The available water capacity is low. If not adequately protected, soil blowing is a hazard and the surface layer easily becomes crusted when dry. Many nutrients, especially phosphorus, are low in the saline-alkali areas. The water table generally benefits plant growth.

Most of the acreage of this soil is in native grass. Only a few areas are cultivated and these are mainly in alfalfa. Capability unit IVs-1 dryland, IVs-11 irrigated; Subirrigated range site; windbreak suitability group 8.

Fillmore Series

The Fillmore series consists of deep, poorly drained soils that are nearly level. These soils are in depressions that are occasionally flooded. They formed in loess on uplands or in a mixture of loess and alluvium on stream terraces.

In a representative profile the surface layer is friable, dark gray silt loam 4 inches thick. Below this is a layer of very friable, gray silt loam 2 inches thick. The subsoil is very firm, dark gray silty clay and firm, dark grayish brown silty clay loam to a depth of 35 inches. Below this is gray and dark grayish brown silt loam to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. These soils have a claypan subsoil that releases moisture slowly to plants.

Fillmore soils are suited to cultivated crops. The hazard of flooding, however, is severe. The soils are also suited to grass, trees, and shrubs, and they are suitable for wildlife habitat.

Representative profile of Fillmore silt loam, 0 to 2 percent slopes, in native grass, 1,320 feet south and 800 feet east of the northwest corner of sec. 28, T 9 N., R. 15 W.:

A1—0 to 4 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium granular structure; hard, friable; slightly acid; abrupt smooth boundary.

A2—4 to 6 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; weak medium platy structure; hard, very friable; slightly acid; abrupt smooth boundary.

B2t—6 to 23 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong prismatic structure parting to moderate strong blocky; very hard, very firm; medium acid; clear smooth boundary.

B3t—23 to 35 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2)

moist; coarse moderate prismatic structure parting to moderate medium subangular blocky; hard, firm; few iron-manganese pellets; neutral; abrupt smooth boundary.

A1b—35 to 45 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; moderate weak subangular blocky structure; hard, friable; neutral; abrupt smooth boundary.

B2b—45 to 60 inches; dark grayish brown (10YR 4/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, friable; neutral.

The A horizon ranges from 1 inch to 6 inches in thickness. An A2 horizon 1 inch to 2 inches thick is present in some places. The B2t horizon is silty clay or clay. Depth to lime ranges from 50 to 60 inches or more.

Fillmore soils in Dawson County have an A1 or Ap horizon that is less than 8 inches in thickness. This feature is outside the range defined for the series, but it does not alter the use or behavior of the soil.

In the landscape, Fillmore soils are near Holdrege and Hall soils. They are more poorly drained and have more clay in the B2t horizon than those soils.

Fm—Fillmore silt loam, 0 to 2 percent slopes. This soil is in depressions of the loessial upland and on stream terraces in the Platte River Valley. Areas range from 5 to 100 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Hall silt loam and Hobbs silt loam that are on the highest elevation of the mapping unit.

Flooding is a severe hazard on this soil. As a result, crops fail about one time in 3 years. Because permeability is very slow and outlets are generally unavailable, the soil dries slowly. Small basins become dry more quickly than the large ones. Most of the water is lost by evaporation. During dry seasons, this soil is droughty and deep cracks extend from the surface layer into the subsoil. Because the surface layer is thin, cultivation commonly mixes the upper part of the subsoil into the plow layer. The soil is difficult to work.

Most of this soil is used as pasture or is used as habitat for wildlife. Annual smartweed grows in the lowest areas. Some areas are barren. A few areas are cultivated. Corn and grain sorghum are the main crops. These areas are also a source of food and cover for wildlife. Capability units IIIw-2 dryland, IIIw-2 irrigated; Clayey Overflow range site; windbreak suitability group 2.

Fo—Fillmore silt loam, drained, 0 to 2 percent slopes. This soil is in depressions of the loessial uplands and on stream terraces in the Platte River Valley. Areas range from 5 to 60 acres in size. The soil has the profile described as representative of the series, except the surface layer is slightly thicker.

Included with this soil in mapping are small areas of Hall silt loam and Hobbs silt loam that are on the higher elevations of the mapping unit.

Surface drainage has been provided for areas of this soil. Ponding, however, is still a hazard following heavy rain. Excess water causes crop failure about once in 5 years. Although the soil is deep, it can be droughty during dry seasons where crops are dryfarmed because the surface layer is the only part of the soil that effectively stores available moisture. The claypan subsoil limits movement of moisture and, when dry, limits penetration by roots. The clayey subsoil also holds moisture under high tension so that roots are not able to absorb it. Cultivation commonly mixes the upper part of the subsoil into the plow layer. The soil is difficult to work.

Most of the acreage of this soil is cultivated, and a large part of it is irrigated. Corn and grain sorghum are the main crops. Capability units IIs-2 dryland, IIs-2 irrigated; Clayey Overflow range site; windbreak suitability group 2.

Gibbon Series

The Gibbon series consists of deep, somewhat poorly drained soils that are nearly level. These soils formed in alluvium on bottom land. Most years the seasonal water table ranges from a depth of 2 or 3 feet in spring to a depth of 6 feet late in summer.

In a representative profile the surface layer is dark gray loam 13 inches thick. Below this is a transitional layer of gray clay loam about 6 inches thick. The underlying material is grayish brown and light brownish gray clay loam to a depth of 37 inches, light gray loam to a depth of 49 inches, and very pale brown coarse sand to a depth of 60 inches or more.

Permeability is moderately slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium.

Gibbon soils are suited to both dryland and irrigated crops commonly grown on these soils. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Gibbon loam, 0 to 2 percent slopes, in a cultivated field, 100 feet west and 1,850 feet north of the southeast corner of sec. 21, T. 9 N., 21 W.:

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable; violent effervescence (5 percent $CaCO_3$); mildly alkaline; abrupt smooth boundary.

A12—7 to 13 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; violent effervescence (8 percent $CaCO_3$); mildly alkaline; clear wavy boundary.

AC—13 to 19 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; violent effervescence (10 percent $CaCO_3$); mildly alkaline; clear wavy boundary.

C1—19 to 26 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few medium distinct dark yellowish brown (10YR 4/4 moist) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; violent effervescence (9 percent $CaCO_3$); soft rounded accumulations of lime; mildly alkaline; gradual wavy boundary.

C2—26 to 37 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few medium distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; hard, friable; violent effervescence (2 percent $CaCO_3$); many fine soft rounded accumulations of lime; mildly alkaline; clear wavy boundary.

C3—37 to 49 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; common medium distinct yellowish brown (10YR 5/6 moist) mottles; massive; slightly hard, friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

IIC4—49 to 60 inches; very pale brown (10YR 7/3) coarse sand, brown (10YR 5/3) moist; common medium distinct yellowish brown (10YR 5/6 moist)

mottles; single grained; loose; free water at a depth of 6 feet; mildly alkaline.

The A horizon ranges from 10 to 20 inches in thickness. It is typically loam, but is silt loam in some areas. It ranges from dark gray to grayish brown. Where present, the AC horizon is 5 to 20 inches thick. The AC horizon and the upper part of the C horizon are loam, silt loam, or clay loam. Reaction is mildly alkaline or moderately alkaline above coarse sand or mixed sand and gravel. Coarse sand or mixed sand and gravel is between depths of 40 and 60 inches.

Gibbon soils in Dawson County have more fine and medium sand at a depth of 20 to 40 inches than is defined in the range of the series. This difference, however, does not alter the use or behavior of the soils.

In the landscape, Gibbon soils are near Lex, Lawet, and Gosper soils. They are deeper to coarse sand or mixed sand and gravel than Lex soils. They are better drained and have less lime in the A horizon than Lawet soils. They are more poorly drained than Gosper soils.

Gb—Gibbon loam, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Areas range from 20 to 200 acres in size.

Included with this soil in mapping are small areas of Gosper loam on the higher elevations of the landscape and areas of Lawet silt loam on the lower elevations and wetter part of the landscape.

Wetness in spring delays tillage and is the main limitation on this soil. Available phosphate is low. Runoff is slow.

Most of the acreage of this soil is cultivated, and a large part is developed for irrigation. Corn, alfalfa, and grain sorghum are the main crops. A few inaccessible areas on islands in the Platte River are in native grasses. Some areas are used as feeding stations for migratory waterfowl. Capability units IIw-4 dryland, IIw-6 irrigated; Subirrigated range site; windbreak suitability group 2.

Gosper Series

The Gosper series consists of deep, moderately well drained soils that are nearly level. These soils formed in alluvial material on stream terraces. Most years the seasonal high water table ranges from a depth of about 4 or 5 feet in spring to a depth of about 8 feet late in summer.

In a representative profile the surface layer is dark gray loam 12 inches thick. The subsoil is firm, brown loam to a depth of 19 inches and friable, brown sandy clay loam to a depth of 31 inches. The underlying material is pale brown sandy loam to a depth of 41 inches, very pale brown loamy sand to a depth of 53 inches, and white coarse sand to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. In the saline-alkali soil, permeability is moderately slow, and the available water capacity is low. The content of organic matter is moderately low, and natural fertility is low.

Gosper soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Gosper loam, 0 to 2 percent slopes, in a cultivated field, 600 feet north and 2,600 feet east of the southwest corner of sec. 26, T. 9 N., R. 20 W.:

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A12—7 to 12 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; neutral; clear smooth boundary.

B2t—12 to 19 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm; shiny faces on peds; mildly alkaline; clear wavy boundary.

B3t—19 to 31 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; strong effervescence; mildly alkaline; gradual wavy boundary.

C1—31 to 41 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—41 to 53 inches; very pale brown (10YR 7/3) loamy sand, pale brown (10YR 6/3) moist; common medium distinct dark yellowish brown (10YR 4/4 moist) mottles; single grained; loose; violent effervescence; moderately alkaline; clear smooth boundary.

C3—53 to 60 inches; white (10YR 8/2) coarse sand, light gray (10YR 7/2) moist; single grained; loose; free water table at a depth of 6 feet; moderately alkaline.

The A horizon ranges from 8 to 18 inches in thickness and from very dark grayish brown to gray. It is typically fine sandy loam and loam, but it is silt loam in some places. The B horizon is grayish brown or brown loam, sandy clay loam, or clay loam. The upper part of the C horizon is sandy loam, loam, sandy clay loam, or clay loam. Loamy sand, sand, or gravelly sand is at depths of 40 to 60 inches. Depth to lime ranges from 10 to 24 inches.

In the landscape, Gosper soils are near Silver Creek, Rusco, and Gibbon soils. They have a B horizon that has less clay than Silver Creek soils. They are shallower to mixed sand and gravel and gravel and have more fine sand and less silt in the B horizon than Rusco soils. They are better drained than Gibbon soils and have more fine sand sand and less silt at a depth of 10 to 40 inches.

Gn—Gosper fine sandy loam, 0 to 2 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. Areas range from 10 to 70 acres in size. The soil has the profile described as representative of the series, except the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Gosper loam.

Where the surface is not adequately protected, soil blowing is a hazard. Content of organic matter is low or moderately low in the areas affected by soil blowing. Unless irrigated, alfalfa commonly shows strain of drought during summer, because the roots do not penetrate the coarse underlying material that is common below a depth of 40 inches.

Nearly all the acreage of this soil is cultivated and developed for irrigation. Corn and alfalfa are the main crops. Capability units IIe-3 dryland, IIe-5 irrigated; Sandy Lowland range site; windbreak suitability group 3.

Go—Gosper loam, 0 to 2 percent slopes. This nearly

level soil is on stream terraces in the Platte River Valley. Areas range from 10 to about 3,000 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Gibbon loam, Rusco silt loam, and Cozad silt loam, wet substratum. Also included are small areas of nearly level Silver Creek silt loam in slightly lower elevations and small areas of saline or alkali soils.

Alfalfa cannot obtain moisture from the water table during dry periods. Unless alfalfa is irrigated, it commonly shows strain of drought during summer. Maintaining fertility is also a concern of management.

Nearly all the acreage of this soil is cultivated. A large part of the acreage is irrigated. Corn, alfalfa, and grain sorghum are the main crops. Some sugar beets, however, are also grown. Capability units IIc-1 dryland, I-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

Gt—Gosper loam, saline-alkali, 0 to 2 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. Areas in native grass have numerous microdepressions where salinity and alkalinity are highest. Because the saline-alkali areas are light gray in color, cultivated fields have a scabby appearance. Areas range from 10 to about 1,500 acres in size. The soil has the profile described as representative of the series, except the surface layer is thinner, salinity is higher, and alkalinity is stronger.

In cultivated areas, about 70 percent of the acreage is free of excess soluble salts and crops show little evidence of injury. The remaining 30 percent has enough excessive salinity, from .15 to .65 percent, or strong alkalinity to restrict the growth of most crops. The highest accumulation of salts is in the upper 15 to 22 inches of the soil.

Included with this soil in mapping are small areas of soils that have a fine sandy loam surface layer. Also included are small areas of Gibbon loam, Rusco silt loam, and Cozad silt loam, wet substratum. A few areas of Silver Creek silt loam are at slightly lower elevations.

The areas of this soil highest in salinity and alkalinity are difficult to till because they are hard when dry and sticky when wet. Runoff is slow or very slow. Alfalfa cannot obtain moisture from the water table during dry periods, because the roots cannot penetrate the coarse underlying material below a depth of 40 inches. Lack of sufficient moisture is a further limitation in dryfarmed areas. Some plant nutrients, mainly phosphorus, are not readily available to plants. Roots cannot absorb moisture easily from the saline-alkali soils.

Most of the acreage of this soil is cultivated and is developed for irrigation. A few areas, however, are used for grazing. Corn, grain sorghum, and alfalfa are the main cultivated crops. Capability units IVs-1 dryland, IIIs-6 irrigated; Saline Lowland range site; windbreak suitability group 8.

Gothenburg Series

The Gothenburg series consists of poorly drained or somewhat poorly drained loamy soils that are nearly level and very shallow over sand or mixed sand and gravel. These soils formed in alluvium on bottom land. They are frequently intersected by shallow stream channels. Most years, the seasonal water table ranges from a depth of 6 inches or 2 feet early in spring to a depth of about 5 feet late in summer.

In a representative profile the surface layer is friable, grayish brown loam 3 inches thick. The underlying material is light gray fine sand to a depth of 11 inches. Below this is light gray mixed sand and gravel to a depth of 60 inches.

Permeability is very rapid in the mixed sand and gravel. The available water capacity is very low. Content of organic matter and natural fertility are low.

Gothenburg soils are not suited to cultivated crops or to trees or shrubs for windbreaks. They are suited to grass, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Gothenburg loam in an area of Gothenburg soils, 0 to 2 percent slopes, in rangeland, 50 feet south and 2,600 feet east of the northwest corner of sec. 9, T. 9 N., R. 22 W.:

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; friable, slightly hard; many fine and medium roots; strong effervescence; moderately alkaline; clear smooth boundary.

IIC2—3 to 11 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; common medium distinct yellowish brown (10YR 5/6 moist) mottles; single grained; loose; mildly alkaline; abrupt smooth boundary.

IIC3—11 to 60 inches; light gray (10YR 7/2) mixed sand and gravel, grayish brown (10YR 5/2) moist; few thin strata of sand and coarse sand; single grained; loose; free water at a depth of 12 inches; mildly alkaline.

The A horizon ranges from 1 inch to 5 inches in thickness and is very dark gray to grayish brown. It is typically loam, but is loamy sand, sandy loam, and fine sandy loam in some places. Thin layers of clay loam and silty clay loam are also commonly present. In some areas there is a 1- to 5-inch thick C1 horizon between the A and IIC horizons that is loam, fine sandy loam, or loamy fine sand. Typically, depth to coarse sand or mixed sand and gravel is 1 inch to 5 inches, but it ranges from 1 inch to 10 inches. Lime is commonly at the surface. It is absent, however, on most low, wet areas. Flooding is common in spring.

In the landscape, Gothenburg soils are near Alda, Lex, and Platte soils. They have a thinner A horizon and are shallower to mixed sand and gravel than those soils.

Gu—Gothenburg soils, 0 to 2 percent slopes. These soils are on bottom land adjacent to the channels of the Platte River. The surface layer ranges from loam to loamy sand.

Included with these soils in mapping are areas where mixed sand and gravel is exposed at the surface. Also included are small areas of Platte loam.

Frequent flooding in spring is a very severe hazard on this soil. It damages fences, is a hazard to livestock, and deposits debris and trash. The very low available water capacity and low natural fertility limit productivity of the grasses.

These soils are used mainly as rangeland. Vegetation is mostly mixed trees and native grass. Eastern cottonwood is common and willows grow in some of the wetter areas. Pits dug during mining operations are filled with water and provide fishing and other

water related recreation. Capability unit VIIs-3 dryland; Subirrigated range site; windbreak suitability group 10.

Hall Series

The Hall series consists of deep, well drained and moderately well drained soils that are nearly level and very gently sloping. These soils formed in loess on uplands and a mixture of loess and alluvium on stream terraces.

In a representative profile the surface layer is friable, dark grayish brown and very dark grayish brown silt loam 12 inches thick. The friable subsoil is dark grayish brown silty clay loam to a depth of 24 inches and grayish brown silt loam to a depth of 40 inches. The underlying material, to a depth of 60 inches, is very pale brown silt loam.

Permeability is moderately slow, and the available water capacity is high. The content of organic matter is moderate, and natural fertility is high. These soils release moisture readily to plants.

Hall soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Hall silt loam, terrace, 0 to 1 percent slopes, in a cultivated field, 90 feet east and 1,750 feet south of the northwest corner of sec. 25, T. 12 N., R. 25 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; clear wavy boundary.

A3—9 to 12 inches; very dark grayish brown (10YR 3/2) heavy silt loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

B2t—12 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, friable; neutral; gradual wavy boundary.

B3—24 to 40 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

C—40 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; violent effervescence (2 percent $CaCO_3$); mildly alkaline.

The A horizon ranges from 10 to 20 inches in thickness. The A3 horizon is silt loam or silty clay loam. The B2t horizon is dark grayish brown or grayish brown. Content of clay in the B2t horizon ranges from 28 to 35 percent. Depth to the calcareous C horizon ranges from 28 to 50 inches.

In the landscape, Hall soils are near Holdrege, Hord, and Rusco soils. They are darker in the upper part of the B horizon than Holdrege or Rusco soils. They have more clay in the combined B horizons than Hord soils.

Ha—Hall silt loam, 0 to 1 percent slopes. This nearly level soil is on broad divides on the loessial uplands. It is on slightly lower elevations than surrounding soils. Areas range from 10 to 60 acres in size. The soil has the profile described as representative of the series, except the surface layer is medium acid.

Included with this soil in mapping are areas of Holdrege silt loam on slightly higher elevations. Also included are small areas of Fillmore silt loam in small depressions.

Lack of sufficient moisture is the main limitation in dryfarmed areas. Where the surface is not adequately protected, soil blowing is a hazard. Runoff is slow.

Nearly all the acreage of this soil is cultivated. This soil is one of the best for the commonly grown crops in the county. A large part of the acreage is irrigated. Corn, alfalfa, grain sorghum, and wheat are the main crops. Capability units IIc-1 dryland, I-4 irrigated; Silty range site; windbreak suitability group 4.

HaB—Hall silt loam, 1 to 3 percent slopes. This very gently sloping soil is on broad divides on the loessial uplands. Areas range from 5 to 200 acres in size. The soil has the profile described as representative of the series, except the thickness of the surface layer is, on the average, slightly thinner in places. Land leveling has removed much of the original surface layer.

Included with this soil in mapping are small areas of Holdrege silt loam on slightly higher elevations.

Water erosion is a moderate hazard. Where the surface is not adequately protected, soil blowing is also a hazard. Some land leveling is needed for gravity irrigation. Lack of sufficient moisture is a limitation in dryfarmed areas. Runoff is slow.

Most of the acreage of this soil is used for both dryland and irrigated crops. Corn, grain sorghum, alfalfa, and wheat are the main crops. A few areas are in native grass. Capability units IIe-1 dryland, IIe-4 irrigated; Silty range site; windbreak suitability group 4.

Hb—Hall silt loam, terrace, 0 to 1 percent slopes. This nearly level soil is on stream terraces. Areas range from 5 to about 200 acres in size. The soil has the profile described as representative of the series. The surface layer is medium acid in a few places.

Included with this soil in mapping are small areas of Hord silt loam and Rusco silt loam. Areas where the water table is at a depth of 8 to 15 feet are in the Platte River Valley.

Lack of sufficient moisture is the main limitation in dryfarmed areas. Where the surface is not adequately protected, soil blowing is a hazard.

Nearly all the acreage of this soil is cultivated and irrigated. This soil is one of the best for the commonly grown crops in the county. Most of the irrigated land has been leveled. Only a few small or odd shaped areas are in grass or are dryfarmed. Corn, grain sorghum, and alfalfa are the main crops. A small acreage of sugar beets are grown. Alfalfa and trees obtain moisture from the water table where it is above a depth of 15 feet. Capability units IIc-1 dryland, I-4 irrigated; Silty Lowland range site; windbreak suitability group 1.

Hc—Hall silt loam, wet substratum, 0 to 1 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley and it is on lower elevations

than the surrounding soils. Most years, the seasonal high water table is at a depth of about 3 or 4 feet in spring and at a depth of 8 feet late in summer. Areas range from 10 to 60 acres in size. The soil has the profile described as representative of the series, except the surface layer is neutral or mildly alkaline, the subsoil and the water table are higher, and the underlying material is mildly alkaline or moderately alkaline. Brown mottles are below a depth of 30 inches. Depth to lime ranges from 7 to 24 inches. Soft, rounded accumulations of lime are common in the lower part of the subsoil.

Included with this soil in mapping are areas of well drained Hall silt loam on the higher elevations of the landscape and areas of Wood River silt loam.

Wetness in spring delays farming operations and is the main hazard. Alfalfa, trees, and other deep rooted plants obtain moisture from the water table.

Nearly all the acreage of this soil is cultivated and is developed for irrigation. Corn, alfalfa, and grain sorghum are the main crops. Capability units IIw-4 dryland, IIw-4 irrigated; Subirrigated range site; windbreak suitability group 2.

Hobbs Series

The Hobbs series consists of deep, well drained soils that are nearly level to gently sloping (fig. 8). These soils formed in alluvium on narrow bottoms and on foot slopes of upland drainageways.

In a representative profile the surface layer is friable, grayish brown silt loam 8 inches thick. The underlying material, to a depth of 60 inches, is grayish brown stratified silt loam.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. These soils release moisture readily to plants. Some areas are occasionally flooded.

Hobbs soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Hobbs silt loam, 0 to 2 percent slopes, in a cultivated field, 350 feet south and 900 east of the northwest corner of sec. 13, T. 10 N., R. 19 W.:

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—8 to 40 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; stratified with layers ½ inch to 4 inches thick and color value about ½ unit darker; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

C2—40 to 60 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; faintly stratified with layers ½ inch to 4 inches thick and color value about ½ unit darker; massive; slightly hard, friable; neutral.

The A horizon ranges from 6 to 9 inches in thickness and ranges from very dark gray to grayish brown. Except where the A horizon is calcareous because of recent deposits of overwash material from adjacent uplands, depth to lime is more than 40 inches. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

In the landscape, Hobbs soils are near Cozad and Hord soils. They lack a B horizon and are more stratified in the C horizon than those soils.

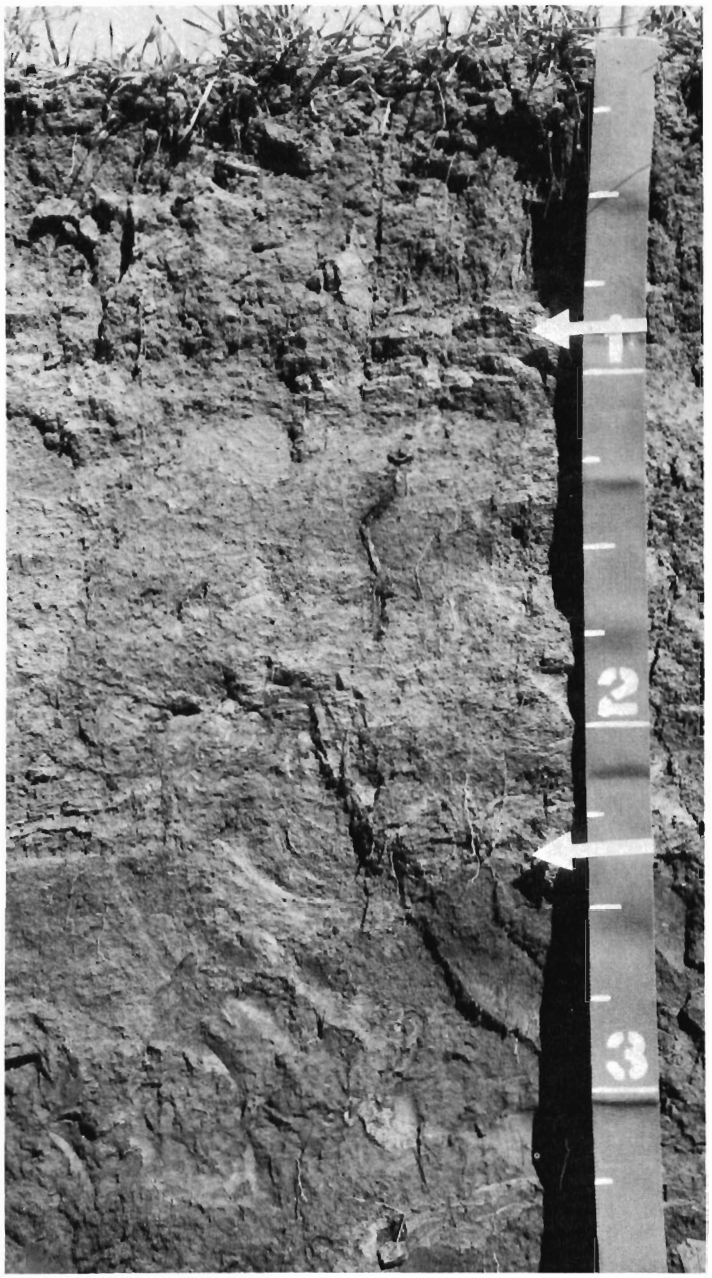

Figure 8.—**Profile of Hobbs silt loam, a deep, weakly developed soil that formed in recently deposited, stratified alluvium.**

Hd—Hobbs silt loam, 0 to 2 percent slopes. This nearly level soil is on bottom land of upland drainageways. Areas are long and narrow and range from 5 to 500 acres in size. The soil has the profile described as representative of the series. In some places, the underlying material has stratified layers of fine sandy

loam or very fine sandy loam 1 inch to 4 inches thick.

Included with this soil in mapping are small areas of Cozad soils.

This soil is subject to occasional flooding. The water, however, generally drains off in a few hours or a day at the most. The flooding water deposits heavy loads of sediment, especially on areas adjacent to uplands that are cultivated without conservation practices or near areas of overgrazed rangeland.

About 50 percent of the acreage of this soil is cultivated. A few areas are irrigated. Corn and grain sorghum are the main crops. Areas in native grass are generally adjacent to larger tracts of strongly sloping or steep rangeland. Capability units IIw-3 dryland, IIw-6 irrigated; Silty Overflow range site; windbreak suitability group 1.

Holdrege Series

The Holdrege series consists of deep, well drained soils that are nearly level to strongly sloping (fig. 9). These soils formed in loess on uplands.

In a representative profile the surface layer is very friable, dark gray silt loam 11 inches thick. The subsoil is friable, grayish brown light silty clay loam to a depth of 16 inches; friable, light brownish gray light silty clay loam to a depth of 22 inches; and very friable, light brownish gray silt loam to a depth of 28 inches. The underlying material, to a depth of 60 inches, is pale brown and white silt loam.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. These soils release moisture readily to plants.

Holdrege soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Holdrege silt loam, 1 to 3 percent slopes, in a cultivated field, 200 feet north and 500 feet east of the southwest corner of sec. 18, T. 12 N., R. 20 W.:

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; medium acid; abrupt smooth boundary.

A12—6 to 11 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, very friable; medium acid; abrupt smooth boundary.

B21t—11 to 16 inches; grayish brown (10YR 5/2) light silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, friable; slightly acid; clear smooth boundary.

B22t—16 to 22 inches; light brownish gray (10YR 6/2) light silty clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; slightly acid; clear smooth boundary.

B3—22 to 28 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C1—28 to 38 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; neutral; abrupt smooth boundary.

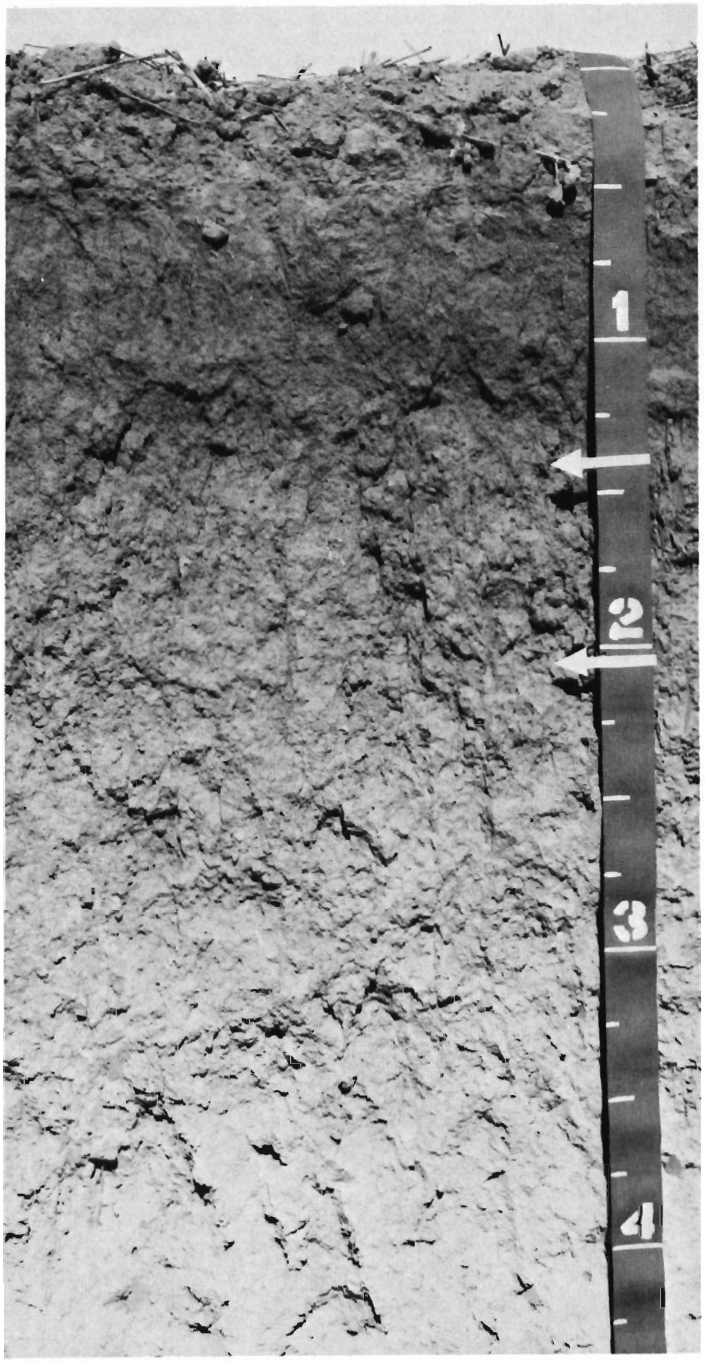

Figure 9.—**Profile of Holdrege silt loam, a deep soil that formed in loess. (Arrows point to the lower boundary of the surface layer and the upper part of the subsoil.)**

C2—38 to 60 inches; white (10YR 8/2) silt loam; light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; violent effervescence (1 percent $CaCO_3$); mildly alkaline.

The A horizon ranges from 8 to 14 inches in thickness and from very dark gray to grayish brown. The B2t horizon ranges from 8 to 16 inches in thickness and is 28 to 35 percent clay. Depth to lime ranges from 25 to 40 inches.

In the landscape, Holdrege soils are near Hall, Uly, and

Coly soils. They are lighter in color in the B2t horizon than Hall soils. They have more clay in the B horizon than Uly soils and they have lime lower in the profile than those soils. Holdrege soils have a thicker A horizon and a B horizon that is not present in Coly soils.

Ho—Holdredge silt loam, 0 to 1 percent slopes. This nearly level soil is on broad divides of the loessial uplands. Areas range from 10 to 500 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Hall silt loam and very gently sloping Holdrege silt loam. Also included are small areas of Fillmore silt loam in depressions.

Lack of sufficient moisture is the main limitation in dryfarmed areas. Where the surface is not adequately protected, soil blowing is a hazard. Runoff is slow.

Nearly all the acreage of this soil is cultivated. This soil is one of the best for the commonly grown crops in the county. A large part of the acreage is irrigated. Corn, alfalfa, grain sorghum, and wheat are the main crops. Capability units IIc-1 dryland, I-4 irrigated; Silty range site; windbreak suitability group 4.

HoB—Holdrege silt loam, 1 to 3 percent slopes. This very gently sloping soil is on divides of the loessial uplands. Areas range from 5 to 500 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of nearly level Holdrege soils and very gently sloping Hall soils. Also included are small areas of Fillmore silt loam in depressions.

Water erosion and soil blowing are the main hazards. Some leveling is needed for gravity irrigation. In dryfarmed areas, an inadequate supply of moisture is a common limitation. Runoff is slow.

Most of the acreage of this soil is used for both dryland and irrigated crops. A few areas are in native grass. Capability units IIe-1 dryland, IIe-4 irrigated; Silty range site; windbreak suitability group 4.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This sloping soil is on hillsides and on ridges between intermittent drainageways of the loessial uplands. Areas range from 5 to 100 acres in size. The soil has the profile described as representative of the series, but the surface layer and subsoil are slightly thinner.

Included with this soil in mapping are small areas of Uly soils and very gently sloping Holdrege soils.

Water erosion is a serious hazard. Where dryfarmed, an inadequate supply of moisture commonly limits production. Runoff is medium.

This soil is well suited to cultivation, but because of location, size, or shape of the areas, most areas have never been cultivated. Nearly all the acreage of this soil is in native grass. Capability units IIIe-1 dryland, IIIe-4 irrigated; Silty range site; windbreak suitability group 4.

HoC2—Holdrege silt loam, 3 to 6 percent slopes, eroded. This soil is on ridgetops on hillsides of the loessial uplands. Areas range from 5 to 400 acres in size. The soil has the profile described as representative of the series, except the thickness of the surface layer is thinner. On ridgetops, about 20 percent of each area has a part of the light silty clay loam subsoil mixed into the plow layer. The surface layer is slightly acid or neutral on the eroded ridges.

Included with this soil in mapping are areas of soils on the lower part of slopes where the surface layer is 14 to 20 inches thick. Also included are a few areas of very gently sloping Holdrege soils and Hall soils.

Water erosion is the main hazard. Where the surface layer is not adequately protected, soil blowing is a hazard. Because eroded areas are low in organic-matter content and plant nutrients, maintaining fertility is a concern. The soil is easy to work. Small gullies are common. Runoff is medium.

Most of the acreage of this soil is cultivated. A few areas are irrigated by gravity or a sprinkler system. Corn, grain sorghum, wheat, and alfalfa are the main crops. A few areas, commonly adjacent to steeper soils, are reseeded to grass. Capability units IIIe-1 dryland, IIIe-4 irrigated; Silty range site; windbreak suitability group 4.

Hord Series

The Hord series consists of deep, well drained soils that are nearly level to gently sloping. These soils formed in loess on uplands, in loess and alluvium on stream terraces, and in alluvium and colluvium on foot slopes.

In a representative profile the surface layer is friable, very dark grayish brown silt loam 18 inches thick. The subsoil is friable silt loam about 25 inches thick. It is dark grayish brown in the upper 7 inches, grayish brown in the middle 8 inches, and pale brown in the lower 10 inches. The underlying material, to a depth of 60 inches, is very pale brown silt loam.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. These soils release moisture readily to plants.

Hord soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Hord silt loam, 0 to 1 percent slopes, in a cultivated field, 175 feet east and 200 feet north of the southeast corner of sec. 33, T. 11 N., R. 25 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; gradual wavy boundary.

B1—18 to 25 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

B2—25 to 33 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly

hard, friable; neutral; gradual wavy boundary.
B3—33 to 43 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; clear wavy boundary.
C—43 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; violent effervescence (2 percent $CaCO_3$); mildly alkaline.

The A horizon ranges from 12 to 22 inches in thickness and from grayish brown to very dark grayish brown. The A horizon is very fine sandy loam, silt loam, or light silty clay loam. The B2 horizon is typically silt loam, but is light silty clay loam in some places. It averages about 26 percent clay, but ranges from 20 to 35 percent. The C horizon is light brownish gray or very pale brown. Depth to lime ranges from 36 to 56 inches.

In the mapping unit HpB, the soil contains more sand than is defined in the range of the series, but this does not alter the use or behavior of the soils.

In the landscape, Hord soils are near Cozad, Hall, and Hobbs soils. Unlike Hobbs soils, they have a B horizon and are not stratified. They have less clay in the B horizon than Hall soils. They have a darker colored B1 horizon than the B horizon at comparable depths in Cozad soils.

HpB—Hord fine sandy loam, 0 to 3 percent slopes. This soil is on stream terraces in the Platte River Valley. Areas are lower in relative elevation than the surrounding soils and range from 10 to 250 acres in size. The soil has the profile described as representative of the series, except the surface layer is fine sandy loam. In addition, the subsoil and underlying material are typically loam or very fine sandy loam, but they are silt loam in a few places.

Included with this soil in mapping are small areas of Anselmo fine sandy loam and Anselmo loam on slightly higher elevations.

Where the surface is not adequately protected, soil blowing is a hazard. In dryfarmed areas, inadequate moisture is a common limitation. The soil is easy to work. Runoff is slow.

Nearly all the acreage of this soil is cultivated, and a large part of it is irrigated. Corn, alfalfa, and wheat are the main crops. Capability units IIe-3 dryland, IIe-5 irrigated; Sandy range site; windbreak suitability group 3.

Hr—Hord silt loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces in major stream valleys. A few areas are also on uplands at elevations slightly above the soils in depressions. The soil has the profile described as representative of the series. A few areas where the water table is at a depth of 8 to 15 feet are in the Platte River Valley.

Included with this soil in mapping are small areas of Cozad silt loam, Hall silt loam, and very gently sloping Hord silt loam.

Lack of sufficient moisture is the main limitation in dryfarmed areas. Where the surface is not adequately protected, soil blowing is a hazard. Runoff is slow.

Nearly all the acreage of this soil is cultivated, and most areas are irrigated. This soil is one of the best for the commonly grown crops in the county. Corn, alfalfa, and grain sorghum are the main crops. Sugar beets and wheat are also grown. Alfalfa and trees obtain moisture from the water table where it is above a depth of 15 feet. Capability units IIc-1 dryland, I-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

HrB—Hord silt loam, 1 to 3 percent slopes. This very gently sloping soil is on stream terraces and colluvial foot slopes near the base of uplands. It also occupies a few upland areas slightly above the level of shallow depressions. Areas range from 5 to 100 acres in size. The soil has the profile described as representative of the series, except the surface layer is slightly thinner. Land leveling has exposed the very pale brown soil material in a few places.

Included with this soil in mapping are small areas of nearly level and gently sloping Hord soils, Cozad silt loam, and Hall silt loam.

Water erosion is the main hazard. Some land leveling is generally needed for gravity irrigation. Fertility is low on the light colored areas. When moisture is adequate, the soil is productive. Runoff is slow.

Most of the acreage of this soil is cultivated and irrigated. A few small or odd shaped areas, however are in native grass. Corn, grain sorghum, and alfalfa are the main crops. Capability units IIe-1 dryland, IIe-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

HrC—Hord silt loam, 3 to 6 percent slopes. This gently sloping soil is on colluvial foot slopes at the base of uplands. Areas range from 5 to 100 acres in size. The soil has the profile described as representative of the series, except the surface layer is slightly thinner.

Included with this soil in mapping are small areas of very gently sloping Hord silt loam and Hall silt loam.

Water erosion is the main hazard. In places, small rills and gullies form, but they are filled in during each successive tillage. Runoff is medium.

Most of the acreage of this soil is cultivated. Corn, grain sorghum, and alfalfa are the main crops. The soil is suited to irrigation, but it is not extensively practiced because areas are small and narrow. Areas in native grass are commonly adjacent to strongly sloping or steep rangeland. Capability units IIIe-1 dryland, IIIe-6 irrigated; Silty range site; windbreak suitability group 4.

Hs—Hord silt loam, wet substratum, 0 to 1 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. Most years, the seasonal water table is at a depth of about 3 or 4 feet in spring and at a depth of about 8 feet late in summer. Areas range from 10 to 500 acres in size. The soil has the profile described as representative of the series, except the water table is higher, the lower part of the subsoil is calcareous, and brown and yellowish brown mottles are between a depth of 3 and 5 feet.

Included with this soil in mapping are small areas of well drained Cozad silt loam and Hord silt loam on slightly higher elevations. Also included are small saline or alkali areas of soils.

Wetness in spring delays farming operations and is the main limitation. Alfalfa, trees, and other deep rooted plants, however, can obtain moisture from the water table.

Nearly all the acreage of the soil is cultivated and is developed for irrigation. Alfalfa and corn are the main crops. Capability units IIw-4 dryland, IIw-6 irrigated; Subirrigated range site; windbreak suitability group 2.

Ht—Hord silty clay loam, 0 to 1 percent slopes. This soil is on stream terraces in the Platte River Valley. Areas are slightly lower than the surrounding soils and range from 5 to 200 acres in size. The soil has the profile described as representative of the series, except the surface layer is silty clay loam. Typically, depth to the water table ranges from 8 or 10 feet in spring to a depth of 15 feet late in summer.

Included with this soil in mapping are small areas of Cozad silty clay loam and Hall silt loam.

When moist, this soil is difficult to till because the surface layer is sticky. Water stands for a considerable time in some areas after heavy rain and delays tillage.

Nearly all the acreage of this soil is cultivated. A large part of it has been developed for irrigation. Corn and alfalfa are the main crops. Alfalfa, trees, and other deep rooted plants commonly obtain moisture from the water table. Capability units IIc-1 dryland, I-3 irrigated; Silty Lowland range site; windbreak suitability group 1.

Hx—Hord silty clay loam, wet substratum, 0 to 1 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. In most years, a seasonal water table ranges from a depth of 3 or 4 feet in spring to a depth of 8 feet late in summer. Areas are slightly lower than the surrounding soils and range from 10 to 200 acres in size. The soil has the profile described as representative of the series, except the surface layer is silty clay loam and the water table is higher. Brown or yellowish brown mottles are between a depth of 3 and 5 feet. The underlying material is mildly alkaline or moderately alkaline. Depth to lime ranges between 15 and 30 inches.

Included with this soil in mapping are small areas of Cozad silt loam, wet substratum, and Hord silt loam, wet substratum.

Wetness in spring delays farming and is the main limitation. Alfalfa, trees, and other deep rooted plants, however, obtain moisture from the water table. When moist, the soil is difficult to till because the surface is sticky. Runoff is slow.

Nearly all the acreage of this soil is cultivated and is developed for irrigation. Alfalfa and corn are the main crops. Capability units IIw-4 dryland, IIw-3 irrigated; Subirrigated range site; windbreak suitability group 2.

Lawet Series

The Lawet series consists of deep, poorly drained soils that are nearly level. These soils formed in alluvium on bottom land and stream terraces. Most years the seasonal water table ranges from a depth of 0 to 2 feet in spring to a depth of about 5 feet late in summer.

In a representative profile the surface layer is friable, dark gray and very dark gray silt loam 19 inches thick. The subsoil is friable, gray loam about 6 inches thick. Both the surface layer and subsoil have a very high amount of lime. The underlying material is grayish brown, light gray, and light olive gray loam to a depth of 40 inches. Below this, to a depth of 60 inches, is light olive gray coarse sand.

Permeability is moderately slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium. In the saline-alkali soil, permeability is slow, and the available water capacity is moderate. The content of organic matter is moderately low, and natural fertility is low.

Lawet soils are suited to the commonly grown crops and where adequate drainage is provided, to plantings of trees and shrubs. They are also suited to grass, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Lawet silt loam, drained, 0 to 2 percent slopes, in native grass meadow, 2,100 feet north and 1,850 feet west of the southeast corner of sec. 31, T. 11 N., R. 24 W.:

A11ca—0 to 11 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; violent effervescence (22 percent CaCO3); mildly alkaline; gradual wavy boundary.

A12ca—11 to 19 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable; violent effervescence (20 percent CaCO3); mildly alkaline; gradual wavy boundary.

B2ca—19 to 25 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; weak fine and medium subangular blocky structure; hard, friable; violent effervescence (16 percent CaCO3); fine soft rounded accumulations of lime; mildly alkaline; clear wavy boundary.

C1—25 to 28 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; common medium distinct yellowish brown (10YR 5/4) moist; mottles; massive; slightly hard, friable; strong effervescence (1 percent CaCO3); mildly alkaline; clear wavy boundary.

C2g—28 to 40 inches; light gray (5Y 7/2) loam, olive gray (5Y 5/2) moist; massive; slightly hard, friable; neutral; clear smooth boundary.

C3g—40 to 43 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 4/2) moist; massive; slightly hard, friable; mildly alkaline; abrupt smooth boundary.

IIC4g—43 to 60 inches; light olive gray (5Y 6/2) mixed sand and gravel, olive gray (5Y 5/2) moist; single grained; loose; free water at a depth of 50 inches; mildly alkaline.

The A horizon is typically silt loam and loam 10 to 24 inches thick. The B horizon is gray or light brownish gray loam, but ranges to silt loam and silty clay loam. One or more horizons above a depth of 15 inches have 15 to 25 percent lime. The C horizon is loam, but ranges from sandy loam to silty clay loam. The IIC horizon is sand, coarse sand, or gravelly sand at a depth of 40 to 60 inches.

In the landscape, Lawet soils are near Lex, Platte, and Gibbon soils. They have more carbonates in the upper part of the profile and are deeper to the coarse IIC horizon than Lex and Platte soils. Lawet soils are more poorly drained, have more lime in the A horizon, and have more sand at a depth of 10 to 40 inches than Gibbon soils.

La—Lawet loam, ponded, 0 to 2 percent slopes. This poorly drained soil is in slightly depressional areas on bottom land in the Platte River Valley. It also occupies a few low areas in Hay Valley. The water table is at or above the surface during spring, but recedes to a level of 3 feet late in summer and fall. Areas

range from 5 to 100 acres in size. The soil has the profile described as representative of the series, except a layer of organic mulch 0 to 3 inches thick is on the surface of the mineral soil. In the vicinity of Hay Valley, the surface layer of the mineral soil is silty clay loam and the subsoil is silty clay loam or silt loam. Also, a few areas on islands are in the Platte River where coarse sand or mixed sand and gravel is at a depth of 20 to 40 inches.

Included with this soil in mapping are areas of marsh on the lower elevations, areas of Lawet silt loam, drained, and Gibbon loam on the higher elevations of the landscape.

This soil is too wet for successful cultivation of the commonly grown crops, and it is commonly too wet for haying operations during wet seasons. Trampling by animals can damage the turf if they are permitted to graze during wet periods. Runoff is very slow.

Nearly all the acreage of this soil is in native grass and is used as rangeland or meadow. Prairie cordgrass is dominant. A few of the lower lying areas support stands of willow trees. This soil is also suitable for use as wildlife habitat. It is not well suited to trees for windbreaks. Capability unit Vw-7 dryland; Wet Land range site; windbreak suitability group 6.

Lb—Lawet silt loam, drained, 0 to 2 percent slopes. This soil is on bottom land in the Platte River Valley. Areas range from 15 to 1,000 acres in size. The soil has the profile described as representative of the series. In places where recent alluvium has been deposited, the surface layer is only 7 to 10 inches thick. In places a buried layer of dark gray clay or silty clay is at a depth of 20 to 35 inches. These areas are adjacent to and north of the Platte River. Where this soil occurs south of the Platte River in an area about 3 miles from Lexington, the water table is about 2 feet deeper than is described in the representative profile.

Included with this soil in mapping are small areas of Gibbon loam and Lex loam, both on slightly higher elevations.

Wetness, mainly in spring, is the main hazard. Seedbed preparation and planting are retarded. The lowest areas need artificial drainage. During wet seasons, haying operations are hampered in the low pockets. Runoff is slow.

About 60 percent of the acreage of this soil is in native grass and is used as range or meadow. Switchgrass and big bluestem are dominant and prairie cordgrass is in the wetter areas. Most of the cultivated acreage has been developed for irrigation. Corn and alfalfa are the main crops. Capability units IIIw-4 dryland, IIIw-4 irrigated; Subirrigated range site; windbreak suitability group 2.

Ld—Lawet silt loam, saline-alkali, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Cultivated areas have a scabby appearance. Areas that are highest in salinity and alkalinity are irregular in shape and the soil is cloddy and light in color on the surface. Where in rangeland, these highly saline-alkali areas are generally covered with a stand of alkali sacaton and inland saltgrass. Areas range from 20 to 500 acres in size. The soil has the profile described as representative of the series, except the upper part of the profile is higher in soluble salts and alkalinity.

About 50 percent of each mapped area is Lawet silt loam that is free of excess soluble salts and crops show no evidence of injury. The remaining 50 percent is affected to a moderate degree, .15 to .35 percent, by excess salinity and it is also strongly alkaline.

Included with this soil in mapping are areas of Gibbon loam on slightly higher elevations of the landscape.

Growth of crops in the saline-alkali areas is restricted. During the wettest seasons, haying operations are hampered by the wetness. Runoff is slow. Availability of plant nutrients, mainly phosphorus, is generally low. The soil is corrosive to buried pipes.

Most of the acreage of this soil is in native grass and is used for grazing or is mowed for hay. Corn and alfalfa are the main crops on the small acreage that is cultivated. Capability units IVs-1 dryland, IIIs-4 irrigated; windbreak suitability group 8. The strongly alkaline part of the unit is in Saline Subirrigated range site and the remaining part is in Subirrigated range site.

Lex Series

The Lex series consists of somewhat poorly drained, nearly level, loamy soils that are moderately deep over mixed sand and gravel. These soils formed in alluvium on bottom land. Most years the seasonal water table ranges from a depth of about 2 or 3 feet in spring to a depth of about 5 feet late in summer.

In a representative profile the surface layer is very dark gray and gray loam 16 inches thick. Below this is a transitional layer of light gray loam 6 inches thick that has a high amount of lime. The underlying material is light brownish gray silt loam to a depth of 24 inches, light gray very fine sandy loam to a depth of 29 inches, and white and light brownish gray gravelly sand to a depth of 60 inches or more.

Permeability is moderate in the upper part of the profile and very rapid in the underlying gravelly sand material. The available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. Because calcium content is excessively high and available phosphorus is low, fertility is not well balanced. In the saline-alkali soil, permeability is moderately slow in the upper part of the profile. The available water capacity is low. Natural fertility and content of organic matter are low.

Lex soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Lex loam, 0 to 2 percent slopes, in a native grass, 1,050 feet west and 50 feet south of the northeast corner of sec. 12, T. 10 N., R. 24 W.:

A11—0 to 6 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular struc-

ture; slightly hard, friable; violent effervescence (13 percent CaCO3); mildly alkaline; clear smooth boundary.

A12—6 to 16 inches; gray (N 5/0) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; violent effervescence (14 percent CaCO3); mildly alkaline; gradual smooth boundary.

ACca—16 to 22 inches; light gray (N 6/0) loam, dark gray (10YR 4/1) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; violent effervescence (19 percent CaCO3); mildly alkaline; clear smooth boundary.

C1—22 to 24 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; few medium distinct dark yellowish brown (10YR 4/4) moist mottles; massive; hard, friable; mildly alkaline; abrupt smooth boundary.

C2—24 to 29 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; few fine distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; slightly hard, friable; stratified with thin layers of loam and silt loam; mildly alkaline; abrupt smooth boundary.

IIC3—29 to 44 inches; white (10YR 8/2) gravelly sand; very pale brown (10YR 7/3) moist; single grained; loose; mildly alkaline; abrupt smooth boundary.

IIC4—44 to 60 inches; light brownish gray (10YR 6/2) gravelly sand, brown (10YR 5/3) moist; single grained; loose; free water at a depth of 49 inches; mildly alkaline.

The A horizon ranges from 10 to 20 inches in thickness and is loam or silt loam. The ACca horizon is typically loam, but is clay loam or silty clay loam in places. Depth to the IIC horizon ranges from 20 to 40 inches. The IIC horizon is typically gravelly sand, but is coarse sand in places.

In the landscape, Lex soils are near Alda, Lawet, Wann, and Platte soils. They contain more clay in the upper part of the C horizon than the upper part of the C horizon in Alda soils. They are shallower to the IIC horizon than Wann and Lawet soils. Lex soils are deeper over mixed sand and gravel in the IIC horizon than Platte soils.

Le—Lex loam, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Areas range from 5 to 500 acres in size. The soil has the profile described as representative of the series. In some places, the surface layer is 15 to 22 percent lime.

Included with this soil in mapping are small areas of Gibbon loam and Lawet silt loam. Also included are a few areas of moderately saline soils.

Wetness is the most important limitation. It commonly delays tillage in spring. Land leveling for irrigation is difficult. If deep cuts are made, sand and gravel is exposed at the surface. Overirrigation tends to leach nutrients out of the root zone into the layer of sand and gravel. Applications of phosphate to this soil improve most crops, especially legumes. When dryfarmed, areas of this soil are droughty late in summer because the water table is commonly below the level where roots can effectively penetrate. Runoff is slow.

About one-half of the acreage of this soil is cultivated and one-half is in native grass. Most of the cultivated areas have been developed for irrigation. Alfalfa and corn are the main crops. Native grass is used as rangeland or meadow. Capability units IIIw-4 dryland, IIIw-7 irrigated; Subirrigated range site; windbreak suitability group 2.

Lf—Lex loam, saline-alkali, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Cultivated areas have a scabby appearance. Areas that are highest in salinity and alkalinity are cloddy and light in color on the surface. Where the fields are in native grass, these highly saline-alkali areas are generally covered with a stand of alkali sacaton and inland saltgrass. Areas range from 10 to 60 acres in size. The soil has the profile described as representative of the series, except it is more strongly affected by salinity and alkalinity.

About 60 percent of each mapped area is relatively free of excess salts. Approximately 40 percent, however, contains a slight amount of excess soluble salts and is also strongly alkaline.

Included with this soil in mapping are small areas of Alda loam.

The growth of most cultivated crops is inhibited in areas that are most severely affected by salinity and alkalinity. In the alkali areas puddles form easily if the surface is disturbed when wet and a hard crust commonly forms when the surface is dry. Available phosphorus is generally low. When leveling the soil for irrigation, care needs to be taken because the underlying sand and gravel is exposed at the surface where deep cuts are made. The soil is corrosive to buried pipe. Runoff is slow.

Most of the acreage of this soil is in native grass and is used for range or meadow. A small acreage is cultivated, mainly to irrigated corn and alfalfa. Capability units IVs-1 dryland, IIIs-7 irrigated; windbreak suitability group 8. The strongly alkaline part of the mapping unit is in Saline Subirrigated range site and the remaining part is in Subirrigated range site.

Ovina Series

The Ovina series consists of deep, moderately well drained soils that are nearly level and very gently sloping. These soils formed in alluvial and eolian material on stream terraces. A seasonal water table ranges from a depth of 3 or 4 feet in spring to a depth of 8 feet late in summer.

In a representative profile the surface layer is very friable, very dark grayish brown fine sandy loam 8 inches thick. The very friable subsoil is fine sandy loam about 18 inches thick. It is brown in the upper 7 inches and pale brown in the lower 11 inches. The underlying material is very pale brown fine sandy loam to a depth of 39 inches, very pale brown loamy fine sand to a depth of 49 inches, and light gray loamy fine sand to a depth of 60 inches or more.

Permeability is moderately rapid, and the available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. These soils release moisture readily to plants.

Ovina soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Ovina fine sandy loam, 0 to 3 percent slopes, in a cultivated field, 65 feet east

and 1,850 feet south of the northwest corner of sec. 31, T. 11 N., R. 22 W.:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

B2—8 to 15 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable; slightly acid; gradual wavy boundary.

B3—15 to 26 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; slightly acid; gradual wavy boundary.

C1—26 to 39 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; neutral; gradual wavy boundary.

C2—39 to 49 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; single grained; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C3—49 to 60 inches; light gray (10YR 7/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; few medium faint brown (10YR 5/3) mottles; single grained; slightly hard, very friable; strong effervescence; free water at a depth of 6 feet; mildly alkaline.

The A horizon ranges from 7 to 10 inches in thickness. The B horizon is typically fine sandy loam, but is light loam in places. The C horizon is typically loamy fine sand or fine sandy loam. Layers of very fine sandy loam and loam, however, are common. Lime is at a depth of 20 to 60 inches.

Ovina soils in Dawson County are better drained, lack distinct mottles, and are lower in reaction than is defined in the range of the series. These differences, however, do not alter the use or behavior of the soils.

In the landscape, Ovina soils are near Anselmo, Wann, and Elsmere soils. They are more poorly drained than Anselmo soils. They are better drained and have lime lower in the profile than Wann soils. They have less sand at a depth of 10 to 40 inches than Elsmere soils.

OvB—Ovina fine sandy loam, 0 to 3 percent slopes. This nearly level and very gently sloping soil is on stream terraces in the Platte River Valley. Areas range from 5 to about 200 acres in size.

Included in mapping are areas of Anselmo fine sandy loam on the highest elevations of the mapping unit.

Wetness, especially in spring, is the main hazard. Tillage is commonly delayed. The water table, however, is generally beneficial in summer and fall when rainfall is lowest. Alfalfa obtains moisture from the water table. Irrigation is necessary for highest production of other commonly grown crops. Soil blowing is a concern in management when the soil is left bare for any length of time.

Most of the acreage of this soil is cultivated and is developed for irrigation. Corn, alfalfa, and grain sorghum are the main crops. Capability units IIw-6 dryland, IIw-8 irrigated; Subirrigated range site; windbreak suitability group 2.

Platte Series

The Platte series consists of poorly drained and somewhat poorly drained, nearly level soils that are shallow over coarse sand or mixed sand and gravel. These soils formed in alluvium on bottom land. The seasonal water table ranges from a depth of 2 or 3 feet in spring to a depth of 5 feet in fall.

In a representative profile the surface layer is dark gray loam 7 inches thick. The underlying material is light gray very fine sandy loam to a depth of 13 inches and light gray sand and gravelly sand to a depth of 60 inches or more.

Permeability is moderately rapid in the upper part of the profile and very rapid in the mixed sand and gravel. The available water capacity, content of organic matter, and natural fertility are low.

Platte soils are not suited to cultivated crops when farmed under dryland management. These soils can be irrigated but suitable crops are limited. The soils are suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Platte loam, 0 to 2 percent slopes, in native grass, 110 feet east and 2,100 feet north of the southwest corner of sec. 4, T. 10 N., R. 24 W.:

A1—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; violent effervescence (7 percent $CaCO_3$); mildly alkaline; clear wavy boundary.

C1—7 to 13 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; abrupt smooth boundary.

IIC2—13 to 15 inches; light gray (10YR 7/2) gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose; mildly alkaline; abrupt smooth boundary.

IIC3—15 to 19 inches; light gray (10YR 7/2) sand, grayish brown (10YR 5/2) moist; common medium distinct dark yellowish brown (10YR 4/4 moist) mottles; single grained; loose; mildly alkaline; abrupt smooth boundary.

IIC4—19 to 60 inches; light gray (10YR 7/2) gravelly sand, grayish brown (10YR 5/2) moist; common medium distinct dark yellowish brown (10YR 4/4) moist; mottles; single grained; loose; free water at a depth of 50 inches; mildly alkaline.

The A horizon ranges from 5 to 12 inches in thickness and is dark gray or dark grayish brown. A transitional layer 2 to 4 inches thick is between the A and C horizons in some places. The C1 horizon is silt loam, very fine sandy loam, fine sandy loam, or sandy loam. Depth to coarse sand or mixed sand and gravel ranges from 12 to 20 inches.

In the landscape, Platte soils are near Alda, Lex, and Lawet soils. They are shallower to coarse sand or mixed sand and gravel than Alda, Lex, and Lawet soils. They contain less clay in the upper part of the C horizon than Lex and Lawet soils.

Pt—Platte loam, 0 to 2 percent slopes. This soil is on bottom land in the Platte River Valley. Areas range from 10 to 1,000 acres in size. The surface layer and underlying material are slightly affected by soluble salts in some places. These saline areas make up about 30 percent of each mapped area. The surface layer is fine sandy loam in a few areas.

Included with this soil in mapping are small areas of Alda loam and Lex loam, both of which are on slightly higher elevations.

Flooding is a hazard during the wettest season, generally in spring. Wetness caused by the high water table commonly interferes with tillage. Cool soil temperatures also delay planting and germination. When the water table is lowest in summer, crops suffer from lack of moisture. Fertility is low and not well bal-

anced. Especially where concentrations of soluble salts occur, available phosphate is low.

Most of the acreage of this soil is in native grass and is used as rangeland or meadow. A few areas are in irrigated cropland. Corn, grain sorghum, and alfalfa are the main crops. Capability units VIw-4 dryland, IVw-13 irrigated; Subirrigated range site; windbreak suitability group 2.

Rusco Series

The Rusco series consists of deep, moderately well drained and well drained soils that are nearly level. These soils formed in silty alluvium on stream terraces. The water table is at a depth of 6 to 8 feet in spring and at a depth of 15 feet in fall.

In a representative profile the surface layer is friable, very dark grayish brown silt loam 11 inches thick. The subsoil is firm, dark brown silty clay loam to a depth of 15 inches; firm, brown silty clay loam to a depth of 22 inches; and friable, pale brown silt loam to a depth of 31 inches. The underlying material is light gray silt loam to a depth of 44 inches and pale brown loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high.

Rusco soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Rusco silt loam, 0 to 1 percent slopes, in cultivated crops, 800 feet north and 2,600 feet west of the southeast corner of sec. 26, T. 10 N., R. 22 W.:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; mildly alkaline; abrupt smooth boundary.

A12—7 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

B21t—11 to 15 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm; neutral; clear wavy boundary.

B22t—15 to 22 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm; mildly alkaline; clear wavy boundary.

B3—22 to 31 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable; strong effervescence; lime in small soft irregular forms; mildly alkaline; gradual wavy boundary.

C1—31 to 44 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; few medium distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; soft, very friable; violent effervescence (2 percent CaCO3); few fine soft rounded accumulations of lime; moderately alkaline; clear smooth boundary.

C2—44 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; thin stratified layers of light gray (10YR 7/2) loamy material; common medium faint dark yellowish brown (10YR 4/4 moist) mottles; massive; soft, very friable; violent effervescence (2 percent CaCO3); moderately alkaline.

The A horizon ranges from 7 to 16 inches in thickness and from very dark grayish brown to grayish brown. The B2t horizon ranges from 7 to 14 inches in thickness and from dark grayish brown to pale brown. Depth to lime ranges from 10 to 30 inches. Sand or gravelly sand is below a depth of 5 feet.

In the landscape, Rusco soils are near Cozad, Gosper, Hall, and Wood River soils. They have a B2 horizon that has more clay than in Cozad soils. They are deeper to the coarse textured underlying material and have less sand at a depth of 10 to 40 inches than Gosper soils. Rusco soils have a lighter colored B2 horizon than the Hall soils and have less clay in the B2 horizon than Wood River soils.

Ru—Rusco silt loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces on the north side in the Platte River Valley. Areas range from 5 to about 2,000 acres in size.

Included with this soil in mapping are small areas of Cozad silt loam, Hall silt loam, and Wood River silt loam. Also included are small alkali or saline areas of soils.

Lack of sufficient moisture is the main limitation in dryfarmed areas. The silty clay loam subsoil is generally within a depth of 12 inches. The fine textured material near the surface slows intake of water. During dry seasons, coarse sand and gravelly sand is above the water table and plant roots are not able to obtain needed moisture. Runoff is slow.

Nearly all the acreage of this soil is cultivated. A large part of it is developed for irrigation. Corn, grain sorghum, and alfalfa are the main crops. A smaller acreage is in sugar beets. Capability units IIc-1 dryland, I-4 irrigated; Silty Lowland range site; windbreak suitability group 1.

Silver Creek Series

The Silver Creek series consists of deep, moderately well drained or somewhat poorly drained soils that are nearly level. These soils formed in alluvium on stream terraces. The seasonal water table is at a depth of about 2 to 5 feet in spring and a depth of 7 feet in summer.

In a representative profile the surface layer is very friable, grayish brown silt loam 8 inches thick. The subsoil is firm, heavy silty clay loam about 25 inches thick. It is very dark gray in the upper 4 inches and grayish brown in the lower 21 inches. The underlying material is light gray loam to a depth of 43 inches and light gray sand and gravelly sand to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. The subsoil and underlying material have a small amount of soluble salts and a moderate amount of exchangeable sodium. In the saline-alkali soil in the Silver Creek complex, content of organic matter is moderately low, natural fertility is low, and available water capacity is low.

Silver Creek soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Silver Creek silt loam, 0 to 2 percent slopes, in a cultivated field, 800 feet north and 100 feet east of the southwest corner of sec. 11, T. 9 N., R. 20 W.:

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

B1t—8 to 12 inches; very dark gray (10YR 3/1) heavy silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, firm; strong effervescence; mildly alkaline; clear smooth boundary.

B21t—12 to 16 inches; grayish brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm; violent effervescence (14 percent CaCO3); moderately alkaline; clear wavy boundary.

B22t—16 to 33 inches; grayish brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate angular blocky; hard, firm; violent effervescence (14 percent CaCO3); moderately alkaline; clear smooth boundary.

C1ca—33 to 43 inches; light gray (10YR 6/1) loam, gray (10YR 5/1) moist; massive; slightly hard, friable; violent effervescence (27 percent CaCO3); strongly alkaline; abrupt smooth boundary.

IIC2—43 to 50 inches; light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; single grained; loose; moderately alkaline; gradual smooth boundary.

IIC3—50 to 60 inches; light gray (10YR 7/2) gravelly sand, light brownish gray (10YR 6/2) moist; single grained; loose; water at a depth of 5 feet; moderately alkaline.

The A horizon ranges from 6 to 18 inches in thickness and ranges from very dark gray to grayish brown. It is loam and silty clay loam, but is silt loam in places. The B horizon is typically heavy silty clay loam, but ranges to heavy clay loam and silty clay. The C1 horizon is typically loam, but ranges to sandy clay loam. Reaction of the C horizon is moderately alkaline or strongly alkaline. Sand, coarse sand, or gravelly sand is at a depth of 40 to 70 inches. Depth to lime ranges from 0 to 10 inches.

The B horizon of Silver Creek soils in Dawson County is not as gray and the profile lacks the mottles as defined in the range of the series. These differences, however, do not alter the use or behavior of the soils.

In the landscape, Silver Creek soils are near Gosper, Rusco, and Wood River soils. They have more clay in the B horizon than Gosper or Rusco soils. They have lime and a water table higher in the profile than Wood River soils.

Sc—Silver Creek silt loam, 0 to 2 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. Areas range from 10 to 350 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Gosper loam and Rusco silt loam. Also included are small areas of saline or alkali soils.

Wetness in spring delays tillage operations and is the main hazard. Alfalfa cannot obtain moisture from the water table during dry periods because roots do not penetrate the coarse underlying material unless it is irrigated. Maintaining and balancing fertility is also a concern of management. Available phosphate is low.

Nearly all the acreage of this soil is cultivated and is developed for irrigation. Corn and alfalfa are the main crops. Capability units IIIw-2 dryland, IIIw-2 irrigated; Subirrigated range site; windbreak suitability group 2.

Sf—Silver Creek silty clay loam, 0 to 2 percent slopes. This nearly level soil is on stream terraces in the Platte River Valley. The most extensive area is in Hay Valley. Brown distinct mottles are common in the underlying material. Mixed sand and gravel is below a depth of 6 feet, except on those areas within 2 miles of the Platte River where it is at a depth of 40 to 60 inches. The water table is at a depth of 2 to 4 feet in spring and at a depth of 5 feet late in summer. Available water capacity is high.

In Hay Valley, saline-alkali areas that make up about 50 percent of the acreage are in a few native grass pastures. The soil has the profile described as representative of the series, except it has a higher degree of soluble salts and the salts are closer to the surface. In addition, the underlying material in most places is silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Gosper loam, on slightly higher elevations.

The high water table and silty clay loam surface layer cause this soil to be wet in spring. This slows up seedbed preparation and planting. The water table, however, provides moisture during summer for alfalfa, trees, and other deep rooted plants. Workability is difficult. Runoff is slow.

Most of the acreage of this soil is cultivated and is developed for irrigation. A few areas, however, are in native grass. Corn and alfalfa are the main crops. Capability units IIIw-2 dryland, IIIw-3 irrigated; Subirrigated range site; windbreak suitability group 2.

Sh—Silver Creek complex, 0 to 2 percent slopes. These nearly level soils are on stream terraces in the Platte River Valley. Areas range from 10 to 400 acres in size. The soils have the profile described as representative of the series, except 30 percent of each mapped area is slightly affected or moderately affected by soluble salts or is strongly alkaline. These saline-alkali horizons are nearer to the surface than is described in the profile. The subsoil is moderately alkaline or strongly alkaline in the more strongly affected areas. Areas in native grass have a higher percentage of the strongly affected soil areas.

Included with this soil in mapping are small areas of Gosper loam, on slightly higher elevations.

These saline-alkali soils are difficult to till. They are hard when dry and sticky when wet. Alfalfa cannot obtain moisture from the water table during dry periods because the roots do not penetrate the sandy underlying material. Lack of sufficient moisture is a limitation in dryfarmed areas. Runoff is very slow.

Most of the acreage is cultivated and is developed for irrigation. Some areas, however, are in native grass. Corn and alfalfa are the main crops. Capability units IVs-1 dryland, IIIs-2 irrigated; Saline Subirrigated range site; windbreak suitability group 8.

Uly Series

The Uly series consists of deep, well drained and somewhat excessively drained silty soils that are

strongly sloping to steep. These soils formed in loess on uplands.

In a representative profile the surface layer is friable, gray silt loam 8 inches thick. The subsoil is very friable, grayish brown silt loam about 7 inches thick. The underlying material, to a depth of 60 inches, is light gray and white silt loam.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low, and natural fertility is medium. These soils release moisture readily to plants.

Where Uly soils are cultivated, they are highly susceptible to erosion. The strongly sloping soils have a limited use for cultivated crops. All of the soils are suited for native grass, and they are suitable for recreational uses and habitat for wildlife. The strongly sloping and moderately steep soils are suited to plantings of trees and shrubs for windbreaks.

Representative profile of Uly silt loam, 11 to 15 percent slopes, in native grass, 1,600 feet east and 1,200 feet north of the southwest corner of sec. 18, T. 11 N., R. 20 W.:

A1—0 to 8 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B2—8 to 15 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium granular; slightly hard, very friable; slightly acid; abrupt smooth boundary.

C1—15 to 40 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; violent effervescence (4 percent $CaCO_3$); mildly alkaline; abrupt smooth boundary.

C2—40 to 60 inches; white (10YR 8/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence (1 percent $CaCO_3$); mildly alkaline.

The A horizon ranges from 7 to 12 inches in thickness and is dark gray to grayish brown. The soil is 18 to 29 percent clay at a depth of 10 to 40 inches. The B horizon is grayish brown or light brownish gray and ranges from 6 to 16 inches in thickness. Depth to lime ranges from 12 to 25 inches.

In the landscape, Uly soils are near Coly, Holdrege, and Hall soils. They have a thicker A horizon and unlike Coly soils, they have a B horizon. The B horizon of Uly soils has less clay and lime is not as deep as Holdrege and Hall soils.

UbE—Uly silt loam, 11 to 15 percent slopes. This moderately steep soil is on side slopes in upland drainageways and on ridges between the drainageways. Areas range from 10 to about 500 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of moderately sloping Holdrege silt loam on the lower elevations of the landscape and small areas of strongly sloping and moderately steep Coly silt loam on the crest of the ridges.

Water erosion is a very severe hazard. Downstream siltation is also a hazard when erosion occurs. Runoff is rapid.

Nearly all the acreage of this soil is in native grass and is used as rangeland. Windbreaks grow successfully. The soil also provides good habitat for rangeland wildlife. Capability unit VIe-1 dryland; Silty range site; windbreak suitability group 4.

UcF—Uly-Coly silt loams, 15 to 30 percent slopes. These steep soils are on side slopes of upland drainageways and on ridges between the drainageways. Areas range from 20 to about 1,000 acres in size. Both soils have the profiles described as representative of their respective series.

About 50 percent of each mapped area is Uly silt loam and about 30 percent is Coly silt loam. The Uly soil occupies the smooth areas at the base of slopes and the ridges between the drainageways. The Coly soil is on steep side slopes of drainageways.

Included with these soils in mapping are areas of Hobbs silt loam on bottom land of the narrow drainageways, which make up about 10 percent of the mapping unit. Also included are areas of gently sloping Holdrege silt loam and gently sloping Hord silt loam on the lower side slopes of drainageways, which make up about 10 percent of the unit.

Where grass cover is removed, these soils are highly susceptible to water erosion, which is the main hazard. Runoff is rapid.

Nearly all the acreage in this map unit is in native grass. Some areas of Hobbs soils in the bottoms, however, are cultivated. These soils are not well suited to planting trees for windbreaks with machinery because they are too steep. They provide good habitat for wildlife. Capability unit VIe-1 dryland; windbreak suitability group 10. Uly soil in Silty range site and Coly soil in Limy Upland range site.

UhD—Uly-Holdrege silt loams, 6 to 11 percent slopes. These strongly sloping soils are on ridgetops and smooth side slopes of drainageways on the uplands. Areas range from 20 to 500 acres in size. Both soils have the profiles described as representative of their respective series.

About 60 percent of each mapped area is Uly silt loam and about 30 percent is Holdrege silt loam. The Uly soil occupies the upper part of side slopes, and the Holdrege soil occupies the lower part.

Included with these soils in mapping are areas of strongly sloping Coly silt loam on ridgetops and gently sloping Hord silt loam at the base of side slopes, which make up about 10 percent of the mapping unit.

Water erosion is the main hazard. Where grass cover is removed, these soils are very susceptible to water erosion. Maintaining the desired species of grass is the main concern in management.

This map unit is suited to marginal use for cultivated crops. Most of the acreage, however, is in native grass and is used for rangeland. Trees are grown successfully in windbreaks. These soils also provide good habitat for rangeland wildlife. Capability units IVe-1 dryland, IVe-6 irrigated; Silty range site; windbreak suitability group 4.

UmD2—Uly-Holdrege-Coly silt loams, 6 to 11 percent slopes, eroded. In this map unit, the soils occur on smooth side slopes adjacent to drainageways on the uplands. Areas range from 20 to about 500 acres in size. Uly silt loam and Holdrege silt loam have the

profiles described as representative of their respective series, but the surface layer is slightly thinner and lime is nearer to the surface. Coly silt loam has the profile described as representative of the Coly series.

About 50 percent of the map unit is Uly silt loam, about 25 percent is Holdrege silt loam, and about 20 percent is Coly silt loam. The Uly soil is mid slope. The Holdrege soil is at the lowest elevation on the slopes and at the head of some drainageways. The Coly soil is at the crest of hills where erosion has been most severe.

Included with these soils in mapping are small areas of gently sloping Hord silt loam at the base of some slopes, which make up about 5 percent of the mapped area.

Water erosion is the main hazard. Where the surface layer is not adequately protected, soil blowing is a hazard. The lightest colored areas have low fertility. These soils are generally easy to work, but small gullies are common. Runoff is medium.

Most of the acreage of this map unit is cultivated. Sprinkler irrigation is suited but not widely used. The main crops are corn, grain sorghum, and wheat. These soils are also well suited to grass, and a few areas have been reseeded to grass. Trees are grown successfully in windbreaks. These soils also provide habitat for wildlife. Capability units IVe-1 dryland, IVe-6 irrigated; windbreak suitability group 4. Uly and Holdrege soils in Silty range site and Coly soil in Limy Upland range site.

Valentine Series

The Valentine series consists of deep, excessively drained sandy soils that have complex slopes ranging from nearly level to rolling (fig. 10). These soils formed in wind deposited sandy material on stream terraces and uplands.

In a representative profile the surface layer is very friable, dark grayish brown loamy fine sand 5 inches thick. Below this is a transitional layer of grayish brown fine sand about 5 inches thick. The underlying material, to a depth of 60 inches, is pale brown fine sand.

Permeability is rapid, and the available water capacity is low. Content of organic matter and natural fertility are low.

The nearly level and gently undulating Valentine soils are suited to both dryland and irrigated crops. Because of the very severe hazard of erosion, the steeper soils are not suited to cultivated crops. All of the soils are suited to grass, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Valentine loamy fine sand, rolling, in native grass, 150 feet east and 1,800 feet north of the southwest corner of sec. 31, T. 12 N., R. 25 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; medium acid; abrupt smooth boundary.

AC—5 to 10 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; soft, loose; medium acid; clear smooth boundary.

C—10 to 60 inches; pale brown (10YR 6/3) fine sand, grayish brown (10YR 5/2) moist; single grained; loose; slightly acid.

Figure 10.—**Profile of Valentine fine sand, a deep soil that formed in sandy, eolian material.**

The A horizon ranges from 2 to 9 inches in thickness. It is typically dark grayish brown, but ranges from dark grayish brown to light brownish gray. The C horizon ranges from light brownish gray to very pale brown. It is typically fine sand, but ranges to loamy fine sand.

In the landscape, Valentine soils are near Anselmo, Elsmere, and Ovina soils. They have a thinner A horizon and

are better drained than Elsmere soils. Valentine soils have more sand at a depth of 10 to 40 inches than Anselmo soils. They are better drained and have more sand in the C horizon than Ovina soils.

VaB—Valentine loamy fine sand, 0 to 3 percent slopes. This nearly level and gently undulating soil is on stream terraces in the Platte River Valley. Areas range from 10 to 700 acres in size. The soil has the profile described as representative of the series, except the surface layer is slightly thicker, especially in low areas. The surface layer is fine sand in some eroded areas. The water table is at a depth of 8 to 15 feet in some places. About 30 percent of the mapping unit has a buried loamy or silty layer between a depth of 2 and 5 feet.

Included with this soil in mapping are small areas of Anselmo fine sandy loam.

Soil blowing is the main hazard. The soil is droughty because of its sandy texture and low available water capacity. Content of organic matter and fertility need to be increased. Where this soil is irrigated, maintaining fertility and preventing loss of water by deep percolation are concerns of management.

Most of the acreage of this soil is cultivated, and a large part of it is irrigated. Corn, grain sorghum, and alfalfa are the main crops. Alfalfa, trees, and other deep rooted plants obtain moisture from the water table where it is at a depth of 8 to 15 feet. A few areas of this soil are in native grass. Capability units IVe-5 dryland, IIIe-11 irrigated; Sandy range site; windbreak suitability group 3.

VaC—Valentine loamy fine sand, 3 to 6 percent slopes. This soil is on stream terraces in the Platte River Valley and one small area is on uplands north of Johnson Lake. The soil is undulating and has a series of low hills interspersed with swales. Areas range from 10 to 600 acres in size. The soil has the profile described as representative of the series, except the surface layer is slightly thicker in swales and other low areas. The surface layer is fine sand in some eroded areas. About 15 percent of this mapping unit has a buried loamy or silty layer between a depth of 2 and 5 feet.

Included with this soil in mapping are small areas of Anselmo fine sandy loam.

Soil blowing is a very severe hazard. The soil is droughty because the available water capacity is low. Content of organic matter is very low on eroded areas. Maintaining desirable grasses on range is a concern of management.

Most of the acreage of this soil is in native grass and is used for grazing. The soil is not suited to dryland cultivated crops because of the hazard of erosion. About 40 percent of the acreage, however, is cultivated and a large part of it is irrigated by sprinkler systems. Corn, grain sorghum, and alfalfa are the main crops. Close sown crops are better suited than row crops. Capability units VIe-5 dryland, IVe-11 irrigated; Sandy range site; windbreak suitability group 7.

VaE—Valentine loamy fine sand, rolling. This soil is hummocky and has complex slopes of 6 to 17 percent, interspersed with swales on uplands. Areas range from 5 to 100 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few blowouts or areas affected by severe soil blowing.

Soil blowing is a severe hazard. This soil is droughty because the texture is coarse and the available water capacity is low. Active blowouts damage surrounding vegetation. Overgrazing depletes desirable grasses and soil blowing can be the result.

Most of the acreage of this soil is in native grass and is used for grazing. The soil is not suited to cultivated crops. A few areas, however, are irrigated with a sprinkler system. Capability unit VIe-5 dryland; Sands range site; windbreak suitability group 7.

Wann Series

The Wann series consists of deep, somewhat poorly drained soils that are nearly level. These soils formed in loamy alluvium on bottom land. The seasonal water table ranges from a depth of about 2 or 3 feet in spring to a depth of 7 feet in summer.

In a representative profile the surface layer is very friable, very dark gray and very dark grayish brown loam 12 inches thick. Below this is a transitional layer of light brownish gray loam about 5 inches thick. The underlying material is very pale brown fine sandy loam to a depth of 27 inches, light gray fine sandy loam to a depth of 46 inches, and very pale brown fine sandy loam to a depth of 58 inches. Below this, to a depth of 60 inches or more, is very pale brown sand. The surface is calcareous.

Permeability is moderately rapid, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium. These soils release moisture readily to plants. In the saline-alkali soil, permeability is moderate, and the available water capacity is moderate. Natural fertility is low.

Wann soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Wann loam, 0 to 2 percent slopes, in a cultivated field, 100 feet north and 2,400 feet east of the southwest corner of sec. 19, T. 9 N., R. 21 W.:

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

A12—7 to 12 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; violent effervescence (2 percent $CaCO_3$); mildly alkaline; clear wavy boundary.

AC—12 to 17 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; violent effervescence (8 percent $CaCO_3$); mildly alkaline; gradual wavy boundary.

C1—17 to 27 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; violent effervescence (5 percent $CaCO_3$); mildly alkaline; gradual smooth boundary.

C2—27 to 36 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; violent effervescence (5 percent $CaCO_3$); mildly alkaline; clear smooth boundary.

C3—36 to 46 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; soft, friable; violent effervescence (7 percent $CaCO_3$); mildly alkaline; abrupt smooth boundary.

C4—46 to 58 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; many medium distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

IIC5—58 to 60 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; many medium distinct dark yellowish brown (10YR 4/4 moist) mottles; single grained; loose; free water at a depth of 6 feet; mildly alkaline.

The A horizon ranges from 11 to 20 inches in thickness. It is fine sandy loam or loam, but ranges to very fine sandy loam. The C horizon is typically fine sandy loam, light loam, and very fine sandy loam that is commonly stratified with lenses and layers of light silt loam and loamy fine sand. The IIC horizon is at a depth of 40 to 60 inches and is sand, coarse sand, or gravelly sand.

In the landscape, Wann soils are near Alda, Lex, and Lawet soils. They are deeper to the IIC horizon and have less clay in the upper part of the C horizon than Lex soils. They are deeper to the IIC material than Alda soils, and they have more sand at a depth of 10 to 40 inches than Lawet soils.

Wa—Wann fine sandy loam, saline-alkali, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Areas are parallel to channels of the river and range from 15 to 100 acres in size. The soil is on slightly higher elevations than the surrounding soils. The soil has the profile described as representative of the series, except it has a fine sandy loam surface layer and is slightly saline above a depth of 20 inches.

This soil makes up about 70 percent of each mapped area. The remaining 30 percent is a similar soil, except it is slightly affected by soluble salts and is strongly alkaline. The highest accumulation of the saline-alkali condition is above a depth of 20 inches.

Included with this soil in mapping are a few places where the surface layer is loamy fine sand.

Most years the water table is sufficiently high in spring so that farming operations are delayed because of the wetness. Growth of crops is restricted in areas that are most severely affected by the saline-alkali condition. Available phosphate is low. If the surface is not protected, soil blowing is a hazard.

Most of the acreage of this soil is in native grass and is used for grazing or hay. Some areas that were previously cultivated have since been reseeded to grass. Areas that are cultivated are generally irrigated. Corn and alfalfa are the main crops. Capability units IVs-1 dryland, IIIs-8 irrigated; Subirrigated range site; windbreak suitability group 8.

Wb—Wann loam, 0 to 2 percent slopes. This nearly level soil is on bottom land in the Platte River Valley. Areas parallel the river and range from 10 to 200 acres in size. The soil has the profile described as representative of the series.

Included with this soil in mapping are a few areas of soils where the surface layer is fine sandy loam. Also included are small areas of Alda loam.

Wetness in spring delays farming operations and is the main limitation. This soil is rarely flooded. During major floods, however, areas of this soil are inundated.

Most of the cultivated acreage is irrigated. The main crops are corn, alfalfa, and grain sorghum. About 50 percent of this soil is in native grass and is used for grazing or hay. These areas are generally on islands in the Platte River, which are generally inaccessible to tillage equipment. Capability units IIw-4 dryland, IIw-8 irrigated; Subirrigated range site; windbreak suitability group 2.

Wood River Series

The Wood River series consists of deep, moderately well drained soils that are nearly level. These soils formed in alluvium on stream terraces. The water table ranges from a depth of 7 to 10 feet in spring to a depth of 15 feet in fall.

In a representative profile the surface layer is friable, gray silt loam 8 inches thick. The subsoil is firm, dark grayish brown silty clay loam to a depth of 16 inches; firm, brown heavy silty clay loam to a depth of 22 inches; and friable, pale brown heavy silt loam to a depth of 30 inches. The underlying material, to a depth of 60 inches, is very pale brown silt loam. The subsoil and underlying material contains an excessive amount of sodium and soluble salts.

Permeability is slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium. The subsoil releases moisture slowly to plants. In the saline-alkali soil in the Wood River complex, the available water capacity is moderate, content of organic matter is moderately low, and natural fertility is low.

Wood River soils are suited to both dryland and irrigated crops. They are also suited to grass, trees, and shrubs, and they are suitable for recreational uses and habitat for wildlife.

Representative profile of Wood River silt loam in an area of Wood River complex, 0 to 2 percent slopes, in a cultivated field, 280 feet east and 1,056 feet north of the southwest corner of sec. 2, T. 9 N., R. 20 W.:

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21t—8 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium prismatic structure; slightly hard, firm; 18 percent exchangeable sodium; neutral; clear smooth boundary.

B22t—16 to 22 inches; brown (10YR 5/3) heavy silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine blocky; slightly hard, firm; 22 percent exchangeable sodium; 0.2 percent soluble salts; moderately alkaline; clear wavy boundary.

B3—22 to 30 inches; pale brown (10YR 6/3) heavy silt loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; 25 percent exchangeable sodium; 0.3 percent soluble salts; strong effervescence; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; soft, very friable;

16 percent exchangeable sodium; 0.2 percent soluble salts; violent effervescence; mildly alkaline.

The A horizon ranges from 7 to 12 inches in thickness. The B2t horizon is typically heavy silty clay loam, but ranges to silty clay. Reaction of the B2t horizon ranges from neutral to moderately alkaline and has more than 15 percent exchangeable sodium. The B3 and C horizons are slightly affected or moderately affected by soluble salts and are mildly alkaline or moderately alkaline. The C horizon is typically silt loam, but is loam in some places. Depth to lime ranges from 18 to 30 inches. In places a buried dark soil is present below a depth of 50 inches. These soils characteristically lack an A2 horizon.

In the landscape, Wood River soils are near Hall, Rusco, and Silver Creek soils. The B2t horizon of Wood River soils contains more clay and exchangeable sodium than Hall and Rusco soils. They have lime at a lower depth and are better drained than Silver Creek soils.

Wo—Wood River silt loam, 0 to 1 percent slopes. This soil is on stream terraces in the Platte River Valley. Areas range from 10 to 100 acres in size. The soil has the profile described as representative of the series, except the surface layer is thicker and concentration of saline-alkali salt in the subsoil is low. The amount of salt is not so excessive that it affects the growth of plants.

Included with this soil in mapping are small areas of Rusco silt loam.

The subsoil permits moisture to move downward slowly and moisture is held under too much tension to be easily used by plant roots. Where the surface is not adequately protected, soil blowing is a hazard. Runoff is slow.

Nearly all the acreage of this soil is cultivated. A large part of it is irrigated. Corn, alfalfa, and grain sorghum are the main crops. Trees can be successfully grown in windbreaks. Areas of this soil also provide food and cover for wildlife. Capability units IIs-2 dryland, IIs-2 irrigated; Clayey range site; windbreak suitability group 4.

Wr—Wood River complex, 0 to 2 percent slopes. In this map unit, the soils are nearly level and are on stream terraces in the Platte River Valley. Many irregularly shaped small microdepressions are in areas of rangeland. These areas are higher in salinity and alkalinity than higher areas outside the depressions. Cultivated areas that are highly saline and alkaline have a scabby appearance. When dry, these areas are cloddy and light gray in color. Areas range from 5 to 2,000 acres in size.

About 70 percent of each mapped area has the profile described as representative of the series. The remaining 30 percent has a subsoil that is moderately saline or is strongly alkaline. In addition, the surface layer is thinner, ranging from 4 to 7 inches in thickness. In places the surface layer is also affected by moderate amounts of exchangeable sodium. Areas in native grass have a higher percentage of the saline-alkali soils than cultivated areas. In the saline-alkali affected areas, the upper part of the claypan subsoil is silty clay and depth to lime ranges from 10 to 22 inches.

Included with this soil in mapping are small areas of Rusco silt loam.

The scabby, saline-alkali areas are low in fertility and nutrients are commonly unavailable for plant use. These areas are moderately low in content of organic matter. They are difficult to till because the soil is hard when dry and sticky when wet. Tractors commonly become stuck in the alkali areas. These soils are droughty because the fine textured claypan type subsoil does not permit moisture to move downward readily. Availability of water to plants is only moderate. Runoff is very slow.

Most of the acreage of this map unit is cultivated and is developed for irrigation. A few areas, however, are in native grass. Corn and alfalfa are the main crops and are generally irrigated. Capability units IVs-1 dryland, IIIs-2 irrigated; Saline Lowland range site; windbreak suitability group 8.

Use and Management of the Soils

This section provides information on how the soils in Dawson County can be used, and discusses the use of the soils for cropland. A discussion of management practices on dryland and irrigated soils is given, and the capability classification used by the Soil Conservation Service is explained. Information on yields of the principal dryfarmed and irrigated crops is given for each arable soil. Management of rangeland is discussed and the soils are grouped into range sites, each of which is a distinctive type of rangeland. Suitability of the soils for growing trees, particularly in windbreaks, is discussed. Information also is given on the capacity of the soil associations to produce food and cover for wildlife. The section concludes with a discussion of the engineering systems in classifying soils for engineering purposes, soil properties significant to engineering, interpretations of engineering properties for each soil series, and the use of test data provided for certain soils in the county.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitation of groups of soils for rangeland, forest trees, or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, subclass,

and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have a few limitations that restrict their use.
Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, rangeland, or wildlife.
Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or rangeland, woodland, or wildlife.
Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or rangeland, woodland, or wildlife.
Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, although they have other limitations that restrict their use.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass or kind of limitation as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass. The capability unit designation for each soil in the county can be found in the "Guide to Map Units."

In the following pages, the capability units in Dawson County are described and suggestions for the use and management of the soils are given.

Use of the Soils for Cropland

About 53 percent of Dawson County is in cultivated cropland. According to the Nebraska Agricultural Statistics, the most important crops in 1972 were corn, 133,000 acres; alfalfa, 91,000 acres; wheat, 9,800; and grain sorghum, 4,500 acres. Other minor crops are sugar beets, soybeans, barley, oats, rye, and tame grasses. The rest of the cropland is in fallow or in crop diversion and conservation programs.

Managing dryfarmed cropland

In Dawson County, the main dryland crops are alfalfa, wheat, corn, and grain sorghum. Small acreages of barley, oats, rye, and tame grasses are also grown. Many acres of alfalfa are not irrigated. This deep rooted plant, however, obtains moisture from the water table in some areas.

Lack of natural rainfall is a limitation in the county. Moisture can be conserved by using conservation tillage methods. Stubble mulch leaves the stubble of crops or crop residue on the surface as cover during fallow and growing of the succeeding crop. Stubble mulch also contributes to good tilth. Wheat, sorghum, and corn provide good crop residue. Burning crop residue is not a desirable practice. Minium tillage is a form of conservation tillage that creates the proper soil condition for seed germination, plant establishment, and prevention of competitive growth with the least disturbance. Excessive tillage breaks down the structure of the soil, thereby reducing the intake of water. Minimum tillage also reduces the cost of crop production.

Water erosion is the main hazard on loamy and silty soils that are very gently sloping or steeper. To help control erosion, terraces can be used. These are embankments or combinations of embankments and channels constructed across a slope. Instead of permitting runoff water to flow uninterrupted downslope, it is diverted or stored. Terraces or terrace systems can be classified by the type of gradient; they are level, uniformly graded, or variably graded. Grassed waterways are needed as outlets on the uniformly graded and variably graded terraces. The slope determines the space needed between the terraces. In addition to controlling water erosion, terraces also conserve moisture that would otherwise be lost downslope.

Where a large drainage area needs runoff to be diverted, a large, grassed terrace called a "diversion" is used. These areas also require a grassed waterway for disposal of surplus water. Cultivation across a slope is called contour farming and requires less power for tilling than for tilling up and down hills.

Soil blowing is the main hazard on sandy soils. It is also a hazard, however, on loamy and silty soils where the surface is unprotected. Soil blowing can be controlled by stripcropping, which is the growing of crops in a systematic arrangement of strips or bands that serve as barriers to wind and water erosion. Conservation tillage also reduces both soil blowing and water erosion. A narrow barrier of trees, generally one to five rows, can be established within a field to protect the soil. These barriers are called field windbreaks.

Wetness, particularly in spring, is a concern of management on soils that have a high or moderately high water table. If adequate outlets are available, open drains or tile drains can be used to reduce wetness. A natural, entrenched stream or a constructed, open channel can provide a disposal outlet. Tile drains are pipes constructed of burned clay, concrete, or plastic material that are used to carry excess water from the soil. The tile lines are laid at a specific depth and grade. Some soils on bottom land are occasionally or frequently flooded. Conservation practices that help to prevent soil erosion on sloping soils upstream also reduce flood hazard on bottom land soils.

The growing of different crops in recurring succession in the same area is called a crop sequence. Cropping systems vary according to the soils on which they are used. For example, the crop sequence on strongly sloping, loamy soils should include a high percentage of grasses and legumes. On nearly level, silty soils, however, the system can include a low percentage of grasses and legumes. A change in the kind of crop grown helps to control weeds, insects, and plant diseases. A crop sequence that preserves good soil tilth and helps to maintain fertility should be used.

Dryfarmed crops do not need as much fertilizer as irrigated crops. Most of the soils in the county need nitrogen for nonlegume crops and eroded soils commonly need phosphorus. Fertilizer should be applied in the amounts needed for a particular crop as indicated by soil tests. To get the greatest benefit from fertilizer it is important to maintain a balance between the amount of ferilizer applied and the moisture content of the soil. Maintaining or improving the content of organic matter is also important to soil fertility. Most conservation practices used to conserve moisture also help to maintain the organic matter content. Applying barnyard manure to the soil improves fertility, organic matter, and tilth. There are many feedlots in Dawson County that provide an inexpensive source of barnyard manure. Transporting it to the field is the main cost.

Some of the soils in the county that are being used for crops should be seeded to native grasses and used for rangeland. However, most of the crops now dryfarmed in the county are well suited to the soils and climate, and the potential for new suitable crops is good.

Dryland capability units

Described in the paragraphs that follow are the dryland capability units for Dawson County. Specific soils within each unit can be determined by referring to the Guide to Map Units at the back of this survey.

CAPABILITY UNIT IIc-1 DRYLAND

This unit consists of deep, nearly level soils on uplands and stream terraces. These soils are moderately well drained or well drained. The surface layer is loam, silt loam, or silty clay loam. The subsoil and underlying material range widely from loamy fine sand to silty clay loam. Some of the soils on stream terraces have mixed sand and gravel at a depth of 40 to 60 inches.

Permeability is moderately rapid to moderately slow, and the available water capacity is moderate or high. Content of organic matter is moderately low or moderate, and natural fertility is medium or high. Runoff is slow.

Lack of natural rainfall is the main limitation. Conservation of moisture is a main concern in management. Soil blowing is a minor hazard.

The main crops are wheat, grain sorghum, corn, and alfalfa. Oats, barley, and rye can also be grown. Alfalfa is a deep rooted plant and can obtain moisture from the water table where it is above a depth of 15 feet.

Using conservation tillage helps to control soil blowing, maintain tilth, and conserve moisture. Applications of barnyard manure improve fertility. Nonlegume crops commonly respond to nitrogen fertilizer. Burning crop residue is not a desirable practice. Growing crops in sequence helps to control insects and plant diseases.

CAPABILITY UNIT IIe-1 DRYLAND

This unit consists of deep, very gently sloping soils on uplands, stream terraces, and foot slopes. These soils are well drained. The surface layer is silt loam. The subsoil is silt loam or silty clay loam, and the underlying material is silt loam.

Permeability is moderately slow or moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. Runoff is slow to medium. The soils are easy to work and are well suited to cultivation.

Controlling water erosion is the main concern in management. Conserving moisture and maintaining good tilth, fertility, and organic matter content are also needed. Where the surface is not protected, soil blowing is a hazard. The main crops are corn, grain sorghum, wheat, and alfalfa.

Terracing, contour farming, and use of conservation tillage help to control erosion. Applications of barnyard manure and commercial fertilizer help to maintain or improve fertility. Growing crops in sequence reduces plant disease and insect carryovers. Burning crop residue is not a desirable practice.

CAPABILITY UNIT IIe-3 DRYLAND

This unit consists of deep, nearly level and very gently sloping soils on stream terraces and uplands. These soils are well drained or moderately well drained. The surface layer is fine sandy loam, and the subsoil is fine sandy loam, silt loam, loam, or sandy clay loam. The underlying material ranges widely from silt loam to loamy fine sand.

Permeability is moderately rapid or moderate, and

the available water capacity is moderate or high. Content of organic matter is moderately low or moderate, and natural fertility is medium. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is medium or slow.

Soil blowing and water erosion are hazards. Controlling erosion is the main concern in management. Conserving moisture and maintaining organic matter content and fertility are also needed.

The main crops are wheat, corn, grain sorghum, and alfalfa. The soils are also suited to grass, trees, and other less intensive uses. Alfalfa is a deep rooted plant and can obtain moisture from the water table where it is above a depth of 15 feet.

Stripcropping, returning crop residue to the soil, and using field windbreaks help to control soil blowing. Fertility can be maintained by using commercial fertilizer and barnyard manure. Nitrogen is generally needed. Terracing and contour farming are needed on very gently sloping soils that are used for row crops. Growing crops in sequence reduces plant disease and insect carryovers. Burning crop residue is not desirable.

CAPABILITY UNIT IIs-2 DRYLAND

This unit consists of deep, nearly level soils on uplands and stream terraces. These soils are moderately well drained or poorly drained. The surface layer is silt loam, and the subsoil is silty clay and silty clay loam. The underlying material is silt loam.

Permeability is slow or very slow in the subsoil and it becomes hard or very hard when dry. The available water capacity is high or moderate. Content of organic matter is moderate, and natural fertility is medium or high. Moisture is not easily extracted by plant roots. Runoff is slow or very slow.

These soils are droughty during dry periods. The claypan subsoil inhibits penetration by roots. Wetness caused by surface water from adjacent higher lying soils is a concern in management in spring.

Wheat, sorghum, alfalfa, and tame grasses are suited to these soils. Wheat, however, is particularly well suited because it matures before the hot, dry summer.

Stubble mulching helps to improve tilth and reduces evaporation. Barnyard manure increases the supply of organic matter and improves fertility. Nitrogen is needed to maintain the productivity of crops other than legumes. Terraces on the adjacent, higher lying soils help to reduce run-in water during periods of heavy rainfall.

CAPABILITY UNIT IIw-3 DRYLAND

Hobbs silt loam, 0 to 2 percent slopes, is the only soil in this unit. This deep soil is on the bottom land of narrow drainageways and is subject to occasional flooding. The texture is silt loam throughout.

Permeability is moderate, and the available water capacity is high. Natural fertility is high. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

Flooding is the main hazard, but the flood water remains on the soil for only a short time. It can, however, damage crops by scouring or by depositing sediment and debris.

The main cultivated crops are corn and grain sorghum. Grass and trees can also be grown. Small grain and alfalfa are likely to be damaged by the occasional floods.

Diversion terraces on higher, adjacent areas help to protect this soil against flooding. Grassed waterways carry runoff from the diversion terraces. Tilth and fertility can be maintained by returning crop residue to the soil, adding barnyard manure, and applying fertilizer. Insect and plant diseases can be controlled by growing crops in a sequence or by chemicals.

CAPABILITY UNIT IIw-4 DRYLAND

This unit consists of deep, nearly level soils on bottom land and stream terraces. These soils are moderately well drained or somewhat poorly drained. The surface layer is loam, silt loam, or silty clay loam. The subsoil is fine sandy loam, loam, clay loam, or silt loam, and the underlying material ranges widely from clay loam to loamy sand. Some of the soils in this unit have mixed sand and gravel between a depth of 40 and 60 inches. A water table is at a depth of 2 to 8 feet, but it fluctuates seasonally, being highest early in spring and lowest in summer.

Permeability is moderately rapid to moderately slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium or high. Available phosphate is commonly low in some areas. These soils absorb moisture easily and release it readily to plants. Runoff is slow.

The main concern in management is wetness caused by the water table. When the water table is highest, the soil is difficult to cultivate. In dry years, however, the high water table is beneficial to crops.

The main crops are corn, grain sorghum, and alfalfa. Alfalfa can obtain moisture from the water table, except in dry seasons on soils that have mixed sand and gravel between a depth of 40 to 60 inches. Trees and grass are also suited to these soils and they receive moisture from the water table.

If adequate outlets can be obtained, the wetness problem can be reduced by using open drains or tile drains. Returning crop residue to the soil and applying fertilizer according to soil tests helps to maintain tilth and improve fertility. Growing crops in sequence reduces plant disease and insect carryovers.

CAPABILITY UNIT IIw-6 DRYLAND

Ovina fine sandy loam, 0 to 3 percent slopes, is the only soil in this unit. This soil is moderately well drained and is on stream terraces. The surface layer and subsoil are fine sandy loam. The underlying material is fine sandy loam or loamy fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. Content of organic matter is moderate. Natural fertility is medium, but phosphate is commonly not available. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

The main concerns in management are wetness during periods of heavy rainfall and soil blowing in drier periods.

The main crops are corn, alfalfa, and grain sorghum.

Alfalfa, trees, and other deep rooted plants can obtain moisture from the water table. Grass is also well suited to this soil.

If adequate outlets can be obtained, the wetness problem can be reduced by using open drains or tile drains. Stripcropping, field windbreaks, and conservation tillage help to control soil blowing. Burning crop residue is not a desirable practice. Fertility can be maintained by using commercial fertilizer.

CAPABILITY UNIT IIIe-1 DRYLAND

This unit consists of deep, gently sloping soils on uplands, stream terraces, and foot slopes. These soils are well drained. The surface layer is silt loam. The subsoil is silt loam or silty clay loam, and the underlying material is silt loam. Some areas of these soils are moderately eroded.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high, except in eroded areas. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is medium.

Where these soils are cultivated, water erosion is the main hazard. Conservation of moisture is the main concern in management. Soil blowing is a minor hazard. Under dryland management, natural rainfall is commonly inadequate to meet crop needs.

The main crops are wheat, grain sorghum, alfalfa, and tame grasses. Oats, barley, and rye can also be grown.

The cropping system needs to include some close growing crops in addition to row crops. Legumes or grass help to maintain fertility and tilth. Crop residue can be returned to the soil. Using an alternate crop-summer fallow system enables moisture to be stored for use by crops that follow the fallow program. Level terraces and contour farming reduce the amount of runoff and water erosion. Burning crop residue is not a desirable practice. Nonlegume crops commonly respond to nitrogen fertilizer. Barnyard manure is beneficial in helping to maintain fertility.

CAPABILITY UNIT IIIe-3 DRYLAND

Anselmo fine sandy loam, 3 to 6 percent slopes, is the only soil in this unit. This soil is deep and well drained on stream terraces. The surface layer and subsoil are fine sandy loam, and the underlying material is loamy fine sand. Erosion is slight, but in a few places it is moderate.

Permeability is moderately rapid, and the available water capacity is moderate. Natural fertility is medium, and content of organic matter is moderately low. This soil absorbs moisture easily and releases it readily to plants. Runoff is medium.

The main hazards are water erosion and soil blowing. Maintaining fertility is also a concern in management. Under dryland management, natural rainfall is commonly inadequate to meet crop needs.

The main crops are corn, grain sorghum, alfalfa, and small grain. Trees can be grown sucessfully in windbreaks. Grass is also well suited to this soil.

Soil blowing can be controlled by conservation tillage, by wind stripcropping, and by establishing windbreaks. Water erosion and soil loss can be reduced by terracing. Fertilizer, mainly nitrogen, is needed to maintain fertility. Applying barnyard manure especially on eroded areas, also helps to maintain fertility and organic matter content. Such cover crops as small grain and legumes aid in maintaining tilth and help to break insect and disease cycles. Burning crop residue is an undesirable practice.

CAPABILITY UNIT IIIw-2 DRYLAND

This unit consists of deep, nearly level soils on stream terraces and nearly level soils in depressions on uplands and stream terraces. These soils are moderately well drained to poorly drained. The surface layer is silt loam. The subsoil is silty clay loam or silty clay, and the underlying material is loam or silt loam. A few areas on stream terraces have mixed sand and gravel between a depth of 40 and 60 inches and a water table at a depth of 4 to 7 feet. Soils in depressions are occasionally flooded by runoff from surrounding higher lying soils.

Permeability is slow or very slow, and the available water capacity is moderate. Content of organic matter is moderate, and natural fertility is medium. These soils absorb water slowly and release it slowly to plants. Runoff is slow or very slow.

Excessive wetness in spring and following heavy rain is the main limitation because it delays tillage and retards crop growth. Maintaining fertility is also a concern in management.

The main crops are corn, small grain, grain sorghum, and alfalfa. These soils are also suited to grass, trees, and other less intensive uses.

Terraces on adjacent higher areas can be used to control runoff and reduce flooding on the soils in depressions. Where wetness is due to the water table, it can be reduced by installing open drains or tile drains if adequate outlets can be obtained. Returning crop residue and applying barnyard manure to the soil help to make the plow layer more friable and help to maintain fertility. Legumes commonly respond to applications of phosphate where it is applied to the soils that have a moderately high water table.

CAPABILITY UNIT IIIw-4 DRYLAND

This unit consists of deep and moderately deep soils over mixed sand and gravel. These soils are nearly level and very gently sloping on stream terraces and bottom land. They are moderately well drained to somewhat poorly drained. The surface layer is silt loam or loam. The underlying material ranges from loam to sand. The soils on bottom land have mixed sand and gravel between a depth of 20 and 60 inches. The water table is at a depth of 1 foot to 8 feet.

Permeability is moderately rapid to moderately slow above the mixed sand and gravel, and the available water capacity ranges from low to high. Content of organic matter is high or moderate. Natural fertility is high, but some areas are low in available phosphorus. These soils generally absorb water well and release it readily to plants.

Excess wetness commonly delays seedbed preparation in spring and planting of crops.

These soils are suited to corn, grain sorghum, and alfalfa. Production of alfalfa varies because in some years the rooting zone is restricted by the high water table. Grass is also suited to these soils and can be used for rangeland or mowed for hay. Trees can obtain moisture from the water table.

If an adequate outlet is available, open drains or tile drains can be used to provide drainage. Returning crop residue to the soil is beneficial in helping to maintain tilth. Insects and plant diseases can be controlled by growing crops in a sequence and by chemicals. Applications of commercial fertilizer, especially nitrogen and phosphate, help to improve and balance fertility.

CAPABILITY UNIT IVe-1 DRYLAND

This unit consists of deep, strongly sloping soils on uplands and stream terraces. These soils are well drained. The surface layer is silt loam. The subsoil is silt loam or silty clay loam, and the underlying material is silt loam. Some of the soils are eroded.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate or moderately low, and natural fertility is medium or high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is rapid.

When the soils are cultivated, water erosion is a serious hazard. In many areas, soil is washed to lower lying areas as the result of water erosion. Fertility is low in eroded areas. Under dryland management, natural rainfall is commonly inadequate to meet crop needs.

Most areas are in native rangeland, but the soils are suited to cultivated crops if proper conservation practices are used. Corn, wheat, grain sorghum, and alfalfa are the main dryfarmed crops. Trees can be successfully grown in windbreaks.

Use of contour farming, terraces, grassed waterways, and stripcropping help to control erosion. Conservation tillage that leaves crop residue at or near the surface reduces runoff, increases the intake of water, and helps to control erosion. Barnyard manure is beneficial in increasing fertility, especially on eroded areas. The cropping system needs to include some close growing crops as well as row crops. Legumes or grass help to keep the soil fertile and maintain tilth. Growing crops in a sequence reduces plant diseases and insect carryovers. Burning crop residue is not a desirable practice.

CAPABILITY UNIT IVe-3 DRYLAND

Anselmo fine sandy loam, 6 to 11 percent slopes, is the only soil in this unit. This soil is well drained on uplands and stream terraces. The surface layer and subsoil are fine sandy loam. The underlying material is loamy fine sand. A few areas of this soil are moderately eroded.

Permeability is moderately rapid, and the available water capacity is moderate. Natural fertility is medium, and content of organic matter is moderately low. On eroded areas, however, these properties are low. This soil absorbs moisture easily and releases it readily to plants. It is easily worked. Runoff is medium.

Where this soil is cultivated, water erosion and soil blowing are severe hazards. Under dryland management, natural rainfall is commonly inadequate to meet crop needs.

The main crops are wheat, rye, alfalfa, and tame grasses. Although corn and grain sorghum are grown to some extent, they are not well suited. Trees can be grown successfully in windbreaks. This soil is well suited to native grass.

Some areas of this soil can be terraced to prevent water erosion, but where the land is hummocky, terracing is not practical. Contour farming also reduces water erosion. Stubble mulching, stripcropping, and field windbreaks help to prevent soil blowing. Frequent use of cover crops in the cropping sequence is desirable. Returning crop residue to the soil and applying nitrogen fertilizer help to maintain fertility. Applying barnyard manure, especially to eroded areas, helps to improve fertility and organic matter content. Burning crop residue is not a desirable practice.

CAPABILITY UNIT IVe-5 DRYLAND

Valentine loamy fine sand, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep and excessively drained on stream terraces. The surface layer is loamy fine sand, and the underlying material is fine sand. Some areas of this soil have been subjected to soil blowing.

Permeability is rapid, and the available water capacity is low. Content of organic matter, and natural fertility are low. The sandy surface layer absorbs water readily. The surface layer is soft when dry and, in eroded areas, is loose. Runoff is slow because most of the rainfall enters the soil.

When the surface is unprotected, soil blowing is a serious hazard. Crops are somewhat difficult to start because soil blowing destroys many of the young plants. Improving fertility, mainly nitrogen, is also a concern in management. Under dryland management, natural rainfall is commonly inadequate to meet crop needs.

The main crops are small grain, tame grass, and alfalfa. Corn and grain sorghum are also grown, but they are not as well suited. Alfalfa and other deep rooted plants can obtain moisture from the water table where it is above a depth of 15 feet. Trees can be established in windbreaks. This soil is also well suited to native grass.

Stripcropping and field windbreaks help to control soil blowing. Returning crop residue and applying barnyard manure to the soil help to maintain and improve organic matter content and fertility. Limiting use of row crops and making maximum use of close growing crops protects the soil and conserves moisture. Commercial fertilizer also improves fertility. Burning crop residue is not a desirable practice. Proper range use, deferred grazing, and a planned grazing system help to maintain the desired kinds of grasses on rangeland. Weeds and brush can be controlled in critical areas by chemicals.

CAPABILITY UNIT IVe-9 DRYLAND

Coly silt loam, 6 to 11 percent slopes, eroded, is the only soil in this unit. This soil is deep and well drained or somewhat excessively drained on uplands. The surface layer and underlying material are silt loam. The soil is calcareous throughout.

Permeability is moderate, and the available water capacity is high. Natural fertility and content of organic matter are low. This soil absorbs moisture easily and releases it readily to plants. Runoff is rapid.

Where this soil is cultivated, water erosion is a serious hazard. Soil that is washed away by erosion can cause damage to crops downstream. Improving and balancing fertility is an important concern in management. Nitrogen is low and phosphate is commonly inadequate to meet crop needs.

Cultivated crops can be grown but are poorly suited to this soil. The low fertility and severe hazard of further erosion make this soil better suited to grass or to grain sorghum or wheat. Trees can be grown in windbreaks.

Contour farming and terraces are needed to reduce runoff and control erosion. Planting cover crops and leaving crop residue on the surface increase absorption of water and reduce soil loss by runoff. Applications of commercial fertilizer, particularly nitrogen and phosphorus, help to improve and balance fertility.

CAPABILITY UNIT IVs-1 DRYLAND

This unit consists of soils that are moderately affected by salinity and alkali. These soils are deep or moderately deep over mixed sand and gravel. They are nearly level or very gently sloping on stream terraces and bottom land. They are moderately well drained to poorly drained. The surface layer is loamy fine sand, fine sandy loam, loam, or silt loam. The subsoil is variable and ranges from loamy fine sand to silty clay. The underlying material, also variable, ranges from loamy sand to silty clay loam. Some soils have mixed sand and gravel at a depth of 20 to 60 inches. In areas not affected by salinity, the surface layer ranges from neutral to moderately alkaline. Saline areas are moderately alkaline to strongly alkaline.

Permeability ranges from rapid to slow, and the available water capacity is low to high. Content of organic matter is moderate or high. Fertility is low because nutrients are not well balanced for plant growth. Soils that have a loam or silt loam surface layer are not easy to till because they are hard when dry and sticky when wet. These soils do not absorb moisture easily or release it readily to plants. Runoff is slow or very slow.

The main concern in management is the excessive salinity and alkalinity, which is toxic to most plants. In dry seasons, the affected areas are droughty. Soil blowing is a hazard, especially on soils where the surface layer is loamy fine sand or fine sandy loam.

The main crops are alfalfa and tame grass. Most of the areas on the bottom land are in native grasses and are used for rangeland or hayland. Trees, alfalfa, and other deep rooted plants obtain moisture from the water table on many soils in this unit.

Land leveling improves surface drainage. This is important because water remaining on the surface tends to increase salinity. Internal drainage can be improved by deep tillage with chiseling implements. Improving tilth in the surface layer by additions of large amounts of barnyard manure also improves internal drainage. Moisture enters the soil more easily. Sulfur and gypsum are used in places to neutralize the alkalinity, but their use is expensive and results are not always satisfactory.

Commercial fertilizer may be used to improve and balance the fertility of these soils. Phosphate is especially beneficial to legumes. Stripcropping and field windbreaks help to control soil blowing, especially on soils that have a sandy surface layer. Proper range use, deferred grazing, and a planned grazing system are beneficial in helping to maintain desired grasses in areas used for rangeland.

CAPABILITY UNIT IVw-5 DRYLAND

Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep and moderately well drained on stream terraces. The surface layer and subsoil are loamy fine sand. The underlying material is loamy fine sand in the upper part and fine sandy loam or loam in the lower part. A water table is at a depth of 2 to 8 feet. Soil blowing has eroded this soil in some areas.

Permeability is moderately rapid or rapid, and the available water capacity is moderate. Natural fertility is low, and content of organic matter is moderately low. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

When the soil is cultivated, wetness caused by the water table and soil blowing are the main hazards. Fertility is a further concern in management.

The main crops are corn, grain sorghum, and alfalfa. Alfalfa, trees, and other deep rooted plants obtain moisture from the water table.

If adequate outlets can be obtained, wetness can be reduced by use of open drains or tile drains. Stripcropping, field windbreaks, and conservation tillage can be used to control soil blowing. In areas used for rangeland, proper range use, deferred grazing, and a planned grazing system can be used to maintain the desired kinds of grasses.

CAPABILITY UNIT Vw-7 DRYLAND

Lawet loam, ponded, 0 to 2 percent slopes, is the only soil in this unit. This soil is deep and poorly drained on bottom land. The texture is loam to a depth of more than 40 inches. The water table fluctuates from the surface to a depth of 3 feet.

Permeability is moderately slow, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is medium. Runoff is very slow.

Excessive wetness is the main limitation on this soil.

This soil is suited to permanent grass, which can be used either as rangeland or hayland. It also provides excellent habitat for wetland wildlife. The soil is too wet for the commonly grown crops.

Proper range use and deferred grazing help to maintain and increase grass production. The turf can be damaged if livestock are allowed to graze when the water table is near the surface.

CAPABILITY UNIT VIe-1 DRYLAND

This unit consists of deep, moderately steep and steep soils on uplands. These soils are well drained or somewhat excessively drained. The texture is silt loam throughout.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderately low or low, and natural fertility is medium or low. These soils absorb moisture easily and release it readily to plants. They are not easy to work because of the slope.

Because the soils are too steep and the hazard of erosion is too great, the soils are not suited to cultivation. They are suited to grass, trees, and other less intensive uses.

Proper range use and deferred grazing help to maintain and improve stands of grass. These areas provide sites for dams along the drainageways, which can be used to impound water for livestock or for recreational purposes. Areas that are presently cultivated can be seeded to native grass and converted to rangeland. Good management is needed in seeded areas to establish and maintain a good grass cover. Weeds and brush can ordinarily be controlled by good range management or by spraying chemicals in some areas.

CAPABILITY UNIT VIe-5 DRYLAND

This unit consists of deep, gently sloping to rolling soils on stream terraces and uplands. These soils are excessively drained. The surface layer is loamy fine sand, and the underlying material is fine sand. Some areas of these soils have been eroded by soil blowing.

Permeability is rapid, and the available water capacity is low. Content of organic matter and natural fertility are low. These soils absorb moisture readily because of their coarse texture.

Soil blowing is a very severe hazard. Keeping native grass in good vigor, keeping the surface protected, and managing the soil for high production are concerns in management.

Because the soils are sandy, droughty, and erodible, they are poorly suited to the commonly grown crops. They are well suited to grass, and trees can be grown in windbreaks. The grass and trees provide food, cover, and nesting sites for wildlife.

Native rangeland can be protected by proper range use, deferred grazing, and a planned grazing system. Weeds and brush can be controlled by good range management, but some areas may need to be sprayed. Uniform grazing can be obtained by proper distribution of salt and water. Areas presently cultivated can be planted to a mixture of native grasses that are suited to sandy soils. Blowouts can be seeded to native grasses after fencing to keep livestock from damaging the seed. Care needs to be taken that soil blowing does not begin again.

CAPABILITY UNIT VIe-7 DRYLAND

Cozad-Hobbs silt loams, 2 to 30 percent slopes, are the only soils in this unit. This unit consists of very gently sloping Hobbs soils on bottom land and Cozad soils on steep side slopes. The bottom land areas are frequently flooded and are dissected by deeply entrenched streams. The soils in this unit are silt loam throughout.

Permeability is moderate, and the available water capacity is high. Content of organic matter is moderate, and natural fertility is high. Runoff is rapid on the side slopes and slow on the bottom land.

The main hazard on the Cozad soil is the steep slopes. The Hobbs soil has entrenched stream channels and is frequently flooded.

This unit is not suitable for the commonly grown crops. It is well suited, however, to grass, native trees, development of wildlife habitat, and as a recreational area. Trees provide shelter for livestock. This unit is not suited to planting of trees in windbreaks.

Proper range use, deferred grazing, and a planned grazing system help to maintain and increase production of grass. Because this mapping unit is covered with trees or is dissected by entrenched stream channels, there is very little grass in many areas. Erosion control structures can be built on carefully selected sites. Large floodwater detention structures reduce flooding on areas below these structures. Where necessary, weeds and brush can be controlled in troublesome areas by chemical sprays.

CAPABILITY UNIT VIe-9 DRYLAND

Coly silt loam, 11 to 20 percent slopes, eroded, is the only soil in this unit. This soil is somewhat excessively drained on uplands. The texture is silt loam throughout.

Permeability is moderate, and the available water capacity is high. Content of organic matter and natural fertility are low. This soil releases moisture readily to plants. Runoff is rapid.

Water erosion is a very severe hazard. Unless the surface is adequately protected, downstream siltation is a concern. Runoff is an important concern in management.

This soil is not suited to the commonly grown crops. It is suited to grass and trees, which can be planted in windbreaks. The grass and trees provide food, cover, and nesting sites for wildlife.

Areas that are in cultivated crops need to be seeded to native grass. This will slow runoff, increase the amount of water absorbed by the soil, and decrease erosion. Where seeded areas are used for rangeland, fencing to control cattle, deferred grazing, and a planned grazing system help to maintain production of the grasses. If siltation from erosion is controlled, dams along the drainageways can be used to impound water for livestock or for recreational purposes.

CAPABILITY UNIT VIw-4 DRYLAND

Platte loam, 0 to 2 percent slopes, is the only soil in this unit. This soil is shallow over mixed sand and gravel. It is poorly drained or somewhat poorly drained

on bottom land. The surface layer is loam, and the upper part of the underlying material is very fine sandy loam. Mixed sand and gravel is at a depth of 10 to 20 inches. The surface layer is calcareous.

Permeability is moderately rapid in the upper part of the profile and very rapid in the mixed sand and gravel. The available water capacity is low. Content of organic matter and natural fertility are low. This soil absorbs water well and releases it readily to plants. Runoff is slow.

During wet seasons, wetness from the water table and flooding are hazards. The soil is droughty during the driest season late in summer. Low fertility is a concern in management. Where areas of rangeland are overgrazed, inland saltgrass is a serious invader.

When this soil is dryfarmed, it is not suited to the commonly grown crops. It is better suited to grasses for pasture or hay and to trees. These areas provide habitat for wildlife.

Proper range use, deferred grazing, and a planned grazing system help to maintain desirable grasses. Uniform grazing can be obtained by proper distribution of salt. Dugouts into the water table create ponds for use by livestock and for recreation. Ordinary good range management practices control undesirable weeds, but troublesome areas may need to be sprayed with chemicals.

CAPABILITY UNIT VIIe-7 DRYLAND

Coly-Hobbs silt loams, 2 to 60 percent slopes, are the only soils in this unit. The Coly soil is on very steep sidewalls of canyons. It is somewhat excessively drained. The Hobbs soil is very gently sloping or gently sloping on bottom land of the upland drainageways. It is occasionally flooded. The texture of the soils is silt loam throughout.

Permeability is moderate, and available water capacity is high. Content of organic matter is moderate or low, and natural fertility is high or low. These soils release moisture easily to plants. Runoff is slow on the bottom land and very rapid on the sidewalls of canyons.

The very steep Coly soils are not suited to cultivation or to planting of trees in windbreaks. The irregular shape and inaccessibility of the bottom land areas of the Hobbs soil make farming operations impractical. The soils in this unit are suited to wildlife habitat and to recreation.

Water erosion is a very severe hazard. Control of runoff and distribution of grazing by livestock are the main concerns in management. Weeds on the bottom land are commonly a problem because livestock spend more time grazing these areas than the very steep side slopes.

Deferred grazing and a planned grazing system improve range condition and protect the grasses. A good cover helps to reduce runoff and to prevent gully erosion. The grassy areas of the Coly soil are too steep to use machinery to seed grasses. Placing salt on the steeper areas makes grazing more uniform. Chemicals control weeds in troublesome areas. Dams can be built to create ponds for livestock and wildlife.

CAPABILITY UNIT VIIs-3 DRYLAND

Gothenburg soils, 0 to 2 percent slopes, are the only soils in this unit. The soils are poorly drained and somewhat poorly drained and nearly level on bottom land. They are very shallow and shallow over mixed sand and gravel. The thin surface layer is mostly loam, but also includes areas of loamy sand and sandy loam. The underlying material is fine sand in the upper part and mixed sand and gravel in the lower part.

Permeability is very rapid, and the available water capacity is very low. Content of organic matter and natural fertility are low. Runoff is slow.

Flooding and wetness from the high water table are hazards. Fences are commonly damaged by floodwater and debris.

The very shallow and shallow depth to mixed sand and gravel limit the kinds of plants that grow well. These soils are not suited to the commonly grown crops, and the areas have limited suitability for grazing. Native cedar, willow, and cottonwood trees are common, but planting of seedlings generally is not successful. Areas of these soils provide habitat for wildlife. Some areas are leased to hunters for recreation.

Deferred grazing and a planned grazing system improve range condition. Proper management of wildlife is needed to help preserve good hunting and fishing areas. Dugouts into the water table can create ponds for use by livestock and for recreation. The excavated sand and gravel is used for construction purposes.

Managing irrigated cropland

In 1972 the irrigated acreage in Dawson County was about 213,600 acres. Corn is the most important irrigated crop. Alfalfa, sugar beets, grain sorghum, and tame grasses are also irrigated. Alfalfa obtains moisture from the water table where it is above a depth of 15 feet. Crops other than alfalfa are nearly all irrigated where they are grown on stream terraces and bottom land.

A sequence which includes corn and alfalfa is the most common crop rotation in the county. Alfalfa is grown for about 4 years. It is then plowed under and corn is planted in the spring. Alfalfa becomes established by using moisture stored in the soil by previous applications of irrigation water.

Using water efficiently and distributing it uniformly are important concerns in management on irrigated land. Land leveling is a process of shaping the surface for improved movement of irrigation water. It is needed on most soils in the county, especially on deep, less sloping areas. Care needs to be taken when leveling soils that are moderately deep or shallow over mixed sand and gravel, because deep cuts can expose this coarse, droughty material at the surface.

Reuse pits are constructed basins that temporarily hold runoff water at the end of a field. The water is redistributed on the land by pumping. This practice not only conserves water, but also reduces loss of excess irrigation water downstream.

In Dawson County, water for irrigation is obtained

from both wells and open canals. It can be distributed by furrows, borders, or sprinklers. The water distribution method is determined by the crop to be grown, the soil, and relief.

Furrow irrigation is a method whereby the surface is partly flooded. It is normally used with clear tilled crops where water is applied in furrows or in rows at sufficient capacity to contain the designed stream.

Border irrigation is a method of applying water by flooding between small dikes. This method is commonly used to irrigate alfalfa on nearly level or very gently sloping soils that are loamy or silty.

A sprinkler system is used where water is applied by means of perforated pipes or nozzles under pressure to form a spray pattern. Most of the gently sloping and strongly sloping soils are irrigated by sprinklers. Sprinklers can be used on nearly all soils, however, they require more power to operate than a gravity system.

The most common kind of sprinkler system is the center-pivot type. This system consists of a single lateral mounted on wheels spaced approximately 100 feet apart and supported by towers or bridge trusses. Each of the towers has a device to provide power to the wheels. The power is commonly supplied by electricity, gasoline, propane gas, or natural gas. The speed of the center-pivot, self-propelled system is generally controlled by the end tower, called the master tower. A system of alignment controls keep the other towers in line with the end tower.

Water erosion is more serious on the sloping soils than on less sloping areas. Uncontrolled irrigation water can strip away the soil at an alarming rate. Erosion can be a problem along the wheel path of center-pivot systems. The use of conservation tillage methods is applicable to both irrigation and dryfarming management in controlling water erosion.

On sloping soils, the proper choice of a water distribution method is very important. Terraces, along with contour furrows, are well suited to all row crops where the slope exceeds 1 percent. Careful maintenance is important on irrigated land that is cultivated on the contour. Overirrigation tends to wash away plant nutrients and small particles of soil. This type of erosion can be controlled by adjusting the rate of water application and planning the proper length of the irrigation run. Bench leveling also helps to control erosion on deep soils where slopes are 1 to 5 percent. This type of leveling consists of shelflike earth embankments that have a level or nearly level gradient and a steep or nearly vertical downhill face constructed along the contour or across the slope.

Because irrigated soils produce larger yields than dryfarmed soils, more plant nutrients are removed from the soil when they are irrigated. To keep irrigated soils fertile, crop residue should be returned to the soil and mineral fertilizers added to replace lost nutrients. Nitrogen is commonly needed for nonlegume crops. Phosphorus can be added to calcareous soils on the bottom land and to the eroded, silty soils on uplands. Where leveling has exposed the light colored underlying material, fertility is generally low. Applications of barnyard manure and possibly zinc improves fertility on these deeply cut areas. The kind and amount of fertilizer needed for specific crops should be determined on the basis of soil tests.

Salinity and alkalinity are concerns in management on approximately 32,000 acres of soils on bottom land and stream terraces. Land leveling these areas improves surface drainage. Water that remains on the surface tends to increase the salinity problem. Large amounts of barnyard manure improve internal drainage by improving tilth of the surface layer. Internal drainage can also be improved by deep tillage with chiseling implements on the deep soils of stream terraces. Sulfur and gypsum can be used to help neutralize the salts, but this method is expensive and results may be disappointing.

Crops presently irrigated in Dawson County are well suited to the soils and climate, and there is a ready market for them. There is potential for increasing the acreage of irrigated crops on saline and alkali soils of the stream terraces. Additional irrigation can also be developed on the silty soils of the uplands.

Farmers needing technical help in planning irrigation developments can contact the local office of the Soil Conservation Service and the county agricultural agent. Information about costs and equipment can be obtained from equipment dealers.

Irrigated capability units

Capability units for irrigated soils are described in the pages that follow. Specific soils in each capability unit can be determined by referring to the Guide to Map Units at the back of this publication.

CAPABILITY UNIT I-3 IRRIGATED

This unit consists of deep, nearly level soils on stream terraces. These soils are well drained. The surface layer is silty clay loam. The subsoil and underlying material are silt loam.

Permeability is moderate in the subsoil, and the available water capacity is high. The intake rate, however, is low because of the silty clay loam surface layer. Content of organic matter is moderate, and natural fertility is high. Runoff is slow.

Because these soils are generally lower in elevation and have a finer textured surface layer than the adjacent soils, they dry out slower. If tilled when wet, the plow layer dries into large hard clods. Maintaining fertility and proper control of irrigation water are concerns in management.

The main crops are corn, grain sorghum, sugar beets, and alfalfa. Mature alfalfa and other deep rooted plants obtain moisture from the water table where it is above a depth of 15 feet.

Barnyard manure and green manure crops help to maintain good tilth, improved fertility, and increase the capacity of the soils to absorb water. Rotating crops helps to reduce the hazards of insects and plant diseases. Some land leveling generally is necessary if irrigation water is to be managed efficiently. Crop response to irrigation is excellent.

CAPABILITY UNIT I-4 IRRIGATED

This unit consists of deep, nearly level soils on uplands and stream terraces. These soils are well drained or moderately well drained. The surface layer is silt loam. The subsoil is silty clay loam and silt loam, and the underlying material is silt loam.

Permeability is moderate or moderately slow, and the available water capacity is high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow.

Maintaining fertility and proper control of irrigation water are the main concerns in management. Soil blowing occurs if the surface layer is not protected.

The main crops are corn, alfalfa, grain sorghum, and sugar beets.

Fertility can be maintained by applying commercial fertilizer and barnyard manure. Returning crop residue helps to keep the soil friable and fertile and it also helps to prevent soil blowing. Some land leveling generally is needed for efficient use of irrigation water. Reuse pits help to eliminate waste water (fig. 11). Application of irrigation water needs to be timely and in proper amounts. Insects and plant diseases can be controlled by chemicals and by using a crop sequence. All the commonly used types of irrigation systems are suitable.

CAPABILITY UNIT I-6 IRRIGATED

This unit consists of deep, nearly level soils on stream terraces. These soils are well drained or moderately well drained. The surface layer is loam or silt loam, and the subsoil is loam, silt loam, or sandy clay loam. The underlying material ranges from silt loam to coarse sand. In some of the soils the underlying material is loamy sand or sand below a depth of 40 inches.

Permeability is moderate, and the available water capacity is high or moderate. The intake rate is moderate. Content of organic matter is moderate, and natural fertility is medium or high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow.

Maintaining fertility and proper control of irrigation are the main concerns in management. If the surface is not protected, soil blowing is a hazard.

The main crops are corn, grain sorghum, alfalfa, and sugar beets. Mature alfalfa plants obtain moisture from the water table where it is above a depth of 15 feet. However, water may be unavailable to alfalfa where dry sand or gravel occurs above the water table.

Fertility can be maintained by applications of commercial fertilizer and barnyard manure. Returning crop residue helps to keep the soils friable and fertile and helps to prevent soil blowing. Rotating crops helps to reduce the hazards of insects and plant diseases. Land leveling is generally needed for uniform applica-

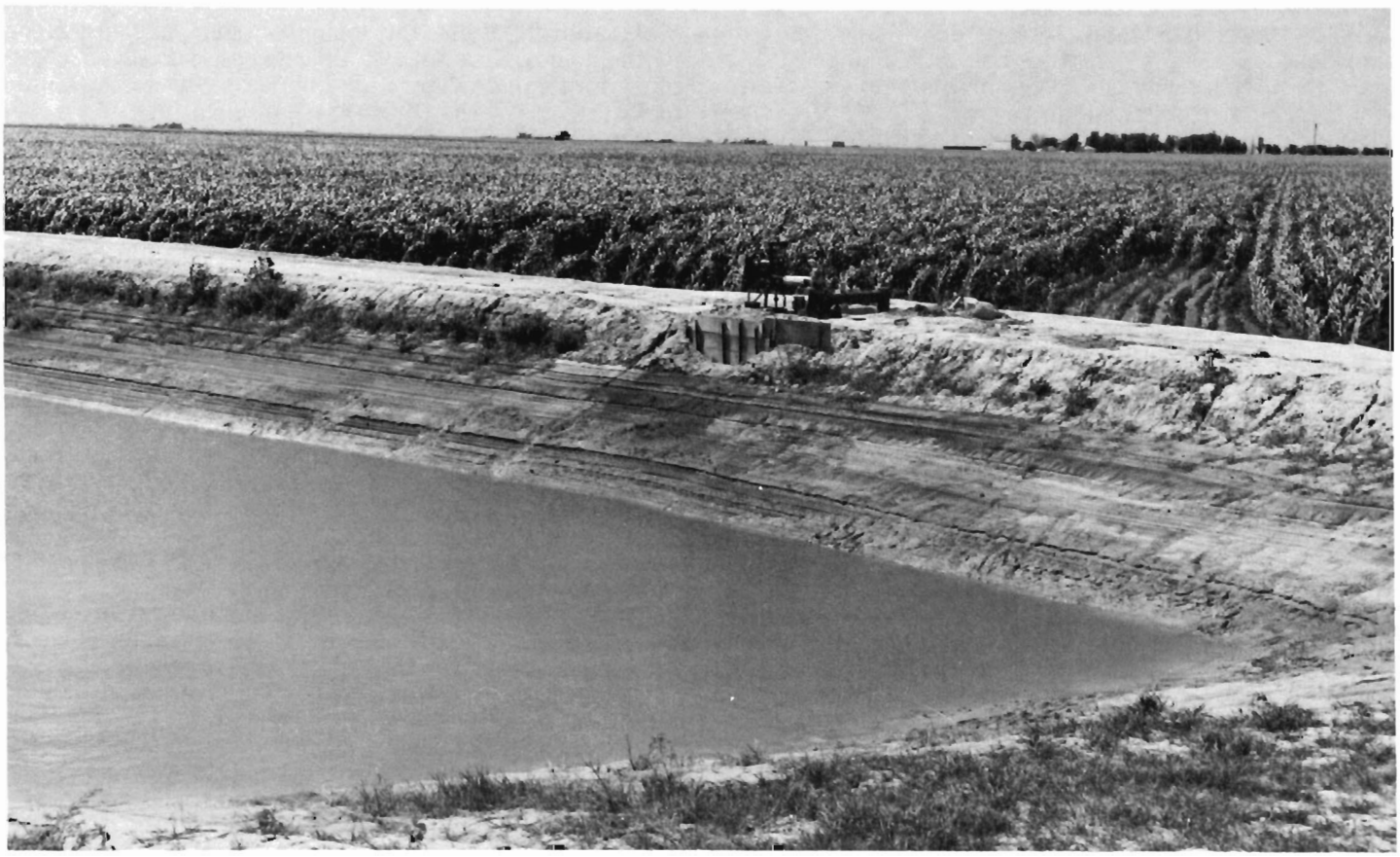

Figure 11.—**Reuse pit for recycling irrigation water on an area of Holdrege silt loam, 0 to 1 percent slopes.**

tion of irrigation water by gravity irrigation systems. Applying irrigation water in sufficient amounts to serve the needs of the crops and at a rate that permits maximum absorption and minimum runoff is important. Reuse pits help to eliminate waste of water. All the common types of irrigation are suitable.

CAPABILITY UNIT I-8 IRRIGATED

Anselmo loam, 0 to 1 percent slopes, is the only soil in this unit. This soil is well drained on stream terraces. The surface layer is loam, and the subsoil is fine sandy loam. The underlying material is loamy fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. The intake rate is moderately high. Content of organic matter is moderately low, and natural fertility is medium. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

If the surface layer is not protected, soil blowing is a hazard. Maintaining fertility and proper control of irrigation water are the main concerns in management.

The principal crops are corn, grain sorghum, and alfalfa.

Returning crop residue to the soil helps to prevent soil blowing. Fertility can be maintained by applying commercial fertilizer and barnyard manure. Rotating crops helps to reduce the hazards of insects and plant diseases. Land leveling and a gravity irrigation system are needed for uniform application of irrigation water. Applying irrigation water in sufficient amounts to serve the needs of crops without leaching the nutrients is needed. All the common types of irrigation are suitable.

CAPABILITY UNIT IIe-4 IRRIGATED

This unit consists of deep, very gently sloping soils on uplands. These soils are well drained. The surface layer is silt loam, and the subsoil is silty clay loam and silt loam. The underlying material is silt loam.

Permeability is moderate or moderately slow, and the available water capacity is high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow or medium.

Water erosion is the main hazard when irrigating these soils. Maintaining fertility and conservation of water are important concerns in management.

The main crops are corn, grain sorghum, alfalfa, and sugar beets.

Water erosion is less where row crops are grown on the contour. Terracing and bench leveling are effective means of erosion control and also help to conserve moisture. Grassed waterways and field borders can be used to dispose of excess water from fields without erosion. Reuse pits help to eliminate waste of water. Fertility can be maintained by applying commercial fertilizer and barnyard manure. Content of organic matter can be maintained by returning crop residue to the soil and by keeping tillage to a minimum.

CAPABILITY UNIT IIe-5 IRRIGATED

This unit consists of deep, nearly level or very gently sloping soils on stream terraces. These soils are well drained or moderately well drained. The surface layer is fine sandy loam. The subsoil is silt loam, loam, or sandy clay loam, and the underlying material is fine sandy loam, loam, or silt loam. In some of the soils the underlying material is a loamy sand or sand below a depth of 40 inches.

Permeability is moderate, and the available water capacity is moderate or high. The intake rate is moderate. Content of organic matter is moderate or high, and natural fertility is medium or high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow or medium.

Maintaining fertility, preventing soil blowing, and proper control of irrigation water are the main concerns in management. Water erosion is a slight hazard on the very gently sloping soils.

The main crops are corn, grain sorghum, or alfalfa. Mature alfalfa obtains moisture from the water table where it is above a depth of 15 feet. However, water may be unavailable where a dry sand layer occurs directly above the water table.

Fertility can be maintained by applying commercial fertilizer and barnyard manure. Planting cover crops or crops that have a high residue, conservation tillage, stripcropping, and establishing field windbreaks help to control soil blowing. Where these soils are irrigated by a gravity method, land leveling is needed to provide an even distribution of water. Sprinkler irrigation systems are also suited.

CAPABILITY UNIT IIe-6 IRRIGATED

This unit consists of deep, very gently sloping soils on stream terraces and foot slopes. These soils are well drained. The texture is silt loam throughout. Land leveling has exposed the light colored subsoil and underlying material in some areas.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow.

Water erosion is a moderate hazard on these soils. Controlling irrigation water and maintaining fertility are important concerns in management. On soils where the light colored material has been exposed by land leveling, nitrogen and phosphate are low.

The main crops are corn, grain sorghum, alfalfa and sugar beets.

Where these soils are irrigated by a gravity system, land leveling is needed to provide an even distribution of water. Terracing and bench leveling are effective means of erosion control and also help to conserve moisture. Fertility can be maintained by applying commercial fertilizer and barnyard manure. Returning crop residue to the soil improves intake of water and organic matter content. Applying barnyard manure to the light colored areas also improves fertility and tilth.

CAPABILITY UNIT IIe-8 IRRIGATED

This unit consists of deep, nearly level and very gently sloping soils on stream terraces and uplands. These soils are well drained. The surface layer and subsoil are fine sandy loam. The underlying material is loamy fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. The intake rate is moderately high. Content of organic matter is moderately low, and natural fertility is medium.

Soil blowing is the main hazard on these soils. Maintaining fertility and proper control of irrigation water are the main concerns in management. Water erosion can be a hazard on the very gently sloping soils.

The main crops are corn, grain sorghum, and alfalfa. Potatoes and sugar beets can also be grown.

The moderately coarse textured surface layer needs the protection of either a growing crop or organic residue. Planting cover crops or crops that have a high residue, conservation tillage, stripcropping, and establishing field windbreaks help to control soil blowing. Legumes should be included in the cropping sequence. Some land leveling generally is needed for gravity irrigation. Fertility can be maintained by applying commercial fertilizer and barnyard manure.

CAPABILITY UNIT IIs-2 IRRIGATED

This unit consists of deep, nearly level soils on uplands and stream terraces. These soils are moderately well drained or poorly drained. The surface layer is silt loam, and the claypan subsoil is silty clay and silty clay loam. The underlying material is silt loam.

Permeability is slow or very slow in the subsoil because the subsoil becomes hard or very hard when dry. The available water capacity is high or moderate. Content of organic matter is moderate, and natural fertility is medium or high. Some of the moisture is held under too much tension to be released readily to plants. Runoff is slow. The claypan subsoil restricts penetration of plant roots and slows the intake of water. Maintaining fertility and water management are important concerns in management.

The main crops are corn, grain sorghum, alfalfa, and tame grasses.

Land leveling is needed in most areas to prepare them for furrow or border irrigation and to provide adequate surface drainage. Care needs to be taken not to expose the very firm subsoil because it is difficult to till and crops respond poorly when it is exposed at the surface. Irrigation runs can be somewhat longer than on most soils because the water intake rate is slow. Reducing and controlling runoff of irrigation water at the end of the field is a desirable conservation practice. Adding commercial fertilizer, mainly nitrogen and phosphorus, is needed. Barnyard manure helps to maintain good tilth and fertility and increases the capacity of the soils to absorb water. Legumes or grass-legume mixtures in the cropping sequence help to keep the subsoil open and result in better penetration of moisture. Where a high level of management is used, crop response to irrigation is excellent.

CAPABILITY UNIT IIw-3 IRRIGATED

Hord silty clay loam, wet substratum, 0 to 1 percent slopes, is the only soil in this unit. This soil is moderately well drained on stream terraces. The surface layer is silty clay loam. The subsoil and underlying material are silt loam.

Permeability is moderate in the subsoil. The intake rate, however, is low because of the silty clay loam surface layer. The available water capacity is high. Content of organic matter is moderate, and natural fertility is high. The surface layer is hard when dry and sticky when wet. Runoff is slow.

Wetness in spring is the main hazard because it delays tillage. This wetness results from the water table at a depth of 4 to 8 feet. This soil is lower in elevation than adjacent soils, which also contributes to wetness. If tilled when wet, the plow layer dries into large hard clods. Maintaining fertility and proper control of irrigation water are concerns in management.

The main crops are corn, grain sorghum, and alfalfa.

Open drains or tile drains can be used to provide drainage in areas where an outlet is available. Land leveling helps to improve surface drainage and water distribution when a gravity irrigation system is used. Additions of commercial fertilizer, particularly nitrogen, are needed to maintain fertility. Tilth can be improved by returning crop residue to the soil. A cropping system that includes periodic use of legumes helps to maintain and improve the water intake. Growing crops in sequence also reduces the hazards of plant diseases and insects.

CAPABILITY UNIT IIw-4 IRRIGATED

Hall silt loam, wet substratum, 0 to 1 percent slopes, is the only soil in this unit. This soil is moderately well drained on stream terraces. The surface layer is silt loam. The subsoil is silty clay loam and silt loam, and the underlying material is silt loam. The water table is at a depth of about 4 feet in spring and ranges to a depth of about 8 feet late in summer.

Permeability is moderately slow, and the available water capacity is high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility is high. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

Excess wetness in spring is the main hazard because it delays tillage and planting. Maintaining fertility and tilth are the most important concerns in management.

Land leveling helps to improve surface drainage. It also improves distribution of water when the soil is irrigated. If outlets are available, open drains or tile drains can be used to provide drainage. Returning all crop residue to the soil and applying fertilizer helps to maintain fertility. Cropping systems that include periodic use of legumes help to maintain and improve the water intake rate and also reduce plant diseases and insects.

CAPABILITY UNIT IIw-6 IRRIGATED

This unit consists of deep, nearly level soils on bottom land or stream terraces. These soils are well drained to somewhat poorly drained. Those soils that are well drained internally, however, are occasionally flooded. The surface layer is silt loam or loam. The

subsoil is silt loam or clay loam, and the underlying material is loam, silt loam, or clay loam. Some of the soils on the bottom land have mixed sand and gravel at a depth of 40 to 60 inches.

Permeability is moderate or moderately slow, and the available water capacity is high. The intake rate is moderate. Content of organic matter is moderate, and natural fertility is high or medium. The soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow.

Excess wetness in spring is the main hazard, because it delays tillage and planting. Flooding is a hazard in some areas. The flood water remains on the soil for only a short time, however, and damage to crops is seldom severe. Some areas are low in available phosphate.

The main crops are corn, grain sorghum, and alfalfa. Alfalfa, however, is not well suited to soils in drainageways, which are occasionally flooded. Sugar beets and tame grasses can also be grown.

Land leveling helps to obtain good surface drainage. If outlets are available, open drains or tile drains can be used to provide drainage in areas that have a high water table. Diversion terraces on higher areas help to protect the soils against flooding, and grassed waterways help to carry runoff from the diversion to an outlet. Rotating crops helps to reduce the hazards of insects and diseases. Legumes, in particular, respond to phosphorus and most other crops respond to nitrogen. Some crops benefit from an addition of zinc.

CAPABILITY UNIT IIw-8 IRRIGATED

This unit consists of deep, nearly level or very gently sloping soils on bottom land and stream terraces. These soils are moderately well drained or somewhat poorly drained. The surface layer is fine sandy loam or loam. The subsoil is loam or fine sandy loam, and the underlying material is loamy fine sand, fine sandy loam, or loam. The soils on bottom land have mixed sand and gravel at a depth of 40 to 60 inches. The water table ranges from a depth of about 2 feet in spring to a depth of 8 feet late in summer.

Permeability is moderately rapid, and the available water capacity is high or moderate. The intake rate is moderately high. Content of organic matter is moderate, and natural fertility is medium. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow. Land leveling has exposed the light colored underlying material in some areas. These cut areas are low in organic matter content and fertility.

Excess wetness in spring is the main hazard because it delays tillage and planting. Maintaining fertility is an important concern in management. If the surface is not protected, soil blowing occurs.

The main crops are corn, grain sorghum, and alfalfa. Alfalfa obtains moisture from the water table, which ranges from a depth of 2 to 8 feet.

If outlets are available, open drains or tile drains can be used to provide drainage. Land leveling is needed for even distribution of water on areas that are irrigated by a gravity system. Sprinkler irrigation is also well suited. Returning crop residue helps to reduce the hazard of soil blowing. Applying manure, especially on cut areas, improves organic matter content and fertility. Nitrogen fertilizer is generally needed, and phosphorus is needed for legumes.

CAPABILITY UNIT IIIe-4 IRRIGATED

This unit consists of deep, gently sloping soils on uplands. These soils are well drained. The surface layer is silt loam. The subsoil is silty clay loam and silt loam, and the underlying material is silt loam. Some of the areas are eroded.

Permeability is moderate, and the available water capacity is high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is medium.

Water erosion is the main hazard. Maintaining fertility and controlling irrigation water are important concerns in management.

The main crops are corn, grain sorghum, alfalfa, sugar beets, and tame grasses.

Bench terraces, contour farming, and conservation tillage help to reduce water erosion. Nonlegume crops benefit from additions of commercial fertilizers, particularly nitrogen. Fertility and organic matter content can be improved by using available barnyard manure, especially on eroded areas. Land leveling is needed to prepare these soils for gravity irrigation. These soils are well suited to sprinkler irrigation (fig. 12).

CAPABILITY UNIT IIIe-6 IRRIGATED

This unit consists of deep, gently sloping soils on foot slopes and stream terraces. These soils are well drained. The texture is silt loam throughout. Some of the soils include small eroded areas.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate. Content of organic matter is moderate, and natural fertility is high. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is medium.

Water erosion is the main hazard on these soils. Maintaining fertility and controlling irrigation water are important concerns in management.

Alfalfa and grass are well suited to irrigation. Where erosion is controlled, corn, grain sorghum, and sugar beets are suited.

Terraces, contour irrigation, waterways, and maximum use of crop residue on the surface are needed to control erosion. Fertility can be maintained by using barnyard manure and commercial fertilizer. The slope makes it difficult to control water erosion. The rate at which irrigation water is applied should not be higher than the intake rate of the soil. If land leveling has been sufficient to prevent runoff and to keep erosion to a minimum, furrow or border irrigation can be used. Contour bench leveling can also be used, especially on the lower slopes. These soils are well suited to sprinkler irrigation systems.

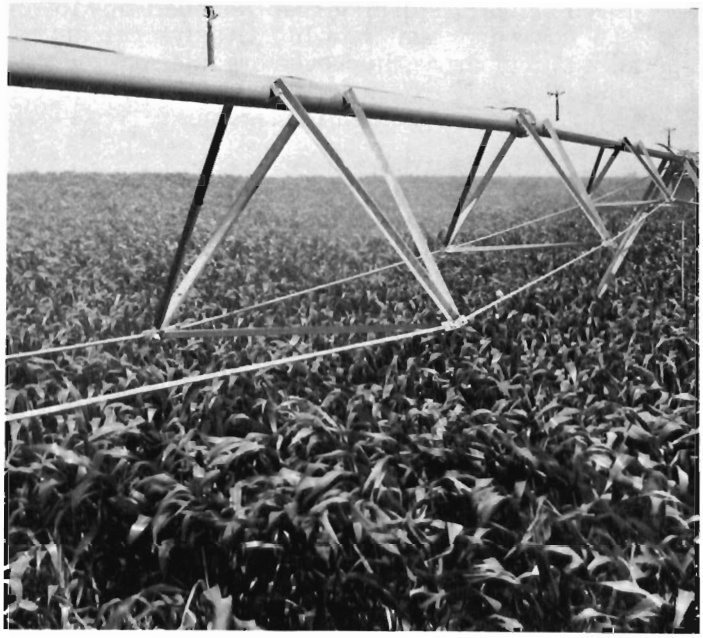

Figure 12.—A center pivot irrigation system provides irrigation water.

CAPABILITY UNIT IIIe-8 IRRIGATED

Anselmo fine sandy loam, 3 to 6 percent slopes, is the only soil in this unit. This soil is well drained on stream terraces and uplands. The surface layer and subsoil are fine sandy loam. The underlying material is loamy fine sand. A few small areas of this soil have been eroded by water or by soil blowing.

Permeability is moderately rapid, and the available water capacity is moderate. The intake rate is moderately high. Content of organic matter is moderately low, and natural fertility is medium. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is medium.

The main hazards are soil blowing and water erosion. Maintaining organic matter content and improving fertility are important concerns in management.

The main crops are corn, grain sorghum, alfalfa, and tame grasses.

Returning available crop residue to the soil and a cropping sequence that includes legumes or grass help to prevent soil blowing and water erosion. Adding barnyard manure increases fertility and improves tilth, especially on eroded areas. Nitrogen fertilizer is particularly needed for sustained production of crops. Some form of land leveling or reshaping is needed for gravity irrigation. Sprinkler irrigation, however, is generally more practical on the soils that are undulating.

CAPABILITY UNIT IIIe-11 IRRIGATED

Valentine loamy fine sand, 0 to 3 percent slopes, is the only soil in this unit. This soil is excessively drained on stream terraces. The surface layer is loamy fine sand, and the underlying material is fine sand. Soil blowing has eroded some areas of this soil.

Permeability is rapid, and the available water capacity is low. The intake rate is very high. Content of organic matter and natural fertility are low. This soil absorbs moisture easily and releases it readily to plants. It is also easy to work and can be cultivated at a relatively high moisture level. Runoff is slow.

Soil blowing is a severe hazard. Maintaining fertility and proper management of water are important concerns in management.

The main crops are corn, grain sorghum, alfalfa, and tame grasses. Sugar beets can also be grown.

A cropping sequence that provides cover most of the time helps to control soil blowing. Keeping crop residue on the surface also reduces soil blowing. Legumes and grasses in the cropping sequence help to maintain fertility and tilth. When gravity irrigation is used, land leveling is needed for proper management of water. Where deep cuts are made, fertility can be restored by applying barnyard manure and large amounts of commercial fertilizer. Nitrogen is most commonly needed. Light, frequent applications of irrigation water are needed. Excessive water leaches fertilizer below the plant roots. This soil is well suited to sprinkler irrigation.

CAPABILITY UNIT IIIs-2 IRRIGATED

This unit consists of deep, nearly level soils on stream terraces. These soils are moderately well drained or somewhat poorly drained. The surface layer is silt loam. The subsoil is silty clay loam or silty clay, and the underlying material is loam or silt loam. Some soils have mixed sand and gravel at a depth of 40 to 60 inches. About 30 percent of these soils are slightly affected or moderately affected by excess soluble salts or they are strongly alkaline.

Permeability is slow, and the available water capacity is low to high. The intake rate is low. Content of organic matter is moderate or moderately low, and natural fertility is moderate. Natural fertility on the saline-alkali part of these soils is low and poorly balanced. These soils absorb moisture slowly and release it slowly to plants. They are not easy to work because they are sticky when wet and hard when dry. They tend to become puddled if worked when wet. Runoff is very slow.

The clayey subsoil and saline-alkali characteristics are the main hazards of these soils. They cause poor surface drainage, low intake of water, and toxic conditions to plants. Maintaining fertility and improving tilth are important concerns in management. Most areas are wet early in spring. This wetness delays tillage and growth of seedling plants. Because some nutrients are unavailable and excess sodium is commonly toxic to plants, cultivated crops grow poorly in the saline-alkali areas.

The main crops are corn, grain sorghum, alfalfa, sugar beets, and tame grasses.

Land leveling improves surface drainage. Low spots that hold water even for a short time aggravate the salinity problem. Returning crop residue to the surface and applying barnyard manure to the saline-alkali areas improves tilth and intake of water. A good source

of crop residue can be obtained by planting corn after a field has been developed for irrigation. Cutting corn or sorghum for silage should be avoided until the organic-matter content has been increased, particularly in the saline-alkali areas. Additions of sulfur and gypsum help to neutralize the salts that are alkali, but desired results are not always obtained. Internal drainage can be improved by deep tillage with chiseling implements and by adding large amounts of barnyard manure. It is important to balance the nutrients needed by plants. Applying phosphate generally improves production and nitrogen is also needed.

CAPABILITY UNIT IIIs-4 IRRIGATED

Lawet silt loam, saline-alkali, 0 to 2 percent slopes, is the only soil in this unit. This soil is deep and poorly drained on bottom land. The surface layer is silt loam, and the subsoil is loam. The upper part of the underlying material is loam and the lower part is mixed sand and gravel. The surface layer is calcareous. About 50 percent of this soil is slightly affected by excess soluble salts or it is strongly alkaline.

Permeability is moderately slow or slow, and the available water capacity is moderate or high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility on the saline-alkali areas is low. The affected soil absorbs moisture slowly and releases it slowly to plants. Because the surface layer is sticky when wet and hard when dry, the soil is difficult to work. It puddles if worked when wet. Runoff is slow.

The saline-alkali characteristic of this soil causes poor tilth and unbalanced fertility for crop production. Wetness in spring delays or prevents tillage. This wetness is caused by poor surface drainage and a water table at a depth of 1 foot to 5 feet.

The main crops are corn, alfalfa, and tame grasses.

Land leveling improves surface drainage. Low spots that hold water for a short time tend to increase the salinity problem. These spots should be filled. Where outlets are available, open drains or tile drains can be used to provide drainage and help to lower the water table. Without proper drainage the soil is commonly too wet for cultivation in spring and soil temperature warms slowly. Returning crop residue to the surface and making heavy applications of barnyard manure to the saline-alkali areas improves tilth and the intake of water.

CAPABILITY UNIT IIIs-6 IRRIGATED

This unit consists of deep, nearly level soils on stream terraces. These soils are moderately well drained. The surface layer and subsoil are loam, silt loam, or sandy clay loam. The underlying material ranges widely from loamy sand to silt loam. Some areas of these soils have mixed sand and gravel at a depth of 40 to 60 inches. About 30 percent of the soils are slightly affected or moderately affected by excess soluble salts or they are strongly alkaline.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate where the soil is not affected by the saline-alkali condition. Content of organic matter is moderate or moderately low. Natural fertility is low in the saline-alkali areas. Plant nutrients are not well balanced for crop production. These soils are difficult to till because they are hard when dry and sticky when wet. Runoff is slow or very slow.

The saline-alkali characteristic of these soils is the main hazard. It limits crop production and lowers tilth, making tillage difficult. Wetness in spring delays tillage and causes the soils to warm slowly.

The main crops are corn, grain sorghum, alfalfa, sugar beets, and tame grasses.

Land leveling improves surface drainage. Low spots that hold water even for a short time increase the wetness and the salinity problem. Open drains or tile drains are needed in some areas. Returning crop residue to the surface and applying large quantities of barnyard manure to the saline-alkali areas improves tilth and the water intake. A good source of crop residue can be obtained by planting corn after a field has been leveled and developed for irrigation. Cutting corn or sorghum for silage should be avoided until the organic matter content has been increased, particularly in the saline-alkali areas. Adding sulfur and gypsum helps to neutralize the salt and alkali, but it may not always be practical because of the increased cost. Internal drainage can be improved by deep tillage with chiseling implements and by adding barnyard manure. Adding amounts of water to the soils that have adequate surface drainage tends to leach the salts to a lower level and thus improves productivity. Soils that have sand and gravel between a depth of 40 and 60 inches respond well to irrigation.

CAPABILITY UNIT IIIs-7 IRRIGATED

Lex loam, saline-alkali, 0 to 2 percent slopes, is the only soil in this unit. This soil is somewhat poorly drained on bottom land. The surface layer and subsoil are loam. The underlying material is very fine sandy loam, loam, or silt loam in the upper part. Gravelly sand is at a depth of 20 to 40 inches. About 40 percent of these soils is slightly affected by excess soluble salts or they are strongly alkaline. The surface layer is calcareous.

Permeability is moderately slow above the sand and gravel, and in the saline-alkali areas, it is slow. The available water capacity is moderate. The intake rate is moderate. Content of organic matter is moderate. In the saline-alkali areas natural fertility is low and it is poorly balanced. These saline-alkali areas are difficult to till because they are hard when dry and sticky when wet. Runoff is slow.

Salinity and alkalinity limits crop growth and causes poor tilth. Alkali areas become puddled if plowed when wet. Managing irrigation is an important concern in management. Wetness in spring delays tillage and contributes to the salinity problem. These soils warm up slowly in spring. Flooding is a hazard, especially in shallow drainageways that dissect areas of this unit.

The main crops are corn, alfalfa, and tame grasses. During dry seasons, alfalfa cannot obtain moisture

from the water table because the roots do not penetrate the layer of mixed sand and gravel.

Land leveling improves surface drainage. Deep cuts should be avoided because the underlying sand and gravel can be exposed at the surface. Small low areas that hold water for a short time tend to increase the salinity problem. In some places, open drains or tile drains can be used to improve drainage. If drainage is provided, soluble salt can be effectively leached by irrigation water. Overirrigation, however, can also leach nutrients out of the root zone into the underlying sand and gravel. Fertility needs to be properly balanced by use of commercial fertilizer or barnyard manure. Large quantities of organic matter, such as corn stalks and stubble or cover crops, improves tilth and makes it easier for water to enter the soil. Gypsum or sulfur can be used to help neutralize the alkalinity, but their use is expensive and desired results are not always obtained.

CAPABILITY UNIT IIIs-8 IRRIGATED

Wann fine sandy loam, saline-alkali, 0 to 2 percent slopes, is the only soil in this unit. This soil is deep and somewhat poorly drained on bottom land. The surface layer is fine sandy loam. The transitional layer is fine sandy loam or loam. The underlying material is fine sandy loam in the upper part. Mixed sand and gravel is at a depth of 40 to 60 inches. About 30 percent of this soil is slightly affected by excess soluble salts or it is strongly alkaline.

Permeability is moderately rapid in the nonalkali part, but is somewhat lower in the alkali part. The available water capacity is moderate. The intake rate is moderately high in the part not affected by alkalinity. Content of organic matter is moderate. Natural fertility is low and not well balanced in the saline-alkali areas. Most of this soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow. The alkali areas are difficult to work because of their puddled condition and high sodium content.

The saline-alkali condition is the main hazard of this soil. It causes poor tilth, toxicity to plants, poor intake of moisture, difficult tillage, and poor crop response. Wetness in spring and cold temperatures delay tillage. When the surface is not protected, soil blowing can be a problem.

The main crops are corn, alfalfa, and tame grasses.

Land leveling improves surface drainage. If drainage is provided, soluble salt can be leached by irrigation water. Open ditches and tile drains can be used to help lower the water table. Returning crop residue to the soil and applying barnyard manure reduces soil blowing and improves fertility, organic matter content, and tilth.

Commercial fertilizer needs to be used to maintain and balance fertility. Crops generally respond to phosphate. Gypsum or sulfur can be used to neutralize the alkalinity, but their use is expensive and not always as beneficial.

CAPABILITY UNIT IIIw-2 IRRIGATED

This unit consists of deep, nearly level soils on stream terraces and in depressions. These soils are moderately well drained to poorly drained. The surface layer is silt loam. The subsoil is silty clay loam or silty clay, and the underlying material is silt loam or loam. Sand and gravel is at a depth of 40 to 60 inches in some areas of these soils on stream terraces.

Permeability is slow or very slow, and the available water capacity is moderate. The intake rate is low. Content of organic matter is moderate, and natural fertility is medium. These soils absorb moisture slowly and release it slowly to plants. The soils in depressions are not easy to work because they are commonly too wet. Runoff is slow or very slow.

Wetness in spring or flooding after rain are the main hazards. Tillage is commonly delayed because of wetness. Tilth is especially poor in the soils in depressions. Maintaining fertility is also a concern in management.

The main crops are corn, grain sorghum, tame grasses, and alfalfa. Alfalfa, however, is not well suited on the soils in depressions.

If outlets are available, open drains or tile drains can be used to provide drainage on some soils on stream terraces. Diversion terraces on adjacent higher areas can help to reduce flooding on the uplands. Turning under crop residue and applying barnyard manure makes the soil more friable and tillage less difficult. Applying nitrogen fertilizer is necessary to maintain fertility. Land leveling improves surface drainage. Care needs to be taken not to expose the firm or very firm subsoil because it is difficult to till and cultivate and crops respond poorly where it is exposed.

CAPABILITY UNIT IIIw-3 IRRIGATED

Silver Creek silty clay loam, 0 to 2 percent slopes, is the only soil in this unit. It is somewhat poorly drained on stream terraces. The surface layer and subsoil are silty clay loam. The underlying material is silt loam.

Permeability is slow, and the available water capacity is moderate. The intake rate is low. Content of organic matter is moderate, and natural fertility is medium. Tillage is difficult because the surface is sticky when wet and hard when dry. Runoff is slow.

Excess wetness in spring is the main concern because it delays tillage and planting. Maintaining fertility is also a concern. If this soil is tilled when wet, it compacts and reduces aeration and movement of water. Available phosphate is low.

The main crops are corn and alfalfa. Alfalfa can generally obtain moisture from the water table, which is at a depth of 2 to 5 feet.

Where outlets are available, open drains or tile drains can be used to provide drainage. Land leveling is needed to improve surface drainage and to make application of water more efficient. Returning crop residue to the soil and applying barnyard manure improves tilth and fertility. Nitrogen and phosphate fertilizers are needed to maintain fertility.

CAPABILITY UNIT IIIw-4 IRRIGATED

Lawet silt loam, drained, 0 to 2 percent slopes, is the only soil in this unit. This soil is deep and poorly drained on bottom land. The surface layer is silt loam

and the subsoil is loam. The upper part of the underlying material is loam. Coarse sand is below a depth of 40 to 60 inches. The surface layer is calcareous.

Permeability is moderately slow, and the available water capacity is high. The intake rate is moderately low. Content of organic matter is moderate, and natural fertility is medium. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow. Much of the phosphate is unavailable because of the high amount of lime in the surface layer.

Without proper drainage, this soil is generally too wet for cultivation early in spring. Maintaining the proper balance of fertility is a concern in management.

The main crops are corn, alfalfa, and tame grasses.

Where outlets are available, open drains or tile drains can be used to provide drainage. Some land leveling is needed for surface drainage and for proper distribution of water. This soil is suited to either sprinkler or gravity irrigation. Legumes respond to applications of phosphorus, and most other crops respond to nitrogen.

CAPABILITY UNIT IIIw-6 IRRIGATED

Cozad silt loam, wet substratum, 1 to 3 percent slopes, is the only soil in this unit. This soil is deep and moderately well drained on stream terraces. The texture is silt loam throughout. A few small eroded areas are included with this soil.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate. Content of organic matter is moderate, and natural fertility is high. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

Wetness in spring is the main hazard. It delays tillage and slows crop growth when the plants are small. Small areas are occasionally flooded. Water erosion on side slopes is also a hazard. Maintaining and improving fertility and organic matter content are concerns in management.

The main crops are corn, grain sorghum, alfalfa, and tame grasses. Alfalfa obtains moisture from the water table.

Open drains or tile drains can be used to provide drainage. Erosion control structures upstream reduce the hazard of flooding. If this soil is gravity irrigated, land leveling is needed to provide an even distribution of water and uniform drainage. Maintaining crop residue on the surface helps to reduce water erosion. Applying barnyard manure to light colored, eroded areas improves fertility and tilth. Commercial fertilizer is generally needed for complete maintenance of fertility. Planting crops in sequence helps to reduce carryovers of insects and plant diseases. Sprinkler irrigation is suited to this soil.

CAPABILITY UNIT IIIw-7 IRRIGATED

This unit consists of nearly level soils that are moderately deep over mixed sand and gravel. These soils are somewhat poorly drained on bottom land. The surface layer is loam. The transition layer is loam or fine sandy loam, and the underlying material ranges widely from loamy fine sand to silt loam above sand and gravel. Depth to mixed sand and gravel is between 20 and 40 inches. The surface layer is calcareous.

Permeability is moderately rapid or moderately slow above the coarse textured material. The available water capacity is low or moderate. The intake rate is moderate. Content of organic matter is moderate or moderately low, and natural fertility is medium. These soils absorb moisture easily and release it readily to plants. They are easy to work. Runoff is slow.

Wetness in spring is the main hazard because it delays tillage and causes slow growth of seedlings. Flooding is also a hazard, especially in the drainageways that dissect areas of this unit. Maintaining fertility and management of water are the main concerns in management.

The main crops are corn, alfalfa, and tame grasses. During dry seasons, alfalfa is not able to obtain moisture from the water table because roots do not commonly grow through the sand and gravel layer.

If outlets are available, open drains or tile drains can be used to provide drainage. Land leveling is needed if these soils are irrigated by a gravity system, however, development is commonly difficult. If deep cuts are made, the mixed sand and gravel is exposed at the surface. Proper application of irrigation water is important. Overirrigation leaches nutrients out of the root zone into the underlying sand and gravel. Legumes respond to applications of phosphorus, and most other crops respond to nitrogen. Sprinkler irrigation is also suited. Some land leveling, however, is necessary to provide surface drainage.

CAPABILITY UNIT IVe-6 IRRIGATED

This unit consists of deep, strongly sloping soils on uplands and stream terraces. These soils are well drained or somewhat excessively drained. The surface layer is silt loam. The subsoil is silt loam or silty clay loam, and the underlying material is silt loam. More than half of these soils are eroded.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate. Content of organic matter ranges from moderate to low, and natural fertility ranges from high to low. These soils absorb moisture easily and release it readily to plants. They are easy to work, but the terrain is not always easy to traverse. Runoff is medium or rapid.

Water erosion is the main hazard. Loss of irrigation water by runoff and maintaining fertility are concerns in management.

These soils are best suited to alfalfa and tame grasses because of the hazard of erosion. Row crops are suited if they are limited to 1 or 2 years in succession and where erosion is controlled. Corn is the main row crop.

Sprinkler irrigation is best suited to these soils. Other methods are difficult to manage and require a great deal of land preparation. Terraces, contour farming, grassed waterways, and leaving crop residue on the surface help to control erosion. Conservation tillage helps to keep residue on the surface. Fertility can be

improved and maintained by applying commercial fertilizer and barnyard manure. Alfalfa responds well to phosphorus, especially on light colored soils. Loss of irrigation water by runoff is a common problem, but should not be excessive if the water is applied at the proper rate.

CAPABILITY UNIT IVe-8 IRRIGATED

Anselmo fine sandy loam, 6 to 11 percent slopes, is the only soil in this unit. This soil is deep and well drained on stream terraces and uplands. The surface layer and subsoil are fine sandy loam. The underlying material is loamy fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. The intake rate is moderately high. Content of organic matter is moderately low, and natural fertility is medium. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is medium.

Water erosion and soil blowing are severe hazards. Leaching of plant nutrients and proper management of water are important concerns in management.

The main crops are alfalfa and tame grasses.

Terraces and contour farming help to prevent water erosion, but they are not practical in hummocky areas. Conservation tillage and stripcropping reduce soil blowing. Proper fertilization is needed to replace plant nutrients lost by cropping and leaching. Irrigation water needs to be applied at the correct time and in proper amounts to prevent water loss by runoff and to meet crop requirements. This soil is best suited to a sprinkler irrigation system.

CAPABILITY UNIT IVe-11 IRRIGATED

Valentine loamy fine sand, 3 to 6 percent slopes, is the only soil in this unit. This soil is deep and excessively drained on stream terraces and uplands. The surface layer is loamy fine sand. The underlying material is fine sand. Some areas have been eroded by soil blowing.

Permeability is rapid, and the available water capacity is low. The intake rate is very high. Content of organic matter and natural fertility are low. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

When the surface is unprotected, soil blowing is a serious hazard. Maintaining and improving fertility and organic matter content are important concerns in management.

The main crops are alfalfa, tame grasses, corn, and grain sorghum.

Sprinkler irrigation is the only method of irrigation suited to this soil. Frequent applications of water are needed because applying too much water at one time leaches plant nutrients below the root zone. Returning crop residue to the soil, keeping tillage to a minimum, and stripcropping help to control soil blowing. Corn and sorghum should not be cut for silage because the stalks and leaves are needed for residue. Field windbreaks also reduce soil blowing, however, they interfere with center pivot sprinkler systems. Adding barnyard manure and commercial fertilizer helps to maintain and improve fertility.

CAPABILITY UNIT IVs-11 IRRIGATED

Elsmere loamy fine sand, saline-alkali, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep and somewhat poorly drained on stream terraces. The surface layer is loamy fine sand. The underlying material is loamy fine sand in the upper part and fine sandy loam or loam in the lower part. About 50 percent of each mapped area is strongly alkaline or very strongly alkaline. This soil also contains small amounts of soluble salts.

Permeability is moderately rapid or rapid, and the available water capacity is moderate or low. The intake rate is very high. Natural fertility is low and not well balanced, and content of organic matter is moderately low. This soil absorbs moisture easily, except in alkali areas where it is absorbed more slowly. These alkali areas also release moisture slowly to plants. They are high in sodium, which destroys the desirable structure making tillage difficult. Runoff is slow.

The alkali characteristic of this soil is a severe hazard and it determines use and management. Wetness in spring and the cool soil temperature commonly delay tillage. Soil blowing is a minor hazard.

The main crops are alfalfa and tame grasses.

Land leveling is generally needed for surface drainage. Where outlets are available, open drains or tile drains improve internal drainage. Drainage is necessary to reduce the saline-alkali and wetness conditions. Adding barnyard manure improves tilth, allows water to enter the soil more readily, and improves organic matter content. Commercial fertilizer can be used to maintain and balance fertility. Crops generally respond to phosphate. Adding sulfur or gypsum helps to neutralize the saline-alkali areas, but their use is expensive and commonly does not achieve the desired results. A cropping sequence that provides cover most of the time helps to decrease soil blowing. A sprinkler type of irrigation is better suited than other methods.

CAPABILITY UNIT IVw-11 IRRIGATED

Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep and moderately well drained or somewhat poorly drained on stream terraces. The surface layer is loamy fine sand. The underlying material is loamy fine sand in the upper part and fine sandy loam or loam in the lower part. A water table is at a depth of 3 to 8 feet. Soil blowing or land leveling has exposed the light colored underlying material in some areas.

Permeability is moderately rapid or rapid, and the available water capacity is moderate. Natural fertility is low, and content of organic matter is moderately low. This soil absorbs moisture easily and releases it readily to plants. It is easy to work. Runoff is slow.

Wetness in spring is the main hazard because it delays tillage and causes cold temperatures, which slows germination and growth of small seedlings. If the surface is not protected, soil blowing is also a hazard. Maintaining fertility, particularly available phosphorus, is a concern in management.

The main crops are alfalfa, tame grasses, corn, and grain sorghum. Alfalfa obtains moisture from the water table.

Both sprinkler irrigation and gravity irrigation are suited to this soil. Land leveling is needed if the soil is gravity irrigated. Low, wet areas can be eliminated by land leveling. Frequent applications of water are needed during the growing season because of the very high intake rate. Conservation tillage and stripcropping help to control soil blowing. Adding barnyard manure improves tilth, helps to control soil blowing, and increases organic matter content. Commercial fertilizer can be used to maintain and balance fertility.

CAPABILITY UNIT IVw-13 IRRIGATED

Platte loam, 0 to 2 percent slopes, is the only soil in this unit. This soil is shallow over mixed sand and gravel. It is poorly drained or somewhat poorly drained on bottom land. The surface layer is loam and the upper part of the underlying material is very fine sandy loam. Gravelly sand is at a depth of 10 to 20 inches. The surface layer is calcareous.

Permeability is moderately rapid in the upper part of the profile and is very rapid in the sand and gravel. The available water capacity is low. Content of organic matter and natural fertility, particularly available phosphorus, are low. This soil absorbs water well and releases it readily to plants. Runoff is slow.

Wetness due to the high water table and flooding in some areas are the main hazards. During dry seasons when the water table is lowest, the soil is droughty. Maintaining fertility and controlling irrigation water are important concerns in management. Small saline-alkali areas are minor concerns in management. Plant nutrients can be easily leached from the rooting zone.

The main crops are alfalfa, tame grasses, corn, and grain sorghum.

Turning under crop residue increases organic matter content, and applying commercial fertilizer helps to maintain and balance fertility. Land leveling is difficult and needs to be carefully controlled because severe cuts can expose the sand and gravel at the surface. Frequent, light applications of water are best because overirrigation leaches nutrients out of the root zone into the underlying sand and gravel. Applying irrigation water generally removes undesirable excess salinity. A sprinkler irrigation system is well suited to this soil.

Predicted Yields

Crop yield predictions are an important interpretation that can be made from a soil survey. The predicted yields per acre for the principal crops grown in Dawson County are given in table 2. These predictions are based on average yields for seeded acres over the most recent 5 year period. They do not represent anticipated yields that might be obtainable in the future under a new and possibly different technology.

Yields for various crops were determined from information obtained from interviews with farmers, directors of the Natural Resource Districts, representatives of the Soil Conservation and Agricultural Extension Service, and others familiar with the soils and farming in the county. Yield information from the Agriculture Stabilization and Conservation Service and research data from Agricultural Experiment Stations was also used. Yield records, trends, research, and experience were taken into consideration.

Crop yields are influenced by many factors. Some of the most influential soil features on yields are depth, texture, slope, and drainage. Erosion, available water capacity, permeability, and fertility are also important. Management practices that affect yields are the cropping pattern, timeliness of operations, plant population, and crop variety. Weather is significant, both on a day to day basis and for longer seasonal or yearly fluctuations. All of these were taken into account when preparing table 2.

The yields listed are those predicted under a high level of management. Under this management, the soil is protected from deterioration and is used in accordance with its capacity. Fertility is maintained and fertilizer or lime is applied at rates indicated by soil tests and field experiments. Crop residue is returned to the soil to improve tilth and maintain or increase organic matter content. Suitable varieties of seed are used and plant populations are optimum. Weeds, insects, and diseases are well controlled. Under irrigation, water is applied in a timely manner and in proper amounts. Water erosion and soil blowing are controlled. Where needed for crop production, the soil is drained. Tillage and seeding practices are performed at the proper time and are adequate.

One of the best uses for table 2 is to compare productivity of one soil with another within the county. The table in no sense gives recommendations and the yields given do not apply to specific farms or farmers. Yields in any one year on a particular soil can vary considerably from the figures given. This can be because of the effect of weather, sudden infestations of diseases, insects, or other unpredictable hazards. By using long time averages, it is possible to consider such hazards in predicting crop yields. Improved technology may make predictions in the table obsolete in a few years. Yield data will then need to be updated as knowledge is gained and improvements in technology show the need.

Management of Soils for Rangeland[2]

Rangeland amounts to approximately 40 percent of the total agricultural acreage in Dawson County. It is scattered throughout the county, but the greatest concentration is on the strongly sloping to very steep soils on uplands and the poorly drained and very poorly drained soils on bottom land along the Platte River. The major soil associations in rangeland are the Uly-Coly, the Coly-Uly-Hobbs, the Lex-Lawet-Gibbon, and the Gothenburg-Platte.

Raising livestock, mainly cow and calf herds, is the second largest farming industry in the county. Calves are sold in the fall as feeders. The range is generally grazed from late in spring to early in fall. The livestock spend the remainder of the year grazing grain sorghum

[2]By PETER N. JENSEN, range conservationist, Soil Conservation Service.

TABLE 2.—*Predicted average acre yields of principal crops*

[Yields are those predicted under improved management. Absence of yields indicates the crop is not suited to the soil or that it is grown only in small amounts]

Map unit	Corn		Grain sorghum		Wheat	Alfalfa hay	
	Dryland	Irrigated	Dryland	Irrigated	Dryland	Dryland	Irrigated
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*
Alda loam, 0 to 2 percent slopes	38	125	45	110	30	2.8	5.0
Anselmo fine sandy loam, 0 to 1 percent slopes	45	125	50	110	30	2.5	5.0
Anselmo fine sandy loam, 1 to 3 percent slopes	41	120	45	100	28	2.5	5.0
Anselmo fine sandy loam, 3 to 6 percent slopes	35	110	42	95	26	2.2	4.5
Anselmo fine sandy loam, 6 to 11 percent slopes	30	95	35	80	22	1.9	3.5
Anselmo loam, 0 to 1 percent slopes	50	135	55	115	32	3.0	5.0
Coly silt loam, 6 to 11 percent slopes, eroded	25	90	29	85	19	2.0	3.2
Coly silt loam, 11 to 20 percent slopes, eroded							
Coly-Hobbs silt loams, 2 to 60 percent slopes							
Cozad fine sandy loam, 0 to 1 percent slopes	45	135	55	115	30	4.0	5.0
Cozad silt loam, 0 to 1 percent slopes	48	145	52	120	40	3.0	6.0
Cozad silt loam, 1 to 3 percent slopes	40	140	47	110	38	2.7	5.8
Cozad silt loam, 3 to 6 percent slopes	38	130	42	95	34	2.4	5.4
Cozad silt loam, 6 to 11 percent slopes, eroded	27	95	31	90	24	2.0	3.8
Cozad silt loam, saline-alkali, 0 to 1 percent slopes	35	100	45	85	25	2.5	4.5
Cozad silt loam, wet substratum, 0 to 1 percent slopes	55	145	60	115	38	5.0	6.0
Cozad silt loam, wet substratum, 1 to 3 percent slopes	48	130	55	105	35	4.5	5.4
Cozad silty clay loam, 0 to 1 percent slopes	45	140	50	120	40	4.0	6.0
Cozad-Hobbs silt loams, 2 to 30 percent slopes							
Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes		95	25	75		3.3	3.9
Elsmere loamy fine sand, saline-alkali, 0 to 3 percent slopes		90	20	68		2.5	3.2
Fillmore silt loam, 0 to 2 percent slopes	35		45		25	1.8	
Fillmore silt loam, drained, 0 to 2 percent slopes	45	115	55	110	30	3.0	4.8
Gibbon loam, 0 to 2 percent slopes	55	135	60	115	35	3.9	5.5
Gosper fine sandy loam, 0 to 2 percent slopes	35	135	40	115	30	2.8	5.0
Gosper loam, 0 to 2 percent slopes	40	140	45	120	35	3.0	5.5
Gosper loam, saline-alkali, 0 to 2 percent slopes	30	100	35	90	23	2.2	3.8
Gothenburg soils, 0 to 2 percent slopes	48	145	52	120	42	2.7	6.0
Hall silt loam, 0 to 1 percent slopes	48	145	52	120	42	2.7	6.0
Hall silt loam, 1 to 3 percent slopes	40	140	50	110	40	2.5	5.8
Hall silt loam, terrace, 0 to 1 percent slopes	52	145	60	120	43	3.5	6.2
Hall silt loam, wet substratum, 0 to 1 percent slopes	55	145	60	115	40	5.5	6.0
Hobbs silt loam, 0 to 2 percent slopes	48	140	55	120	30	3.0	5.5
Holdrege silt loam, 0 to 1 percent slopes	40	145	46	120	40	2.5	6.2
Holdrege silt loam, 1 to 3 percent slopes	38	140	44	115	38	2.3	6.0
Holdrege silt loam, 3 to 6 percent slopes	35	130	40	110	35	2.1	5.5
Holdrege silt loam, 3 to 6 percent slopes, eroded	34	120	38	105	32	2.0	5.0
Hord fine sandy loam, 0 to 3 percent slopes	45	135	50	112	34	2.6	5.0
Hord silt loam, 0 to 1 percent slopes	50	145	55	120	43	3.5	6.2
Hord silt loam, 1 to 3 percent slopes	48	140	53	115	40	3.0	6.0
Hord silt loam, 3 to 6 percent slopes	45	130	50	110	37	2.5	5.5
Hord silt loam, wet substratum, 0 to 1 percent slopes	60	145	65	115	40	5.5	6.2
Hord silty clay loam, 0 to 1 percent slopes	40	135	45	120	35	4.5	5.5
Hord silty clay loam, wet substratum, 0 to 1 percent slopes	45	135	50	110	34	4.5	5.5
Lawet loam, ponded, 0 to 2 percent slopes							
Lawet silt loam, drained, 0 to 2 percent slopes	40	110	45	95		3.2	5.0
Lawet silt loam, saline-alkali, 0 to 2 percent slopes	30	80	32	68	26	2.4	3.2
Lex loam, 0 to 2 percent slopes	40	125	48	115	32	2.8	5.0
Lex loam, saline-alkali, 0 to 2 percent slopes	35	100	40	90	24	2.3	4.2
Ovina fine sandy loam, 0 to 3 percent slopes	55	125	60	110	30	4.0	5.5
Platte loam, 0 to 2 percent slopes		80		80			4.0
Rusco silt loam, 0 to 1 percent slopes	40	140	60	120	40	2.5	6.0
Silver Creek silt loam, 0 to 2 percent slopes	40	125	42	100	35	2.8	5.0
Silver Creek silty clay loam, 0 to 2 percent slopes	45	130	50	115	33	3.5	5.5
Silver Creek complex, 0 to 2 percent slopes	30	95	32	80	26	2.0	3.8
Uly silt loam, 11 to 15 percent slopes							
Uly-Coly silt loams, 15 to 30 percent slopes							
Uly-Holdrege silt loams, 6 to 11 percent slopes	30	100	35	95	25	2.3	4.0
Uly-Holdrege-Coly silt loams, 6 to 11 percent slopes, eroded	27	95	31	90	21	2.2	3.8
Valentine loamy fine sand, 0 to 3 percent slopes	25	100	26	80	18	1.3	3.6
Valentine loamy fine sand, 3 to 6 percent slopes		90		70			3.0
Valentine loamy fine sand, rolling							
Wann fine sandy loam, saline-alkali, 0 to 2 percent slopes	35	90	40	80	28	3.0	4.8
Wann loam, 0 to 2 percent slopes	45	130	50	110	35	3.7	5.5
Wood River silt loam, 0 to 1 percent slopes	42	130	48	110	35	3.0	5.0
Wood River complex, 0 to 2 percent slopes	28	90	34	80	25	2.5	3.5

or corn aftermath in fall and early in winter and are fed either hay, silage, or both, the remainder of the winter.

Management and improvement practices

Management practices that maintain or improve range condition are needed, regardless of other practices used. These practices are proper grazing use, defered grazing, and planned grazing systems. The proper distribution of livestock in a pasture can be improved by the correct location of fences, livestock water developments (fig. 13), and salting facilities.

Practices that improve range condition include range seeding, which is the establishment of native grasses by seeding, either wild harvest or improved strains, on land that is suitable for range. Coly silt loam, 11 to 20 percent slopes, eroded, and Uly silt loam, 11 to 15 percent slopes, are still being used for crops but should be seeded to rangeland. The most important grasses used in the seed mixture include big bluestem, little bluestem, indiangrass, switchgrass, side-oats grama, and blue grama. Little care other than management of grazing is needed to maintain forage production.

Range site and condition classes

Different kinds of rangeland produce different kinds and amounts of native grass. For proper range management, an operator should know the different kinds of soil or range sites in his holding and the native plants each site can grow. Management can then be used that favors the growth of the best forage plants on each kind of soil.

Range sites are distinctive kinds of rangeland that differ from each other in their ability to produce a significantly different kind, proportion, or production of climax, or original, vegetation. A significant difference is one great enough to require some variation in management, such as a different stocking rate. Climax vegetation is the combination of plants that originally grow on a given site. The most productive combination of range plants is generally the climax vegetation.

Range condition is classified according to the percent of climax vegetation on the site. This classification is used for comparing the kind and amount of present vegetation with that which the site can produce. Changes in range condition are due mainly to the intensity of grazing and to drought.

Climax vegetation can be altered by intensive grazing because livestock graze selectively. They constantly seek the more palatable and nutritious plants. Plants react to grazing in one of three ways—decrease, increase, or invade. Decreaser and increaser plants are climax plants. Generally, *decreasers* are the most heavily grazed and, consequently, the first to be injured by

Figure 13.—Dugout in an area of Hobbs silt loam.

overgrazing. *Increasers* withstand grazing better or are less palatable to livestock. They increase under grazing and replace the decreasers. *Invaders* are weeds that become established after the climax vegetation has been reduced by grazing.

Common and scientific names for plants mentioned in this section are presented in the list that follows.

Common name	*Scientific name*
alkali sacaton	Sporobolus airoides (Torr.) Torr.
asters	Aster spp. L.
big bluestem	Andropogon gerardi Vitman.
blue grama	Bouteloua gracilis (H.B.K.) Lag, ex Steud.
blue verbena	Verbena hastata L.
brittle pricklypear	Opuntia fragilis (Nutt.) Engelm.
broom snakeweed	Gutierrezia sarothrae (Pursh.) Britt. & Rusby
buffalograss	Buchloe dactyloides (Nutt.) Engelm.
Canada wildrye	Elymus canadensis L.
cudweed sagewort	Artemesia glomerata var. gnaphalodes (Nutt.) T. & G.
dandelion	Taraxacum officinale Weber in Wiggers
foxtail barley	Hordeum jubatum L.
green muhly	Muhlenbergia racemosa (Michx.) B.S.P.
hairy grama	Bouteloua hirsuta Lag.
indiangrass	Sorghastrum nutans (L.) Nash.
inland saltgrass	Distichlis stricta (Torr.) Rydb.
Kentucky bluegrass	Poa pratensis L.
leadplant	Amorpha canescens Pursh.
little bluestem	Andropogon scoparius Michx.
needleandthread	Stipa comata Trin. and Rupr.
plains bluegrass	Poa arida Vassey
plains muhly	Muhlenbergia cuspidata (Torr.) Rydb.
prairie cordgrass	Spartina pectinata Link.
prairie junegrass	Koeleria cristata (L.) Pers.
prairie sandreed	Calamovilfa longifolia (Hook) Scribn.
red clover	Trifolium pratense L.
redtop	Agrostis alba L.
reedgrasses	Calamagrostis spp. Adans.
sand bluestem	Andropogon hallii Hack.
sand dropseed	Sporobolus cryptandrus (Torr.) A. Gray
sand lovegrass	Eragrostis trichodes (Nutt.) Wood
sand paspalum	Paspalum stramineum Nash
Scribner panicum	Panicum scribnerianum Nash
sedges	Carex spp. L.
side-oats grama	Bouteloua curtipendula (Michx.) Torr.
slender wheatgrass	Agropyron trachycaulum (Link) Malte
switchgrass	Panicum virgatum L.
western ragweed	Ambrosia psilostachya DC.
western wheatgrass	Agropyron smithii Rydb.

Range condition is expressed in four condition classes to show the present condition of the vegetation on a range site in relation to the vegetation that grew on it originally. The condition is *excellent* if 76 to 100 percent of the vegetation is climax; *good* if 51 to 75 percent is climax; *fair* if 26 to 50 percent is climax; and *poor* if 0 to 25 percent is climax.

Descriptions of range sites

The range sites in Dawson County are described in this section. The descriptions include the topography of each site, a brief description of the soils in each site, the dominant vegetation when in excellent range condition, the dominant vegetation in poor range condition, and the total annual production in pounds per acre by air dry weight for years when the site is in excellent condition.

To find the names of all the soils in any given site, refer to the "Guide to Map Units" at the back of this survey. The range site of the map unit can also be determined from this guide.

WET LAND RANGE SITE

Lawet loam, ponded, 0 to 2 percent slopes, is the only soil in this range site. This soil is deep and poorly drained in slightly depressional areas of bottom land and stream terraces in the Platte River Valley. The underlying material is loamy or sandy. The kind of vegetation that grows on this site is mainly a result of the water table that fluctuates from the surface to a depth of about 3 feet.

The climax plant cover is a mixture of such decreaser grasses as prairie cordgrass and reedgrasses. These grasses make up about 65 percent of the total plant production, and other perennial grasses and forbs account for the remainder. Some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of Kentucky bluegrass, foxtail barley, red clover, redtop, asters, dandelion, and small amounts of prairie cordgrass and members of the sedge family.

Where this site is in excellent condition, the total annual production ranges from 5,000 pounds per acre, air-dry weight, in unfavorable years to 6,000 pounds in favorable years.

SUBIRRIGATED RANGE SITE

This range site consists of nearly level or very gently sloping soils. Most of these soils are somewhat poorly drained, but a few are poorly drained or moderately well drained. The soils are on bottom land and stream terraces in the Platte River Valley. They range from very shallow to deep over mixed sand and gravel. The surface layer is silty, loamy, or sandy. The subsoil is silty, loamy, or clayey, and the underlying material ranges widely from sandy to clayey. The kind of vegetation that grows on this site is mainly a result of a water table that fluctuates between a depth of 6 inches and about 8 feet.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, indiangrass, switchgrass, little bluestem, prairie cordgrass, slender wheatgrass, and Canada wildrye. These grasses make up about 75 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Kentucky bluegrass, green muhly, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of Kentucky bluegrass, redtop, dandelion, western ragweed, blue verbena, foxtail barley, and small amounts of western wheatgrass and members of the sedge family.

Where this site is in excellent condition, the total annual production ranges from 4,500 pounds per acre, air-dry weight, in unfavorable years to 5,500 pounds in favorable years.

SALINE SUBIRRIGATED RANGE SITE

This range site consists of nearly level, poorly drained to moderately well drained soils. These soils are on bottom land and stream terraces in the Platte River Valley. They are moderately deep or deep over

sand and gravel. The surface layer is loamy or silty, and the underlying material ranges from loamy to clayey. These soils are slightly affected or moderately affected by excess soluble salts and they are moderately alkaline or strongly alkaline. The water table fluctuates between a depth of 1 foot to 7 feet. In most places the surface layer is calcareous. The kind of vegetation that grows on this site is mainly a result of the saline-alkali condition and the moderately deep water table.

The climax plant cover is a mixture of such decreaser grasses as alkali sacaton, switchgrass, indiangrass, slender wheatgrass, plains bluegrass, and Canada wildrye. These grasses make up about 80 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Inland saltgrass and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of inland saltgrass, blue grama, buffalograss, Kentucky bluegrass, dandelion, and members of the sedge family.

Where this site is in excellent condition, the total annual production ranges from 4,000 pounds per acre, air-dry weight, in unfavorable years to 5,000 pounds in favorable years.

SILTY OVERFLOW RANGE SITE

This range site consists of deep, nearly level to gently sloping soils. These soils are well drained and are on bottom land that floods occasionally. The surface layer and underlying material are silty. Flooding, slight deposition of silt, high available water capacity, and a moderate infiltration rate are the dominant influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, little bluestem, switchgrass, slender wheatgrass, and Canada wildrye. These grasses make up about 70 percent of the total plant volume and other grasses and forbs account for the remainder. Western wheatgrass, green muhly, side-oats grama, Kentucky bluegrass, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of Kentucky bluegrass, western wheatgrass, and members of the sedge family.

Where this site is in excellent condition, the total annual production ranges from 3,500 pounds per acre, air-dry weight, in unfavorable years to 4,500 pounds in favorable years.

CLAYEY OVERFLOW RANGE SITE

This range site consists of deep, nearly level, poorly drained soils that occur in depressions on uplands and stream terraces. The surface layer is silty, and the subsoil is mainly clayey. Flooding as a result of runoff from higher-lying soils, slow runoff, and poor internal drainage are the dominant influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, switchgrass, little bluestem, and Canada wildrye. These grasses make up about 50 percent of the total plant volume and other grasses and forbs account for the remainder. Western wheatgrass, Kentucky bluegrass, blue grama, buffalograss, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of Kentucky bluegrass, blue grama, buffalograss, western ragweed, and members of the sedge family.

Where this site is in excellent condition, the total annual production ranges from 2,500 pounds per acre, air-dry weight, in unfavorable years to 4,000 pounds in favorable years.

SANDY LOWLAND RANGE SITE

Gosper fine sandy loam, 0 to 2 percent slopes, is the only soil in this range site. This soil is deep and moderately well drained on stream terraces in the Platte River Valley. The subsoil is loamy. Sand and gravel is between a depth of 40 to 60 inches. The kind of vegetation that grows on this site is mainly a result of the water table that fluctuates between depths of 4 to 8 feet and the underlying sand and gravel.

The climax plant cover is a mixture of such decreaser grasses as sand bluestem, little bluestem, switchgrass, and Canada wildrye. These grasses make up about 45 percent of the total plant volume and other grasses and forbs account for the remainder. Prairie sandreed, blue grama, needleandthread, Scribner panicum, sand dropseed, cudweed sagewort, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of sand dropseed, blue grama, Scribner panicum, and western ragweed.

Where this site is in excellent condition, the total annual production ranges from 3,000 pounds per acre, air-dry weight, in unfavorable years to 4,000 pounds in favorable years.

SILTY LOWLAND RANGE SITE

This range site consists of nearly level or very gently sloping, well drained or moderately well drained soils. These soils are deep on stream terraces and uplands. The surface layer is silty, except in a few areas where it is loamy. The subsoil is mainly silty. Permeability is moderate or moderately slow. Runoff from higher lying soils, high available water capacity, and a moderate or moderately slow infiltration rate are the dominant influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, little bluestem, switchgrass, and Canada wildrye. These grasses make up about 70 percent of the total plant volume and other grasses and forbs account for the remainder. Western wheatgrass, needleandthread, side-oats grama, blue grama, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of Kentucky bluegrass, blue grama, sedges, and western ragweed.

Where this site is in excellent condition, the total annual production ranges from 3,000 pounds per acre, air-dry weight, in unfavorable years to 4,500 pounds in favorable years.

SALINE LOWLAND RANGE SITE

This range site consists of nearly level, moderately well drained soils. These soils are deep on stream terraces in the Platte River Valley. The surface layer is

loamy or silty, and the subsoil is loamy, silty, or clayey. The soils are slightly affected or moderately affected by soluble salts, and some areas are moderately alkaline. Permeability is moderately slow. The water table fluctuates between a depth of 4 to 15 feet. The saline-alkali condition of these soils is the main influence on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as western wheatgrass, alkali sacaton, switchgrass, plains bluegrass, and slender wheatgrass. These grasses make up about 70 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Inland saltgrass, Kentucky bluegrass, and members of the sedge family are the principal increasers. When the site is in poor condition, the typical plant community consists dominantly of inland saltgrass.

Where this site is in excellent condition, the total annual production ranges from 2,500 pounds per acre, air-dry weight, in unfavorable years to 3,500 pounds in favorable years.

SANDS RANGE SITE

Valentine loamy fine sand, rolling, is the only soil in this range site. This soil is excessively drained on uplands. The surface layer and underlying material are sandy. Permeability is rapid. The coarse texture and low available water capacity are the main influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as sand bluestem, switchgrass, sand lovegrass, prairie junegrass, and Canada wildrye. These grasses make up about 60 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Little bluestem, prairie sandreed, needleandthread, blue grama, Scribner panicum, sand dropseed, and sand paspalum are the principal increasers. When the site is in poor condition, the typical plant community consists of blue grama, hairy grama, sand dropseed, sand paspalum, Scribner panicum, western ragweed and brittle pricklypear.

Where this site is in excellent condition, the total annual production ranges from 1,500 pounds per acre, air-dry weight, in unfavorable years to 2,800 pounds in favorable years.

SANDY RANGE SITE

This range site consists of nearly level to strongly sloping, well drained or excesesively drained soils. These soils are deep on stream terraces or uplands. The surface layer, subsoil, and underlying material are loamy or sandy. Permeability is moderate to rapid. The moderately rapid infiltration rate and the well drained to excessively drained soils are the dominant influence on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as sand bluestem, little bluestem, switchgrass, side-oats grama, and prairie junegrass. These grasses make up about 65 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Blue grama, needleandthread, prairie sandreed, sand dropseed, Scribner panicum, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of blue grama, Scribner panicum, sand dropseed, and western ragweed.

Where this site is in excellent condition, the total annual production ranges from 1,500 pounds per acre, air-dry weight, in unfavorable years to 3,000 pounds in favorable years.

SILTY RANGE SITE

This range site consists of nearly level to steep, well drained and somewhat excessively drained soils. These soils are deep and have a silty surface layer and subsoil. The infiltration rate is moderate or moderately slow, and the available water capacity is high. The soil depth, rate of infiltration, drainage, and available water capacity are the dominant influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, little bluestem, side-oats grama, switchgrass, and indiangrass. These grasses make up about 65 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Blue grama, buffalograss, western wheatgrass, sand dropseed, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of blue grama, buffalograss, sand dropseed, and western ragweed.

Where this site is in excellent condition, the total annual production ranges from 2,000 pounds per acre, air-dry weight, in unfavorable years to 3,500 pounds in favorable years.

CLAYEY RANGE SITE

Wood River silt loam, 0 to 1 percent slopes, is the only soil in this range site. This soil is deep and moderately well drained on stream terraces in the Platte River Valley. It has a silty surface layer and claypan subsoil. The slow permeability in the subsoil is the main influence on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses as big bluestem, little bluestem, switchgrass, indiangrass, and side-oats grama. These grasses make up about 55 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Blue grama, buffalograss, western wheatgrass, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of buffalograss, blue grama, Kentucky bluegrass, western ragweed, blue verbena, and annual grasses.

Where this site is in excellent condition, the total annual production ranges from 1,500 pounds per acre, air-dry weight, in unfavorable years to 3,000 pounds in favorable years.

LIMY UPLAND RANGE SITE

This range site consists of strongly sloping to steep, somewhat excessively drained soils on uplands. These soils are deep. The surface layer is calcareous. The surface layer and underlying material are silty. Per-

meability is moderate, and the available water capacity is high. The kind of vegetation that grows on this site is mainly a result of the calcareous surface layer.

The climax plant cover is a mixture of such decreaser grasses as little bluestem, side-oats grama, big bluestem, switchgrass, plains muhly, and western wheatgrass. These grasses make up about 80 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Blue grama, hairy grama, buffalograss, sand dropseed, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of blue grama, Kentucky bluegrass, Scribner panicum, sedges, sand dropseed, and western ragweed.

Where this site is in excellent condition, the total annual production ranges from 1,500 pounds per acre, air-dry weight, in unfavorable years to 3,000 pounds in favorable years.

THIN LOESS RANGE SITE

The Coly part of Coly-Hobbs silt loams, 2 to 60 percent slopes, is the only soil in this range site. This silty calcareous soil is steep or very steep on uplands. Catsteps are common. Steepness of slope, excessive runoff, weak soil development, and the calcareous surface layer are the dominant influences on the kind of vegetation that grows on this site.

The climax plant cover is a mixture of such decreaser grasses and shrubs as little bluestem, big bluestem, side-oats grama, prairie sandreed, plains muhly, needleandthread, western wheatgrass, and leadplant. These grasses and shrubs make up about 80 percent of the total plant volume and other perennial grasses and forbs account for the remainder. Blue grama, sand dropseed, and some sedges are the principal increasers. When the site is in poor condition, the typical plant community consists of blue grama, sand dropseed, broom snakeweed, and various annuals.

Where this site is in excellent condition, the total annual production ranges from 1,500 pounds per acre, air-dry weight, in unfavorable years to 2,750 pounds in favorable years.

Use of Soils for Windbreaks[3]

Native woodland in Dawson County occurs mainly in strips along the Platte River. These wooded strips are composed of eastern cottonwood and some eastern redcedar, American elm, green ash, boxelder, willows, Russian-olive, buffaloberry, and redosier dogwood. Most of these trees are in noncommercial stands, growing mainly on Gothenburg loamy sand. A small percentage of this stand can be considered as commercial and is growing mainly on Platte loam.

A narrow strip of woodland also occurs along the Wood River in the northeast part of the county. These stands are mainly American elm, green ash, boxelder, and eastern cottonwood.

Early settlers in Dawson County planted trees for protection, shade, and fenceposts. Throughout the years land owners have continued to plant trees to protect their buildings and livestock. Native trees and shrubs contribute a great deal to the natural beauty of the landscape. Their presence benefits wildlife by producing food and cover.

Kinds of windbreaks

Because of the scarcity of many trees and the severe weather that prevails, windbreaks are needed for protection of farmsteads and livestock (fig. 14). Windbreaks help to reduce home heating costs, control drifting snow, reduce soil erosion, provide shelter for livestock, improve wildlife habitat, and beautify the home and countryside.

Narrow windbreaks or screen plantings are also useful in urban areas where they slow the speed of the wind, settle dust, and help to reduce the noise level. Although trees are not easily established every year, the observance of basic rules of tree culture can result in a high degree of tree survival. Healthy seedlings of suited species, properly planted in a well prepared soil and carefully tended can survive and grow well.

Growth of trees

Table 3 gives the suitability and expected height of trees and shrubs at 20 years of age for species suitable in windbreaks in Dawson County. Detailed measurements were taken for most tree and shrub species listed. However, some tree heights and ratings of suitability are estimated. The soils in each group are similar in characteristics that affect the growth of trees.

The ratings given in table 3 are based on observations of relative vigor and general condition of the trees. Species that have a rating of good are best suited to windbreaks on soils of that group. A rating of *good* indicates that one or more of the following conditions generally apply: leaves, or needles, are normal in color and growth; small amounts of deadwood (tops, branches, and twigs) occur in the live crown of the tree; and damage caused by disease, insects, and climate is limited. A rating of *fair* indicates one or more of the following conditions generally apply: leaves, or needles, are obviously abnormal in color and growth; substantial amounts of deadwood (tops, branches, and twigs) occur in the live crown; damage caused by disease, insects, and climate is moderate; and the current year's growth is obviously less than normal. A rating of *poor* indicates one or more of the following conditions apply: leaves, or needles, are very abnormal in color and growth; very large amounts of deadwood (tops, branches, and twigs) occur within the live crown; and damage caused by disease, insects, and climate is extensive.

Cedar and pine are best suited to windbreaks. Measurement shows that these species rated high in survival and vigor. These species hold their leaves through the winter, thus giving maximum protection when it is most needed. Table 3 also indicates several species of broadleaf trees that are well suited for use in windbreaks.

Eastern redcedar can reach a height of 25 to 35 feet

[3]By JAMES W. CARR, JR., forester, Soil Conservation Service.

Figure 14.—This feedlot is protected by a 5-year old windbreak.

at maturity. Ponderosa pine, Austrian pine, and Scotch pine grow slightly faster and are somewhat taller at maturity. The same is generally true of broadleaf trees.

Rate of growth for trees in a windbreak varies widely with soil moisture and fertility. Exposure and arrangement of trees in the planting also has a marked effect upon growth. Some species grow faster than others; some make an early fast growth, but tend to die young. This is occasionally true of eastern cottonwood. Siberian elm and Russian-olive are vigorous early growers. They can, however, spread where they are not wanted and can be short lived. Boxelder and Russian mulberry commonly freeze back in severe winters, and green ash is susceptible to damage by borers.

Selecting trees to fit the soil.—A good windbreak needs to be designed to fit the soil in which it is to grow. The intended purpose of the planting needs to be considered. Specific information on design, establishment, and care of windbreaks is available from the Soil Conservation Service and Extension Service Forester.

The soils in Dawson County are grouped into windbreak suitability groups according to characteristics that affect tree growth. To find the name of all the soils in any one group, refer to the "Guide to Map Units" at the back of this survey. Soils in a group produce similar growth and survival under normal conditions of weather and care.

The soils of Nebraska are grouped into windbreak suitability groups according to a system that is used statewide. Not all groups are in Dawson County. A brief description of the windbreak suitability groups in the county is given in the following pages.

WINDBREAK SUITABILITY GROUP 1

This group consists of deep, nearly level and very gently sloping soils on stream terraces and bottom land. Nearly all of these soils are well drained, but a few are moderately well drained. The surface layer and subsoil is medium textured or moderately coarse textured. The soils on the bottom land are occasionally flooded. The available water capacity is high or moderate.

These soils generally provide good planting sites.

Suited species have a good chance for survival and growth. Competition from weeds and grasses for moisture is the main hazard. Cultivation with conventional equipment between rows and use of either hand hoes or chemical herbicides in tree rows can eliminate this hazard.

WINDBREAK SUITABILITY GROUP 2

This group consists of soils that range from shallow to deep over mixed sand and gravel. These soils are nearly level and very gently sloping on stream terraces, bottom land, and depressions. Most of the soils are somewhat poorly drained, but a few soils are poorly drained or moderately well drained. The surface layer ranges from coarse textured to moderately fine textured. The subsoil is coarse textured to fine textured, and the underlying material is coarse textured to moderately fine textured. Except for the soils in depressions, the seasonal water table ranges from a depth of 2 feet early in spring to a depth of about 8 feet late in summer. The soils in depressions are occasionally flooded. The available water capacity ranges from low to high.

These soils generally provide a good planting site. Trees have a good chance for survival and growth if the species selected tolerate occasional wetness. Using the species rated as good or fair for this group eliminates this hazard. The herbaceous vegetation that grows on this site is abundant and persistent. This is a concern in management because controlling weeds is more difficult.

WINDBREAK SUITABILITY GROUP 3

This group consists of deep, nearly level to strongly sloping soils on stream terraces and uplands. These soils are mainly well drained, but a few are moderately well drained or excessively drained. The surface layer is moderately coarse or coarse textured. The subsoil and underlying material are medium textured to moderately coarse textured. The moderately well drained soils have mixed sand and gravel at a depth between 40 and 60 inches. The available water capacity is low to high.

These soils are good for planting sites. Suited species have a fair chance for survival and a good chance for growth. Lack of moisture and soil blowing are the main hazards. Soil blowing can be controlled by maintaining strips of sod or other vegetation between tree rows. Cultivation generally needs to be restricted to tree rows.

WINDBREAK SUITABILITY GROUP 4

This group consists of deep, nearly level to moderately steep soils on uplands and stream terraces. These soils are mainly well drained, but a few are moderately well drained. The surface layer is medium textured. The well drained soils have a moderately coarse textured to moderately fine textured subsoil, and the moderately well drained soils have a fine textured and moderately fine textured subsoil. The underlying material ranges from coarse textured to medium textured. The available water capacity is moderate or high.

These soils generally provide good planting sites. Suited species have a good chance for survival and a fair chance for growth. Drought and competition for moisture from weeds and grasses are the main hazards. Drought can be minimized by using those species rated as good or fair for this group. Competition from weeds and grasses can be eliminated by using conventional cultivation equipment between tree rows, hand hoeing, or the use of suitable herbicides. Where the soils slope, trees should be planted on the contour. Tree growth may be somewhat slower on these steeper slopes because of the rapid runoff.

WINDBREAK SUITABILITY GROUP 5

Coly silt loam, 6 to 11 percent slopes, eroded, is the only soil in this group. This soil is well drained or somewhat excessively drained. The surface layer is calcareous. The surface layer and underlying material are medium textured. Runoff is rapid. The available water capacity is high.

This soil provides a fair to poor planting site. Suited species have a fair chance for survival and growth. Lack of adequate moisture is the main hazard and the calcareous surface layer is the main limitation. Trees planted on the contour allow normal cultivation between rows to store moisture and control weeds. The calcareous soil condition can be minimized by using those species rated as good or fair for this group.

WINDBREAK SUITABILITY GROUP 6

Lawet loam, ponded, 0 to 2 percent slopes, is the only soil in this group. This soil is poorly drained on bottom land. The water table is at a depth of 0 to 2 feet in spring. The surface layer and subsoil are medium textured. The available water capacity is moderate. Runoff is slow.

This soil generally provides a poor planting site. Suited species, however, have a fair chance of survival and growth. The main limitation is the high water table. This can be minimized by using only those species rated as good or fair for this group. The main hazard is establishing trees on this soil. Excessive wetness prohibits planting in some years. Also, normal ground preparation methods cannot be carried out in spring because of the high water table.

WINDBREAK SUITABILITY GROUP 7

This group consists of deep, gently sloping to moderately steep soils on stream terraces and uplands. These soils are excessively drained. The surface layer and underlying material are coarse textured. These soils have been eroded by wind in places. The available water capacity is low.

These soils provide a fair to poor planting site. Suited species have a fair chance for survival and growth. Soil blowing and the lack of adequate moisture are the main hazards. Because the soils are so loose, trees cannot be successfully cultivated without creating erosion. Where cultivated, young trees suffer during high

TABLE 3.—*Suitability of adapted dryland trees and shrubs*

[Dashed line indicates that measurements of height are not given for species that have a rating of poor.

Tree and shrub species	Windbreak suitability group					
	1		2		3	
	Suitability	*Feet*	*Suitability*	*Feet*	*Suitability*	*Feet*
Conifers:						
Austrian pine	Good	28	Fair	24	Good	26
Blue spruce	Good	22	Fair[1]	18	Poor	
Eastern redcedar	Good	22	Good	18	Good	20
Ponderosa pine	Good	28	Poor		Good	26
Scotch pine	Good	28	Fair	22	Fair	26
Deciduous trees:						
Boxelder	Good	22	Good	20	Fair	18
Bur oak	Good	24	Poor		Fair	18
Eastern cottonwood	Good	50	Fair	55	Good	50
Golden willow	Fair	28	Good	26	Poor	
Green ash	Good	26	Fair	24	Good	24
Hackberry	Good	24	Fair	20	Fair	20
Honeylocust	Good	28	Good	24	Good	26
Russian mulberry	Good	20	Good	22	Fair	18
Black walnut	Good	26	Poor		Poor	
White willow	Fair	28	Good	26	Poor	
Shrubs:						
American plum	Good	7	Fair	5	Good	6
Autumn olive	Good	10	Fair	8	Fair	8
Silver buffaloberry	Fair	6	Good	6	Poor	
Common chokecherry	Good	10	Good	8	Good	9
Peking cotoneaster	Good	6	Fair	4	Fair	5
Honeysuckle	Good	8	Fair	6	Fair	5
Lilac	Good	6	Fair	5	Good	6
Redosier dogwood	Good	6	Good	6	Poor	
Western sandcherry	Fair	4	Poor		Good	4
Skunkbush sumac	Good	8	Poor		Good	6

[1] Substitute Black Hills spruce in soils of this group.

winds and would be covered by drifting sand. This hazard can be minimized, however, by planting trees in a shallow furrow with no cultivation. Only conifers are suited to this method planting.

WINDBREAK SUITABILITY GROUP 8

This group consists of deep or moderately deep soils over mixed sand and gravel. These soils are nearly level or very gently sloping on stream terraces and bottom land. They range from poorly drained to moderately well drained. They are either slightly affected or moderately affected by excessive soluble salts or they are strongly alkaline. This saline and alkaline condition is toxic to many species of trees. The surface layer ranges from coarse textured to medium textured, the subsoil is coarse textured to fine textured, and the underlying material is coarse textured to moderately fine textured. The available water capacity is moderate or high.

These soils provide a poor planting site. Suited species have a fair to poor chance for survival and growth. The slight saline or alkaline condition is the main hazard, and it can be minimized by using only those species rated as good or fair for this group.

WINDBREAK SUITABILITY GROUP 10

This group consists of soils that have a wide range of characteristics. Slope ranges from nearly level to very steep. Drainage ranges from poor to excessive. Texture ranges from loamy to gravelly. All of the soils in this group have at least one characteristic that makes them unsuited to planting of trees or shrubs. They are either too steep, too gravelly, or are flooded too frequently.

The soils in this group are generally not suited to windbreaks. Some areas can be used for recreation, forest, and wildlife habitat. If hand planted or if special approved practices are used, tolerant trees and shrubs can be grown.

Use of the Soils for Wildlife Habitat and Recreation[4]

Wildlife populations in Dawson County are determined largely by the quality and quantity of vegetation that the land is capable of producing. Cover, food, and water, in proper combinations, are the three essential elements to wildlife abundance.

Topography plays a major role in determining wildlife numbers as does such soil characteristic as fertility. Fertile soils support more and better qualities of wildlife, both game and nongame species. The game species are mainly discussed here, although nongame species are becoming increasingly important. By improving living conditions for the game species, nongame species also benefit.

[4] By ROBERT O. KOERNER, biologist, Soil Conservation Service.

for windbreaks and estimated height attained in 20 years

Suitability ratings are not given for group 10 because soils of this group are generally not suited to windbreak plantings]

Windbreak suitability group—Cont.									
4		5		6		7		8	
Suitability	*Feet*	*Suitability*	*Feet*	*Suitability*	*Feet*	*Suitability*	*Feet*	*Suitability*	*Feet*
Good	24	Good	20	Poor		Good	18	Poor	
Fair	18	Poor		Poor		Poor		Poor	
Good	20	Good	16	Poor		Good	16	Fair	10
Good	24	Good	20	Poor		Good	20	Fair	14
Fair	24	Fair	18	Poor		Fair	18	Poor	
Poor		Poor		Poor		Poor		Poor	
Fair	20	Good	16	Poor		Poor		Poor	
Poor		Poor		Fair	45	Poor		Fair	40
Poor		Poor		Good	22	Poor		Fair	22
Fair	22	Poor		Poor		Poor		Fair	16
Fair	20	Poor		Poor		Poor		Poor	
Good	24	Fair	18	Poor		Poor		Fair	18
Fair	18	Poor		Poor		Poor		Poor	
Fair	20	Poor		Poor		Poor		Poor	
Poor		Poor		Good	22	Poor		Fair	22
Good	6	Poor		Poor		Poor		Poor	
Good	8	Poor		Poor		Poor		Poor	
Poor		Poor		Fair	5	Poor		Good	5
Good	8	Fair	5	Poor		Poor		Poor	
Good	5	Poor		Poor		Poor		Poor	
Good	6	Poor		Poor		Poor		Poor	
Good	6	Fair	5	Poor		Poor		Poor	
Poor		Poor		Fair	5	Poor		Poor	
Poor		Poor		Poor		Fair	4	Poor	
Good	6	Good	5	Poor		Poor		Poor	

Outdoor interpretation and an appreciation of the natural environment by persons other than hunters and fishermen, now has greater importance. This helps people to understand the relationship between plants, animals and man, and how they are dependent upon the soil.

Wildlife species can be used to evaluate the quality of the environment. It has been said that "a livable environment for wildlife is generally a quality environment for man."

In many cases, the soils rated as highest for wildlife potential do not have the highest wildlife populations. This is not caused by the inability of soils to produce habitat and food for wildlife, but by such factors as hunting pressure, clean tillage, and improved harvesting methods. The potential still remains, and wildlife values can be enhanced with little cost and effort.

Wildlife has a place in both rural and urban settings and needs to be considered when planning for optimum use of these areas. Fish ponds filled by runoff from fertile fields generally produce more pounds of fish than average because of the increased food production. Zooplankton are microscopic animals and phytoplankton are microscopic plants produced in fertile ponds. They provide food for larger aquatic animals, such as frogs, which in turn are used as food by fish.

Steep slopes and rough, irregular topography are hazards to livestock and are poorly suited to crop production. In these areas, the natural undisturbed landscape can become escape cover for wildlife and provide a source of food. In many instances where vegetation is lacking, it can be developed by planting flowering and fruit trees and shrubs. The section, "Use of the Soils for Windbreaks," and table 3 gives suited species.

Wetness, permeability, and the available water capacity are important characteristics to consider when selecting pond sites for wildlife and recreation.

The principal soil associations, as shown on the general soil map, are evaluated for wildlife habitat potential in Dawson County. In table 4 soil potential is rated for grain and seed crops, domestic grasses and legumes, wild herbaceous plants, hardwood trees and shrubs, coniferous plants, wetland food and cover, and shallow water areas.

Grain and seed crops consist of domestic grain or other seed producing annuals planted to produce wildlife food. Examples are corn, sorghum, wheat, oats, barley, millet, soybeans, and sunflowers.

Domestic grasses and legumes consist of domestic perennial grasses and herbaceous legumes that are planted for wildlife cover and food. Examples are intermediate and tall wheatgrass, bromegrass, orchardgrass, clover, alfalfa, trefoil, and crownvetch.

Wild herbaceous plants are native or naturally es-

TABLE 4.—*Potential of principal soils, by soil association, for wildlife habitat*

Soil associations and soil series	Potential for producing wildlife habitat							Potential as habitat for—			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood trees and shrubs	Coniferous plants	Wetland food and cover	Shallow water areas	Open land wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Holdrege-Hall:											
Holdrege	Good	Good	Good	Good	Fair	Very poor	Very poor	Good	Good	Very poor	Good.
Hall	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Uly-Coly:											
Uly	Fair	Good	Good	Good	Fair	Very poor	Very poor	Fair	Good	Very poor	Good.
Coly	Poor	Fair	Fair	Poor	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair.
Coly-Uly-Hobbs:											
Coly	Poor	Fair	Fair	Poor	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair.
Uly	Fair	Good	Good	Good	Fair	Very poor	Very poor	Fair	Good	Very poor	Good.
Hobbs	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Fair.
Valentine-Anselmo-Elsmere:											
Valentine	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
Anselmo	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Fair	Very poor	Good.
Elsmere	Fair	Fair	Fair	Fair[1]	Fair	Good	Good	Fair	Fair	Good	Fair.
Cozad-Hord:											
Cozad	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Hord	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Wood River-Rusco-Cozad:											
Wood River	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Fair.
Rusco	Good	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Very poor	Good.
Cozad	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Gosper-Cozad-Silver Creek:											
Gosper	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good.
Cozad	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Silver Creek	Fair	Good	Good	Fair[1]	Fair	Fair	Fair	Fair	Fair	Fair	Good.
Lex-Lawet-Gibbon:											
Lex	Fair	Fair	Good	Fair[1]	Fair	Fair	Fair	Fair	Fair	Fair	Good.
Lawet	Fair	Fair	Fair	Fair[1]	Fair	Good	Good	Fair	Fair	Good	Fair.
Gibbon	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Gothenburg-Platte:											
Gothenburg	Very poor	Very poor	Poor	Poor[1]	Poor	Good	Good	Very poor	Fair	Good	Poor.
Platte	Poor	Poor	Fair	Fair[1]	Fair	Good	Good	Poor	Fair	Good	Fair.

[1]Good for eastern cottonwood and willows.

tablished dryland herbaceous grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiangrass, goldenrod, switchgrass, pokeweed, wheatgrass, fescue, and grama.

Hardwood trees and shrubs include nonconiferous trees and associated woody understory plants that provide wildlife cover or that produce nuts, buds, catkins, twigs, bark, or foliage used as food by wildlife. Shrubby plants produce buds, twigs, bark, or foliage used as food by wildlife or provide cover and shade for some wildlife species. Examples are snowberry, honeysuckle, ash, oak and Russian-olive.

Coniferous plants include cone bearing trees, shrubs, or ground cover that furnish wildlife cover or supply food in the form of browse, seeds, or fruitlike cones. Commonly established through natural processes, they can be planted or transplanted. Examples are pine, spruce, fir, cedar, and juniper.

Wetland food and cover consists of annual and perennial wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover used extensively by wetland wildlife. Examples are smartweed, wild millet, rushes, sedges, reeds, prairie cordgrass, and cattail.

Shallow water areas are areas of surface water with average depth of less than 5 feet that are useful to wildlife. They are natural wet areas or those created by dams or levees or by water control devices in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, and wildlife ponds.

Ratings for kinds of wildlife habitat

Soils are rated according to their suitability for producing various kinds of wildlife habitat: open land, woodland, wetland, and rangeland. They are directly related to the four broad classes of wildlife.

Open land wildlife are birds and mammals in cropland, pastures, meadows, lawns, and areas overgrown with grasses, herbs, shrubs, and vines. Examples are pheasant, meadowlark, killdeer, cottontail rabbit, and badger.

Woodland wildlife are birds and mammals in wooded areas that contain either hardwood or coniferous trees and shrubs or a mixture of both. Examples are prairie grouse, thrushes, vireos, woodpecker, squirrel, opossum, raccoon, white-tailed deer, and mule deer.

Wetland wildlife are birds and mammals in swampy, marshy, or open water areas. Examples are ducks, geese, herons, shore birds, rails, kingfishers and muskrat.

Rangeland wildlife are birds and mammals in natural rangelands. Examples are antelope, white-tailed deer, mule deer, prairie groups, lark bunting, and prairie dog.

Soil associations are rated for both rangeland and woodland wildlife habitat potential. Many kinds of wildlife frequent both habitat types in Dawson County.

The levels of suitability are expressed by the ratings good, fair, poor, and very poor. *Good* indicates habitats are easily improved, maintained, or created. There are few or no soil limitations in management and satisfactory results can be expected. *Fair* indicates habitats can be improved, maintained, or created, but moderate soil limitations affect habitat management or development. A moderate intensity of management and fairly frequent attention is required to ensure satisfactory results. *Poor* indicates habitats can be improved, maintained, or created, but the soil limitations are severe. Habitat management can be difficult and expensive and require intensive effort. Results are questionable. *Very poor* indicates that under the prevailing conditions, it is impractical to attempt to improve, maintain, or create habitats. Unsatisfacory results are probable.

Kinds of wildlife habitat by soil association

The Holdrege-Hall association has long, smooth slopes of 0 to 6 percent. The association is mainly cultivated cropland. Milo, corn, wheat, and alfalfa are the main crops. This association supports open land wildlife, mainly pheasant and bobwhite quail. Some waterfowl are produced at the Johnson Canyon Reservoir and in the natural wetlands. Travel lanes for wildlife, as well as nesting cover, are present in the vegetated banks of irrigation canals.

The Uly-Coly association supports open land wildlife, such as pheasant and other small game. Coyotes and fox are also common. Deer frequent the windbreaks and shelterbelts, as well as drainageways that have a woody or herbaceous cover.

The Coly-Uly-Hobbs association has rough, broken land and provides excellent habitat for deer. In the drainageways, redcedar, native plum, and buckrush are common. Areas for fishing, boating and camping are available. Many species of birds, such as hawks, owls, doves, and meadowlarks, nest in the trees or grassland.

The Valentine-Anselmo-Elsmere association has a high hazard of soil blowing. As a result, the use of cover crops is desirable. Field windbreaks help to control erosion and also serve as cover and travel coves for wildlife. Some scattered potholes provide areas for migration and production of waterfowl. The water table is near the surface in these low areas, and trees, such as eastern cottonwood, take advantage of this natural condition. These areas also provide good cover for wildlife.

The Cozad-Hord association is largely in cultivated crops and much of the land is irrigated. This association is an ideal combination for many kinds of wildlife because it is near channels of the Platte River and has a readily available supply of food. Corn, grain sorghum, and alfalfa are the main crops. Where mowing of the first cutting of alfalfa is delayed until July, more pheasants are produced.

The Wood River-Rusco-Cozad association is on stream terraces and provides food for a large number of wildlife species. Excellent tree cover is available along channels of the Platte River tributaries.

The Gosper-Cozad-Silver Creek association is on low stream terraces where the water table is at a depth of about 4 to 10 feet. These areas are nearly level. Irrigated corn and alfalfa provide food for both per-

manent wildlife as well as migrating species, such as sandhill cranes, ducks, geese, and swans. Channels of creeks commonly intersect this association provide travel lanes for wildlife that move to and from the Platte River.

The Lex-Lawet-Gibbon association occurs near channels of the Platte River and provides an important staging area for migrating sandhill cranes. Each spring, approximately 140,000 migrating cranes roost between Lexington and Grand Island, along this river. Wet meadows along the Platte River are also excellent habitat for shore birds and migrating waterfowl.

The Gothenburg-Platte association includes channels of the Platte River and adjacent bottom land. The diversity of cover vegetation along with water and food on the adjoining croplands make this association suited to practically all species of wildlife in Nebraska, as well as the migratory species. Many opportunities exist for improving wildlife habitat in this association.

Technical assistance is available for designing and installing measures to improve wildlife habitat as well as recreation facilities in Dawson County. The Soil Conservation Service has a field office in Lexington and can provide this assistance or can direct inquires to an appropriate Federal or state agency.

Engineering Uses of the Soils

This section is useful to those who need information about soils used as structural material or as foundations upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage condition, shrink-swell potential, grain size, plasticity, and recreation. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6 and 7, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, is not intended for use in design, and does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths more than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit can contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The "Glossary" defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*2*), used by the SCS engineers, Department of Defense, and others, and the AASHTO system (*1*), adopted by the American Association of State Highway and Transportation Officials.

The Unified system is used to classify soils according to engineering uses for building material or for the support of structures other than highways. Soils are classified according to particle size distribution, plasticity index, liquid limit, and organic matter content. Soils are grouped into 15 classes. There are eight classes of coarse grained soils that are subdivided on the basis of gravel, sand, and fine content, and the plasticity of the fines. These are identified as GW, GP, GM, GC, SW, SP, SM, and SC. Six classes of fine grained soils are subdivided on the basis of the liquid limit, plasticity index, and organic matter content. Nonplastic classes are ML, MH, OL, and OH; plastic classes are CL and CH. There is one class of highly organic soils, Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example CL-ML.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown,

the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is given in table 5 for all of the soils mapped in the survey area.

USDA texture is determined by the relative proportion of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the "Glossary." Stones, cobbles, and gravel are used as textural modifiers where present in the soil.

Soil properties significant to engineering

Several estimated soil properties significant to engineering are given in table 5. These estimates are made by layers of representative soil profiles having significantly different soil properties. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in most years.

Soil *texture* is described in table 5 in the standard terms used by the Department of Agriculture. These terms are based on the percentages of sand, silt, and clay in the less than 2 millimeter fraction of the soil. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand," "sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the "Glossary" of this survey.

Liquid limit and *plasticity index* are water contents obtained by specified operations. As the water content of a clayey soil, in which particles coarser than 0.42 millimeter have been removed, it is increased from a dry state, the material changes from a semisolid to a plastic. If the moisture content is further increased, the material changes from a plastic to a liquid. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic; and the liquid limit, from a plastic to a liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of water content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 5, but in table 7 the data are based on tests of soil samples.

Permeability, as used here, is an estimate of the rate at which saturated soil transmits water in a vertical direction under a unit head of pressure. It is estimated on the basis of those soil characteristics observed in the field, particularly structure, porosity, and texture. Lateral seepage or such transient soil features as plowpans and surface crusts are not considered.

Available water capacity is an estimate of the capacity of soils to hold water for use by most plants. It is defined here as the difference between the amount of water in the soil at field capacity and the amount at wilting point of most plants.

Reaction refers to the acidity or alkalinity of a soil, expressed in pH values for a stated soil solution mixture. The pH value and terms used to describe soil reaction are explained in the "Glossary."

Shrink-swell potential refers to the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. The extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils can damage building foundations, roads, and other structures. Soils that have a *high* shrink-swell potential are the most hazardous. Shrink-swell is not indicated for organic soils or certain soils which shrink markedly on drying but do not swell when rewetted.

Engineering interpretations of soils

The estimated interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Dawson County. In table 6, ratings are used to summarize the limitations or suitability of the soils for all listed purposes other than for drainage of cropland and pasture, irrigation, ponds and reservoirs, embankments, and terraces and diversions. For these particular uses, table 6 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings *slight, moderate,* and *severe. Slight* means soil properties are generally favorable for the rated use, or in other words, limitations that are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance are required.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately as the terms *slight, moderate,* and *severe.*

Following are explanations of some of the columns in table 6.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the

TABLE 5.—*Estimated engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other series that appear in the first column

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification	
				Unified[1]	AASHTO[1]
	Feet	*Inches*			
Alda: Ad	2–3	0–7	Loam	CL or ML	A–4
		7–20	Fine sandy loam and loamy fine sand	SM	A–2
		20–25	Loam	CL or ML	A–4
		25–60	Sand and gravelly sand	SP or SP–SM	A–3 or A–1
Anselmo:					
An, AnB, AnC, AnD	>10	0–27	Fine sandy loam	SM	A–4 or A–2
		27–60	Loamy fine sand and very fine sandy loam.	SM	A–2
Ap	>10	0–12	Loam	ML or CL–ML	A–4
		12–35	Fine sandy loam	SM	A–4 or A–2
		35–60	Loamy fine sand	SM	A–2
*Coly: CoD2, CoE2, CpG. For Hobbs part of CpG, see Hobbs series.	>10	0–60	Silt loam	ML	A–4
*Cozad:					
Cr	8–10	0–10	Fine sandy loam	SM	A–4 or A–2
		10–60	Silt loam	ML	A–4
Cs, CsB, CsC, CsD2, [3]Cv, [3]CvB, CyF. For Hobbs part of CyF, see Hobbs series.	>10	0–15	Silt loam	ML or CL	A–4 or A–6
		15–60	Silt loam	ML or CL	A–4 or A–6
Ct	4–6	0–7	Silt loam	ML or CL	A–4 or A–6
		7–20	Silt loam	ML or CL	A–6 or A–4
		20–60	Silt loam	CL or CL–ML	A–4 or A–6
Cx	8–10	0–11	Silty clay loam	CL	A–6 or A–7
		11–16	Silt loam	ML or CL	A–6 or A–4
		16–60	Silt loam	ML	A–4
Elsmere:					
Em	2–3	0–36	Loamy fine sand	SM	A–2
		36–60	Loam, fine sandy loam, and loamy fine sand.	ML or SM	A–4 or A–2
Es	3–4	0–36	Loamy fine sand	SM	A–2
		36–60	Loam, fine sandy loam, and loamy fine sand.	ML or SM	A–4 or A–2
Fillmore: Fm, Fo	>10	0–6	Silt loam	ML	A–4
		6–23	Silty clay	CH	A–7
		23–35	Silty clay loam	CL or CH	A–7 or A–6
		35–60	Silt loam	ML or CL	A–4 or A–6
Gibbon: Gb	2–3	0–13	Loam	CL or ML	A–4
		13–37	Clay loam	CL	A–6
		37–49	Loam	CL or ML	A–4
		49–60	Coarse sand	SP or SM	A–2 or A–3
Gosper:					
Gn, Go	4–5	0–19	Loam and fine sandy loam	CL, ML, or SM	A–4 or A–6
		19–31	Sandy clay loam	CL, SC, or SM–SC	A–6 or A–4
		31–53	Sandy loam and loamy sand	SM	A–4 or A–2
		53–60	Coarse sand	SP or SM	A–2 or A–3
Gt	4–5	0–19	Loam	CL or ML	A–4
		19–31	Sandy clay loam	CL, SC, or SM–SC	A–6
		31–53	Sandy loam and loamy sand	SM	A–4 or A–2
		53–60	Coarse sand	SP or SM	A–2 or A–3
Gothenburg: Gu	0.5–2.0	0–3	Loam	ML	A–4
		3–60	Fine sand and mixed sand and gravel	SP	A–2 or A–1

properties of the soils

The soils in such mapping units may have different properties and limitations, and for this reason, it is necessary to follow care-
of this table. The symbol > means more than; the symbol < means less than]

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
				Percent		*In/hr*	*In/in of soil*	*pH*	
100	95–100	85–95	60–75	15–30	3–10	0.6–2.0	0.20–0.22	7.4–7.8	Low.
100	95–100	75–85	10–35	[2]NP	NP	2.0–6.0	0.08–0.10	7.4–7.8	Low.
100	95–100	85–95	60–75	15–30	3–10	0.6–2.0	0.17–0.19	7.4–7.8	Low.
50–90	55–75	35–50	0–7	NP	NP	>20	0.02–0.04	6.6–7.8	None.
	100	90–100	20–50	<20	NP	2.0–6.0	0.15–0.18	6.1–7.3	Low.
	100	90–100	15–35	NP	NP	2.0–6.0	0.08–0.10	6.6–7.3	Low.
	100	90–100	60–75	15–30	2–7	0.6–2.0	0.20–0.22	6.1–6.5	Low.
	100	90–100	20–50	<20	NP	2.0–6.0	0.15–0.17	6.6–7.3	Low.
	100	90–100	15–35	NP	NP	6.0–20	0.08–0.10	6.6–7.3	Low.
		100	95–100	30–40	4–10	0.6–2.0	0.20–0.24	7.4–7.8	Low.
	100	90–100	20–50	<20	NP	2.0–6.0	0.16–0.18	6.1–6.5	Low.
		100	90–100	25–35	2–10	0.6–2.0	0.20–0.22	6.6–7.3	Low.
		100	95–100	30–40	5–15	0.6–2.0	0.22–0.24	6.6–7.3	Low.
		100	85–100	25–35	2–15	0.6–2.0	0.20–0.22	7.4–7.8	Low.
		100	90–100	30–40	5–15	0.6–2.0	0.15–0.18	7.8–9.0	Low.
		100	95–100	30–40	5–20	0.2–0.6	0.12–0.15	7.8–9.0	Moderate.
		100	90–100	25–35	5–15	0.6–2.0	0.12–0.15	7.8–9.0	Low.
		100	95–100	35–50	20–30	0.2–0.6	0.21–0.23	6.6–7.3	Moderate.
		100	90–100	30–40	2–15	0.6–2.0	0.20–0.22	6.6–7.3	Low.
		100	85–95	25–35	2–10	0.6–2.0	0.20–0.22	7.4–7.8	Low.
	100	85–95	15–30	NP	NP	6.0–20	0.08–0.12	5.6–7.8	Low.
100	95–100	70–95	25–75	20–35	2–10	0.6–6.0	0.08–0.19	7.4–8.4	Low.
	100	85–95	15–30	NP	NP	2.0–6.0	0.06–0.10	7.4–9.5	Low.
100	95–100	70–95	25–75	20–35	2–10	2.0–6.0	0.06–0.15	7.4–9.0	Low.
		100	95–100	20–35	2–11	0.6–2.0	0.22–0.24	5.6–6.0	Moderate.
		100	95–100	50–75	30–45	<0.06	0.10–0.14	6.1–7.3	High.
		100	95–100	35–60	20–40	0.2–0.6	0.18–0.20	6.6–7.3	High.
		100	95–100	25–40	7–15	0.6–2.0	0.20–0.22	6.6–7.3	Low.
100	95–100	85–100	70–90	15–30	2–10	0.6–2.0	0.20–0.22	7.4–7.8	Low.
100	95–100	90–100	80–95	30–40	15–25	0.2–0.6	0.15–0.17	7.4–7.8	Moderate.
100	95–100	85–100	70–90	15–30	2–10	0.6–2.0	0.17–0.19	7.4–7.8	Low.
95–100	70–95	51–90	2–15	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
100	95–100	85–100	45–90	<35	<15	0.6–6.0	0.20–0.22	6.6–7.8	Low.
95–100	95–100	80–90	40–75	20–35	5–15	0.6–2.0	0.16–0.18	7.4–7.8	Moderate.
100	95–100	50–85	15–50	<20	<10	2.0–20	0.08–0.13	7.9–8.4	Low.
100	95–100	51–90	2–15	NP	NP	>20	0.02–0.04	7.4–7.8	None.
100	95–100	85–100	60–90	20–30	3–10	0.6–2.0	0.15–0.18	6.6–7.8	Low.
100	95–100	80–90	40–75	20–35	5–15	0.2–0.6	0.12–0.15	7.4–9.0	Moderate.
100	95–100	50–85	15–40	<20	<10	2.0–20	0.08–0.13	7.9–8.4	Low.
100	95–100	51–90	2–15	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
98–100	95–100	90–100	60–90	20–34	4–10	0.6–2.0	0.20–0.22	7.9–8.4	Low.
80–100	65–100	40–80	0–5	NP	NP	6.0–>20	0.02–0.05	7.4–7.8	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification	
				Unified[1]	AASHTO[1]
	Feet	*Inches*			
Hall: Ha, HaB, Hb, [3]Hc	>10	0–12	Silt loam	ML or CL	A–4 or A–6
		12–24	Silty clay loam	CL	A–6 or A–7
		24–60	Silt loam	CL	A–4 or A–6
Hobbs: Hd	>10	0–60	Silt loam	CL or CL–ML	A–6 or A–4
Holdrege: Ho, HoB, HoC, HoC2	>10	0–11	Silt loam	CL or CL–ML	A–4 or A–6
		11–22	Silty clay loam	CL	A–6 or A–7
		22–60	Silt loam	CL or CL–ML	A–6 or A–4
Hord:					
HpB	>10	0–23	Fine sandy loam	SM, SM–SC, or ML	A–4
		23–60	Loam	ML or CL–ML	A–4
Hr, HrB, HrC, [3]Hs	>10	0–18	Silt loam	ML	A–4
		18–60	Silt loam	ML	A–4
Ht, [3]Hx	8–10	0–9	Silty clay loam	CL	A–6 or A–7
		9–30	Silt loam	ML or CL	A–4 or A–6
		30–60	Silt loam	ML or CL	A–4
Lawet:					
La, [4]Lb	0–2	0–19	Silt loam	CL	A–6
		19–43	Loam	CL	A–6
		43–60	Sand and gravel	SP, SM or SP–SM	A–2 or A–3
Ld	0–2	0–19	Silt loam	CL	A–6
		19–43	Loam	CL	A–6
		43–60	Sand and gravel	SP or SP–SM	A–2 or A–3
Lex:					
Le	2–3	0–22	Loam	CL	A–6
		22–29	Silt loam and very fine sandy loam	CL	A–6
		29–60	Gravelly sand	SP, SM, or SP–SM	A–2, A–3, or A–1
Lf	2–3	0–22	Loam	CL	A–6
		22–29	Silt loam and very fine sandy loam	CL	A–6
		29–60	Gravelly sand	SP or SP–SM	A–2 or A–3
Ovina: OvB	3–4	0–39	Fine sandy loam	SM or ML	A–4
		39–60	Loamy fine sand	SM	A–2
Platte: Pt	2–3	0–7	Loam	CL or CL–ML	A–4 or A–6
		7–13	Very fine sandy loam	ML or SM	A–4
		13–60	Sand and gravelly sand	SP	A–2
Rusco: Ru	6–8	0–11	Silt loam	ML	A–4
		11–22	Silty clay loam	CL	A–6 or A–7
		22–60	Silt loam and loam	CL	A–6 or A–4
Silver Creek:					
Sc	4–5	0–8	Silt loam	CL or ML	A–6 or A–4
		8–33	Heavy silty clay loam	CH or CL	A–7
		33–43	Loam	CL or CL–ML	A–4 or A–6
		43–60	Sand and gravelly sand	SP–SM or SP	A–1 or A–3
Sf	2–4	0–8	Silty clay loam	CL or CH	A–7
		8–24	Heavy silty clay loam	CH or CL	A–7
		24–60	Silt loam	CL or ML	A–6 or A–4
Sh	4–5	0–8	Silty clay loam	CL or CH	A–7
		8–24	Heavy silty clay loam	CH or CL	A–7
		24–60	Silt loam	CL or ML	A–6 or A–4

properties of the soils—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
				Percent		*In/hr*	*In/in of soil*	*pH*	
		100	95–100	30–40	4–15	0.6–2.0	0.22–0.24	6.1–6.5	Moderate.
		100	95–100	35–50	20–30	0.2–0.6	0.18–0.20	6.6–7.3	Moderate.
		100	90–95	25–40	8–20	0.6–2.0	0.20–0.22	6.6–7.8	Moderate.
		100	90–100	25–40	7–15	0.6–2.0	0.20–0.24	6.6–7.3	Moderate.
		100	95–100	25–40	5–15	0.6–2.0	0.22–0.24	5.6–6.0	Moderate.
		100	95–100	30–45	15–30	0.6–2.0	0.18–0.20	6.1–6.5	Moderate.
		100	95–100	25–40	5–20	0.6–2.0	0.20–0.22	6.6–7.8	Moderate.
	100	95–100	40–60	<25	<7	2.0–6.0	0.16–0.18	6.6–7.3	Low.
	100	90–100	50–75	15–30	2–10	0.6–2.0	0.17–0.19	6.6–7.8	Low.
		100	90–100	25–35	2–10	0.6–2.0	0.22–0.24	6.1–6.5	Low.
		100	90–100	25–35	2–10	0.6–2.0	0.20–0.22	6.6–7.8	Low.
		100	95–100	35–50	20–35	0.2–0.6	0.21–0.23	6.6–7.3	Moderate.
		100	90–100	20–35	4–15	0.6–2.0	0.20–0.22	6.6–7.8	Moderate.
		100	85–100	20–35	4–10	0.6–2.0	0.20–0.22	7.4–8.4	Low.
		100	85–95	20–35	11–25	0.6–2.0	0.22–0.24	7.4–7.8	Moderate.
	100	90–100	70–95	20–40	11–25	0.2–0.6	0.17–0.19	6.6–7.8	Moderate.
95–100	70–95	40–65	0–12	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
		100	85–95	20–35	11–25	0.06–0.2	0.16–0.22	7.9–9.0	Moderate.
	100	90–100	70–95	20–40	11–30	0.2–0.6	0.13–0.17	7.3–9.0	Moderate.
95–100	70–95	45–65	0–12	NP	NP	<20	0.02–0.04	7.4–7.8	Low.
	100	90–100	75–95	20–35	11–25	0.6–2.0	0.20–0.24	7.4–7.8	Moderate.
100	95–100	85–100	60–85	20–35	11–25	0.2–0.6	0.17–0.19	7.4–7.8	Moderate.
95–100	80–100	40–55	2–7	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
	100	90–100	75–95	20–35	11–25	0.2–0.6	0.16–0.22	7.9–9.0	Moderate.
100	95–100	85–100	60–85	20–35	15–25	0.2–0.6	0.13–0.19	7.4–8.4	Moderate.
95–100	80–100	40–55	2–7	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
	100	75–100	35–60	NP	NP	2.0–6.0	0.15–0.18	6.1–7.3	Low.
	100	80–100	15–30	NP	NP	6.0–20	0.08–0.10	7.4–7.8	Low.
100	98–100	95–100	65–95	20–35	7–15	0.6–2.0	0.20–0.22	7.4–7.8	Low.
100	98–100	95–100	45–90	20–30	>7	2.0–6.0	0.17–0.19	6.6–7.3	Low.
100	65–75	40–50	0–5	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
	100	95–100	90–95	30–40	4–10	0.6–2.0	0.22–0.24	6.6–7.8	Moderate.
	100	95–100	95–100	30–45	15–30	0.2–0.6	0.18–0.20	6.6–7.8	Moderate.
	100	90–100	80–100	20–35	8–15	0.6–2.0	0.17–0.22	7.4–8.4	Moderate.
	100	95–100	90–100	25–40	7–15	0.6–2.0	0.22–0.24	7.4–7.8	Moderate.
	100	90–100	95–100	45–60	30–40	0.06–0.2	0.18–0.20	7.4–8.4	High.
	100	85–95	75–95	20–35	4–15	0.6–2.0	0.17–0.19	8.5–9.0	Moderate.
100	60–95	40–65	2–12	NP	NP	>20	0.02–0.04	7.4–8.4	Low.
		100	90–100	40–60	20–35	0.2–0.6	0.21–0.23	7.4–8.4	High.
		90–100	95–100	45–60	30–40	0.06–0.2	0.18–0.20	7.4–8.4	High.
	100	95–100	90–100	25–40	7–20	0.6–2.0	0.20–0.22	7.4–8.4	Moderate.
		100	90–100	40–60	20–35	0.2–0.6	0.14–0.17	7.9–8.4	High.
		90–100	95–100	45–60	30–40	0.06–0.2	0.12–0.15	8.5–9.0	High.
	100	95–100	90–100	25–40	7–20	0.6–2.0	0.12–0.15	7.4–8.4	Moderate.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification	
				Unified[1]	AASHTO[1]
	Feet	*Inches*			
*Uly: UbE, UcF, UhD, UmD2	>10	0–8	Silt loam	ML or CL	A–6, A–7, or A–4
For Coly part of UcF and UmD2, see Coly series. For Holdrege part of UhD and UmD2, see Holdrege series.		8–15	Silt loam	ML or CL	A–6, A–7, or A–4
		15–60	Silt loam	CL or ML	A–4 or A–6
Valentine: VaB, VaC, VaE	>10	0–5	Loamy fine sand	SM	A–2
		5–60	Fine sand	SM or SP–SM	A–2 or A–3
Wann:					
Wa	2–3	0–14	Fine sandy loam	SM	A–2 or A–4
		14–54	Fine sandy loam and loam	SM	A–2 or A–4
		54–60	Sand	SP–SM or SP	A–1, A–2, or A–3
Wb	2–3	0–17	Loam	CL or CL–ML	A–4
		17–58	Fine sandy loam and loam	SM	A–2 or A–4
		58–60	Sand	SP–SM or SP	A–1, A–2, or A–3
Wood River:					
Wo	7–9	0–12	Silt loam	ML	A–4
		12–22	Silty clay	CH or CL	A–7
		22–31	Silty clay loam	CL or CH	A–7 or A–6
		31–60	Silt loam	CL	A–6 or A–4
Wr	7–9	0–8	Silt loam	ML	A–4
		8–16	Silty clay loam	CL or CH	A–7
		16–22	Heavy silty clay loam	CL	A–6 or A–7
		22–60	Silt loam	CL	A–6 or A–4

[1] If two or more classifications are shown, the classification listed first is considered to be the most common.
[2] NP means nonplastic.

system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage while bacteria decompose the solid and liquid wastes. Lagoons have a nearly level flow area surrounded by cut slopes or embankments of compacted, nearly impervious soil material. They generally are designed so that depth of sewage is 2 to 6 feet. Impervious soil at least 4 feet thick for the lagoon floor and sides is required to minimize seepage and contamination of local ground water. Soils that are very high in organic matter and those that have stones and boulders are undesirable. Unless permeability is very slow, contamination of local ground water is a hazard in areas where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce its capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Dwellings, as rated in table 6, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Sanitary landfill is a method of disposing of solid waste, either in excavated trenches or on the surface of

properties of the soils—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
				Percent		*In/hr*	*In/in of soil*	*pH*	
		100	95–100	30–50	7–20	0.6–2.0	0.22–0.24	6.1–6.5	Moderate.
		100	95–100	30–50	7–20	0.6–2.0	0.20–0.22	6.1–6.5	Moderate.
		100	95–100	25–35	7–15	0.6–2.0	0.20–0.22	7.4–7.8	Moderate.
	100	95–100	13–25	NP	NP	6.0–20	0.10–0.12	5.6–6.0	Low.
	100	90–100	5–20	NP	NP	6.0–20	0.05–0.07	5.6–6.5	Low.
98–100	95–100	80–95	30–45	20–35	2–10	2.0–6.0	0.14–0.16	7.8–8.4	Low.
98–100	95–100	70–95	30–45	30–40	2–7	0.6–2.0	0.10–0.14	8.5–9.0	Low.
95–100	70–95	45–65	2–12	NP	NP	6.0–20	0.02–0.04	7.4–7.8	Low.
98–100	95–100	85–95	55–75	20–30	5–10	0.6–2.0	0.20–0.22	7.4–7.8	Low.
98–100	95–100	70–95	30–45	<30	<7	2.0–6.0	0.14–0.16	7.4–8.4	Low.
95–100	70–95	45–65	2–12	NP	NP	>20	0.02–0.04	7.4–7.8	Low.
		100	95–100	25–40	3–10	0.6–2.0	0.22–0.24	6.6–7.3	Moderate.
		100	95–100	40–60	20–40	0.06–0.2	0.11–0.14	7.4–7.9	High.
		100	95–100	35–55	15–35	0.2–0.6	0.18–0.20	7.9–8.4	Moderate.
		100	90–100	20–40	8–25	0.6–2.0	0.20–0.22	7.4–7.8	Moderate.
		100	95–100	25–40	3–10	0.6–2.0	0.15–0.18	6.6–7.3	Moderate.
		100	95–100	40–55	20–35	0.06–0.2	0.10–0.13	7.9–8.4	High.
		100	95–100	30–50	15–35	0.2–0.6	0.12–0.15	7.9–8.4	Moderate.
		100	90–100	20–40	8–25	0.6–2.0	0.12–0.15	7.9–8.4	Moderate.

[3] Water table at a depth of 3 to 4 feet.
[4] Water table at a depth of 1 foot to 3 feet in some units.

the soil. The waste is spread, compacted in layers, and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this purpose. The best soils have a loamy or silty texture, have moderate or slow permeability, are deep to bedrock and a seasonal water table, are free of large stones and boulders, and are not subject to flooding. In areas where the seasonal water table is high, water seeps into the trenches and causes problems in excavating and filling the trenches. Also, seepage into the refuse increases the risk of pollution of ground water. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability that might allow noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 6 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the area type of *sanitary landfill,* refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, can be a limitation because of difficulty in operating equipment.

Local roads and streets, as rated in table 6, have an all weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load supporting capacity and stability of the subgrade and workability and quantity of cut and fill material available. The AASHTO and Unified classifications of soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Road fill is soil material used in embankments for

TABLE 6.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other series

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with or without basements	Sanitary landfill[1]	Local roads and streets	Road fill
Alda: Ad	Severe: seasonal high water table at a depth of 2 to 3 feet.[2]	Severe: seasonal high water table at a depth of 2 to 3 feet; moderately rapid permeability; subject to rare flooding.	Severe: seasonal high water table at a depth of 2 to 3 feet; mixed sand and gravel below a depth of 2 feet; cutbanks cave.	Severe: subject to rare flooding; seasonal high water table at a depth of 2 to 3 feet; subject to frost action.	Trench type—Severe: moderately rapid permeability; seasonal high water table at a depth of 2 to 3 feet. Area type—Severe: moderately rapid permeability; seasonal high water table at a depth of 2 to 3 feet.	Severe: high susceptibility to frost action.	Poor to a depth of 2.5 feet: roadfill obtained by hydraulic mining; subject to frost action and water erosion. Excellent below a depth of 2.5 feet.
Anselmo: An, AnB, AnC, AnD, Ap.	Slight where slopes are less than 8 percent; moderate where more than 8 percent.[2]	Severe: moderately rapid permeability; slope is more than 7 percent in some areas of AnD.	Slight where slopes are less than 8 percent; moderate where more than 8 percent; cutbanks may cave.	Moderate: subject to frost action; slope is more than 7 percent in AnD.	Trench type—Severe: moderately rapid permeability. Area type—Severe: moderately rapid permeability.	Moderate: subject to frost action and erosion; slope is more than 8 percent in AnD.	Fair: subject to frost action; needs close compaction control; erodible where soil slopes.
*Coly: CoD2, CoE2, CpG. For Hobbs part of CpG, see Hobbs series.	Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate: moderate permeability; severe where slopes are more than 7 percent.	Slight where slopes are less than 8 percent; moderate where slopes are 8 to 15 percent; severe where more than 15 percent; vertical cuts in dry soil are common; may cave when saturated.	Moderate where slopes are less than 15 percent; severe where more than 15 percent; subject to frost action.	Trench type—Slight where slopes are less than 15 percent; moderate where 15 to 25 percent; severe where more than 25 percent. Area type—Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate where slopes are less than 15 percent; low strength; subject to frost action; severe where slopes are more than 15 percent.	Fair: subject to frost action; needs composition control; poor where slopes are more than 25 percent.
*Cozad: Cr, Cs, CsB, CsC, CsD2, CyF, Cx. For Hobbs part of CyF. see Hobbs series.	Slight where slopes are 0 to 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate: moderate permeability where slopes are 2 to 7 percent; severe where slopes are more than 7 percent.	Slight where slopes are 0 to 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate: where slopes are 0 to 15 percent; low strength; severe where slopes are more than 15 percent.	Trench type—Slight where slopes are 0 to 15 percent; moderate where 15 to 25 percent; severe where more than 25 percent. Area type—Slight where slopes are 0 to 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate where slopes are 0 to 15 percent; low strength; severe where more than 15 percent.	Fair: subject to frost action; needs close compaction control; erodible by water on cut and fill slopes; poor where slopes are more than 25 percent.
Ct	Severe: moderately slow permeability.	Slight	Moderate: moderately well drained.	Moderate: frost action potential.	Trench type—Moderate: moderately well drained. Area type—Slight.	Moderate: subject to frost action.	Fair: moderate shrink-swell potential; subject to frost action.

engineering properties of the soils

The soils in such mapping units may have different properties and limitations, and for this reason, it is necessary to follow care-that appear in the first column of this table]

Suitability as source of—Cont.			Soil features affecting—				
Sand	Topsoil	Cover material for landfill	Pond reservoir areas	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Fair below a depth of about 2.5 feet: water table near top of sand; excess fines.	Good above a depth of 1 foot, poor below: too sandy; difficult to reclaim borrow area.	Fair in upper 2 feet, poor, below: area difficult to reclaim.	Very rapid permeability below a depth of 2.5 feet; seasonal high water table at a depth of 2 to 3 feet; sand and gravel below a depth of 2 feet; sites suitable for dugout ponds in places.	Good compaction characteristics below a depth of 2.08 feet; subject to seepage; erodible by water; subject to piping.	Water table at a depth of 2 to 5 feet; very rapid permeability in sand and gravel below a depth of 2 feet; difficult to obtain suitable outlets in places.	Low available water capacity; somewhat poorly drained; mixed sand and gravel at a depth of 2 feet; moderate intake rate.	Nearly level.[3]
Poor: sand is below a depth of about 3 feet; contains excessive fines; poor gradation.	Good where slopes are less than 8 percent; fair where more than 8 percent.	Good where slopes are less than 8 percent; fair where more than 8 percent.	Moderately rapid permeability; moderate to high seepage.	Medium to low compacted permeability; high susceptibility to piping; subject to erosion by water and wind.	Well drained[3].....	Moderate available water capacity; erodible where soil slopes; moderately high intake rate; hazard of soil blowing.	Highly erodible on slopes; subject to piping; moderately rapid permeability; complex slopes.
Not suitable; no sand available.	Fair: low organic matter content; poor where slope is more than 15 percent.	Good where slopes are 6 to 8 percent; fair where slopes are 8 to 15 percent; poor where more than than 15 percent.	Moderate seepage; slope is from 6 to 60 percent.	Foundations subject to extreme amounts of consolidation when loaded and saturated; fair compaction characteristics; low permeability where properly compacted.	Well drained and somewhat excessively drained.[3]	Suited only where slope is less than 11 percent; moderate permeability; erodible; moderate intake rate.	Highly erodible on slopes; subject to piping; outlets for waterways may need structures; favorable where slope is less than 11 percent.
Not suitable; no sand available.	Good where slopes are less than 8 percent; fair where 8 to 15 percent; poor where more than 15 percent.	Good where slopes are 0 to 8 percent; fair where 8 to 15 percent; poor where more than 15 percent.	Moderate seepage; slope is from 0 to 30 percent.	Moderate piping hazard; low permeability when compacted; fair compaction characteristics.	Well drained[3].....	High available water capacity; moderate intake rate except unit Cx has low intake rate; not suited where slope is more than 11 percent.	Erodible on slopes; favorable where slopes are less than 11 percent.
Not suitable; no sand available.	Poor: soluble salts and strong alkalinity.	Poor: difficult workability.	Moderate permeability below a depth of 4 feet; nearly level; piping.	Soluble salts present; readily dispersed soil material.	Surface drainage needed; seasonal high water table at a depth of 4 feet.	Moderate to low intake rate; soluble salts present; susceptible to accumulation of excess salts and alkali.	[3].

TABLE 6.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with or without basements	Sanitary landfill[1]	Local roads and streets	Road fill
Cozad—Continued: Cv, CvB	Severe: seasonal high water table at a depth of 3 to 4 feet.	Severe: moderate permeability; seasonal high water table at a depth of 3 to 4 feet.	Severe: seasonal high water table at a depth of 3 to 4 feet.	Severe: subject to frost action; seasonal high water table at a depth of 3 to 4 feet.	Trench type—Moderate: moderately well drained. Area type—Slight.	Moderate: subject to frost action.	Fair to poor: poor bearing capacity; subject to frost action.
Elsmere: Em, Es	Severe: seasonal high water table at a depth of 2 to 4 feet.[2]	Severe: rapid permeability; seasonal high water table at a depth of 2 to 4 feet.	Severe: seasonal high water table at a depth of 2 to 4 feet.	Severe: seasonal high water table at a depth of 2 to 4 feet.	Trench type—Severe: rapid permeability; seasonal high water table at a depth of 2 to 4 feet. Area type—Severe: rapid permeability.	Moderate: subject to frost action; somewhat poorly drained.	Fair: subject to frost action; somewhat poorly drained.
Fillmore: Fm, Fo	Severe: very slow permeability; poorly drained; subject to flooding in unit Fm.	Severe: poorly drained; subject to flooding in unit Fm.	Severe: poorly drained; subject to flooding in unit Fm; poor workability.	Severe: poorly drained; high shrink-swell potential; subject to flooding in unit Fm; poor workability.	Trench type—Severe: poorly drained; subject to flooding in unit Fm. Area type—Severe: poorly drained; subject to flooding in unit Fm.	Severe: high shrink-swell potential; subject to flooding in unit Fm.	Poor: high shrink-swell potential; subject to frost action; subject to flooding in unit Fm.
Gibbon: Gb	Severe: seasonal high water table at a depth of 2 to 3 feet.	Severe: subject to flooding; seasonal high water table at a depth of 2 to 3 feet.	Severe: seasonal high water table at a depth of 2 to 3 feet.	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding.	Trench type—Severe: seasonal high water table at a depth of 2 to 3 feet. Area type—Severe: seasonal high water table at a depth of 2 to 3 feet; subject to rare flooding.	Severe: moderate shrink-swell potential; somewhat poorly drained; subject to frost action.	Poor: somewhat poorly drained; subject to frost action.
Gosper: Gn, Go, Gt	Moderate: moderately well drained; seasonal high water table at a depth of 4 to 5 feet.	Severe: high seepage below a depth of 4 feet; seasonal high water table at a depth of 4 to 5 feet.	Severe: danger of caving; seasonal high water table at a depth of 4 to 5 feet.	Moderate: moderate shrink-swell potential; seasonal high water table at a depth of 4 to 5 feet.	Trench type—Severe: rapid permeability below a depth of 4 feet; seasonal high water table at a depth of 4 to 5 feet. Area type—Severe: rapid permeability below a depth of 4 feet; seasonal high water table at a depth of 4 to 5 feet.	Moderate: moderate shrink-swell potential; subject to frost action.	Fair: moderate shrink-swell potential; subject to frost action.

engineering properties of the soils—Continued

Suitability as source of—Cont.			Soil features affecting—				
Sand	Topsoil	Cover material for landfill	Pond reservoir areas	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Not suitable; no sand available.	Good	Good	Low to moderate seepage; seasonal high water table at a depth of 3 to 4 feet.	Low permeability when compacted; fair compaction characteristics; seasonal high water table at a depth of 3 to 4 feet.	Seasonal high water table at a depth of 3 to 4 feet.	High available water capacity; moderate intake rate; moderately high water table.	(3).
Fair to poor: sand sizes are limited; excessive fines below a depth of 3 feet.	Poor: too sandy	Fair to poor: too sandy.	High seepage; nearly level; rapid permeability; seasonal high water table at a depth of 2 to 4 feet.	Medium to high susceptibility to piping; medium permeability when compacted; borrow areas may be below water table.	Somewhat poorly drained; suitable outlets may be difficult to obtain.	Seasonal high water table at a depth of 2 to 4 feet; very high intake rate; rapid permeability; subject to soil blowing.	(3).
Not suitable; no sand available.	Poor: clayey subsoil; poorly drained.	Poor: poorly drained; clayey subsoil.	Low seepage; topography is depressional; may be suitable for dugouts; very slow permeability.	Low permeability when compacted; fair to poor compaction characteristics; high shrink-swell potential.	Poorly drained; subject to occasional ponding in unit Fm; very slow permeability; adequate outlets may not be available.	Moderate available water capacity; very slow permeability; occasional ponding of surface water.	(3).
Poor to a depth of 4 feet; check below this depth.	Fair: contains high clay content in upper part.	Fair: too clayey	High seepage potential below a depth of 4 feet; nearly level; can be used for dugout ponds.	Medium to high susceptibility to piping; fair to good compaction characteristics; somewhat poorly drained; moderately high water table.	Somewhat poorly drained; may be difficult to obtain outlets; moderately high water table.	High available water capacity; somewhat poorly drained; moderately high water table; moderate intake rate.	Nearly level.[3]
Fair below a depth of 4 feet; excess fines; poor gradation.	Fair: contains moderate clay content in upper part; poor in unit Gt due to excess salts and alkali.	Good, except poor in unit Gt, due to excess salinity and alkalinity.	High seepage potential below a depth of 4 feet.	Medium to high susceptibility to piping; fair to good compaction characteristics; moderately well drained; seepage potential below a depth of 4 feet.	Moderately well drained; may be difficult to obtain outlets.	Moderate available water capacity; moderate intake rate; excess salts and alkali in unit Gt.	Nearly level.[3]

TABLE 6.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with or without basements	Sanitary landfill[1]	Local roads and streets	Road fill
Gothenburg: Gu	Severe: seasonal high water table at a depth of 0.5 to 2 feet; subject to flooding.[2]	Severe: very rapid permeability; subject to flooding; seasonal high water table at a depth of 0.5 to 2 feet.	Severe: seasonal high water table at a depth of 0.5 to 2 feet; subject to flooding; cutbanks cave.	Severe: subject to flooding; seasonal high water table at a depth of 0.5 to 2 feet; cutbanks for basement walls subject to caving.	Trench type—Severe: seasonal high water table at a depth of 0.5 to 2 feet; subject to flooding. Area type—Severe: seasonal high water table at a depth of 0.5 to 2 feet; subject to flooding.	Severe: poorly drained; subject to flooding; seasonal high water table at a depth of 0.5 to 2 feet.	Poor: wetness; difficult to reclaim borrow areas; sand can be drained or mined hydraullically.
Hall: Ha, HaB, Hb	Moderate: moderately slow permeability.	Moderate: moderate permeability below a depth of 2 feet.	Slight	Moderate: moderate shrink-swell potential.	Trench type—Severe: seasonal high water table at a depth of 3 to 4 feet.	Moderate: subject to frost action; moderate shrink-swell potential.	Fair: needs slope compaction control; moderate shrink-swell potential; subject to frost action.
Hc	Moderate: moderately slow permeability; seasonal high water table at a depth of 3 to 4 feet.	Moderate: moderate permeability below a depth of 2 feet; seasonal high water table at a depth of 3 to 4 feet.	Moderate: moderately well drained; seasonal high water table at a depth of 3 to 4 feet.	Moderate: moderate shrink-swell potential; subject to frost action.	Trench type—Moderate: moderately well drained. Area type—Slight.	Moderate: subject to frost action.	Fair: needs close compaction control; moderate shrink-swell potential; subject to frost action.
Hobbs: Hd	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding and frost action.	Trench type—Severe: subject to flooding. Area type—Severe: subject to flooding.	Severe: subject to flooding and frost action.	Fair: subject to frost action; fair compaction characteristics.
Holdrege: Ho, HoB, HoC, HoC2.	Slight	Moderate: moderate permeability.	Slight	Moderate: moderate shrink-swell potential; subject to frost action.	Trench type—Slight. Area type—Slight.	Moderate: moderate shrink-swell potential; subject to frost action.	Fair: good compaction characteristics.
Hord: HpB, Hr, HrB, HrC, Ht.	Slight	Moderate: moderate permeability.	Slight	Moderate: subject to frost action.	Trench type—Slight. Area type—Slight.	Moderate: subject to frost action; low strength.	Fair: good compaction characteristics; subject to frost action.
Hs, Hx	Moderate: seasonal high water table at a depth of 3 to 4 feet.	Moderate: moderate permeability; seasonal high water table at a depth of 3 to 4 feet.	Moderate: seasonal high water table at a depth of 3 to 4 feet.	Moderate: subject to frost action; seasonal high water table at a depth of 3 to 4 feet.	Trench type—Moderate: seasonal high water table at a depth of 3 to 4 feet. Area type—Moderate: seasonal high water table at a depth of 3 to 4 feet.	Moderate: subject to frost action.	Fair: good compaction characteristics; subject to frost action.

engineering properties of the soils—Continued

Suitability as source of—Cont.			Soil features affecting—				
Sand	Topsoil	Cover material for landfill	Pond reservoir areas	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Good: can be drained.	Poor: too sandy; thin layer; borrow areas difficult to reclaim.	Poor: too sandy; thin layer; borrow areas difficult to reclaim.	Suitable for dugouts; high water table.	Subject to seepage in fill and foundation.	Poorly drained; high water table; subject to flooding.	Very shallow soil over mixed sand and gravel.[3]	Very shallow soil over mixed sand and gravel.[3]
Not suitable; no sand available.	Good	Good in surface layer; fair in subsoil.	Low to moderate seepage; low storage potential because of nearly level and very gentle slopes.	Fair to good compaction characteristics; low to medium permeability when compacted; erodible by water on cut and fill slopes.	Well drained[3]	High available water capacity; moderate intake rate.	Nearly level or very gently sloping.[3]
Not suitable; no sand available.	Good	Good in surface layer; fair in subsoil.	Low to moderate seepage; low storage potential because of nearly level slopes.	Fair to good compaction characteristics; low to medium permeability when compacted; erodible by water on cut and fill slopes.	Moderately well drained; seasonal high water table at a depth of 3 to 4 feet; may be difficult to obtain outlets.	High available water capacity; moderate intake rate; water table at a depth of 4 to 8 feet.	Nearly level.[3]
Not suitable; no sand available.	Good: may be wet due to flooding.	Good to fair: subject to flooding.	Moderate seepage potential.	Medium to low permeability when compacted; fair compaction characteristics.	Subject to flooding; moderate permeability.	Subject to flooding; high available water capacity.	Nearly level.[3]
Not suitable; no sand available.	Fair: thin layer	Good	Moderate permeability; low to moderate seepage potential; storage limited.	Low permeability when compacted; foundations are subject to consolidation when loaded and saturated; erodible where soils slope.	Well drained[3]	High available water capacity; moderately low intake rate; easily worked.	Susceptible to erosion on slopes; terraces generally not needed on units Ho and HoB.
Not suitable; no sand available.	Good	Good	Subject to seepage; limited storage potential in areas of nearly level and very gentle slopes.	Low permeability when compacted; good compaction characteristics; erodible by water on cut and fill slopes; susceptible to piping.	Well drained[3]	High available water capacity; erodible where soils gently slope.	Erodible where soils gently slope; terraces generally not needed on nearly level and very gentle slopes.
Not suitable; no sand available.	Good	Good	Low seepage; nearly level slopes limit storage potential; seasonal high water table at a depth of 3 to 4 feet.	Low permeability when compacted; good compaction characteristics; erodible by water on cut and fill slopes.	Seasonal high water table at a depth of 3 to 4 feet.	High available water capacity; moderately well drained.	Nearly level.[3]

TABLE 6.—*Interpretation of*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with or without basements	Sanitary landfill[1]	Local roads and streets	Road fill
Lawet: La, Lb, Ld....	Severe: seasonal high water table at a depth of 0 to 3 feet; subject to flooding.	Severe: seasonal high water table at a depth of 0 to 3 feet; subject to flooding.	Severe: seasonal high water table at a depth of 0 to 3 feet; subject to flooding.	Severe: seasonal high water table at a depth of 0 to 3 feet; subject to flooding and frost action.	Trench type—Severe: seasonal high water table at a depth of 0 to 3 feet. Area type—Severe: seasonal high water table at a depth of 0 to 3 feet.	Severe: seasonal high water table at a depth of 0 to 3 feet; subject to frost action.	Poor: seasonal high water table at a depth of 0 to 3 feet; unit Ld is saline-alkali and is readily dispersed; subject to frost action.
Lex: Le, Lf.....	Severe: seasonal high water table at a depth of 2 to 3 feet.[2]	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding; seepage.	Severe: seasonal high water table at a depth of 2 to 3 feet; cutbanks cave.	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding and frost action; basement walls subject to caving during construction.	Trench type—Severe: seasonal high water table at a depth of 2 to 3 feet. Area type—Severe: seasonal high water table at a depth of 2 to 3 feet.	Severe: somewhat poorly drained; subject to frost action, flooding.	Fair to poor: seasonal high water table at a depth of 2 to 3 feet; unit Lf contains excess salts and is readily dispersed.
Ovina: OvB.....	Severe: seasonal high water table at a depth of 3 to 4 feet.[2]	Severe: moderately rapid permeability; seasonal high water table at a depth of 3 to 4 feet.	Severe: seasonal high water table at a depth of 3 to 4 feet.	Severe: seasonal high water table at a depth of 3 to 4 feet; subject to frost action.	Trench type—Severe: seasonal high water table at a depth of 3 to 4 feet. Area type—Severe: seasonal high water table at a depth of 3 to 4 feet; rapid permeability.	Severe: subject to frost action; seasonal high water table at a depth of 3 to 4 feet.	Fair to poor: subject to frost action; low volume change; good workability.
Platte: Pt.....	Severe: subject to flooding; seasonal high water table at a depth of 2 to 3 feet.[2]	Severe: very rapid permeability; seasonal high water table at a depth of 2 to 3 feet; subject to flooding.	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding.	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding.	Trench type—Severe: seasonal high water table at a depth of 2 to 3 feet; seepage. Area type—Severe: seasonal high water table at a depth of 2 to 3 feet; seepage.	Severe: subject to frost action; seasonal high water table at a depth of 2 to 3 feet.	Poor: high water table; sand and gravel can be drained or mined hydraulically.
Rusco: Ru.....	Moderate: moderately slow permeability.	Moderate: moderate permeability below a depth of 2 feet.	Slight.....	Moderate: moderate shrink-swell potential; subject to frost action.	Trench type—Slight. Area type—Slight.	Moderate: subject to frost action.	Poor: fair to poor bearing capacity; moderate shrink-swell potential; medium to high compressibility.
Silver Creek: Sc, Sf, Sh.	Severe: slow permeability; seasonal high water table at a depth of 2 to 5 feet.	Moderate for units Sc and Sh: seasonal high water table at a depth of 4 to 5 feet. Severe for unit Sf: seasonal high water table at a depth of 2 to 5 feet.	Severe: too clayey; seasonal high water table at a depth of 2 to 5 feet.	Severe: high shrink-swell potential; subject to frost action; seasonal high water table at a depth of 2 to 5 feet.	Trench type—Severe: seasonal high water table at a depth of 2 to 5 feet. Area type—Severe: seasonal high water table at a depth of 2 to 5 feet.	Severe: high shrink-swell potential; subject to frost action; wetness.	Poor: poor workability; difficult to compact; water table limits depth of borrow; subject to frost action; high shrink-swell potential.

engineering properties of the soils—Continued

Suitability as source of—Cont.			Soil features affecting—				
Sand	Topsoil	Cover material for landfill	Pond reservoir areas	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Fair: check below depth of 4 feet; poorly graded.	Poor: high water table; unit Ld contains soluble salts.	Poor: poorly drained.	High water table; may be suitable for dugouts.	High water table; good to fair compaction characteristics; medium to low permeability when compacted; unit Ld contains excess soluble salts.	High water table; may be difficult to obtain outlets.	High available water capacity; drainage needed; unit Ld contains soluble salts; unit La is generally too wet.	High water table; nearly level.[3]
Good below a depth of 3 feet.	Fair: limited material; unit Lf contains soluble salts; high water table.	Fair: sand and gravel at a depth of about 2.5 feet.	Moderately high water table; may be suitable for dugouts; seepage.	Moderately high water table; good to fair compaction characteristics; medium to low permeability when compacted.	Moderately high water table; may be difficult to obtain outlets.	Moderate available water capacity; very rapid permeability below a depth of 2.5 feet; moderately high water table; unit Lf contains excess soluble salts.	Nearly level.[3]
Poor: high content of fines.	Good to a depth of 3 feet; fair below a depth of 3 feet; too sandy.	Good	High seepage	Low to medium	Moderately high water table; may be difficult to obtain outlets.	Moderate available water capacity; moderately high water table; subject to soil blowing.	Nearly level.[3]
Good: sand below a depth of 1 foot; obtained by hydraulic mining.	Poor: poorly drained; borrow area difficult to reclaim.	Poor: high water table; limited material; borrow area difficult to reclaim.	High water table; high seepage; can be used as sites for dugouts.	High water table; low compressibility; high permeability when compacted seepage.	High water table; suitable outlets may not be available; subject to flooding.	Shallow soil over mixed sand and gravel; low available holding capacity; very high intake rate.	Shallow soil over mixed sand and gravel.[3]
Not suitable; no sand available.	Good in upper 1 foot; fair in subsoil.	Fair: too clayey	Low to moderate seepage; nearly level; limited storage potential.	Erodible where soils slope; fair to good stability and compressibility.	Moderately well drained and well drained.[3]	High available water capacity; moderately low intake rate.	Nearly level.[3]
Fair below a depth of 5 feet.	Poor: high plasticity below a depth of 1 foot; strongly alkaline soils in unit Sh.	Poor: too clayey	Slow permeability; seasonal high water table at a depth of 2 to 5 feet.	Low permeability when compacted; compaction characteristics; strongly alkaline soils in unit Sh; high shrink-swell potential.	Moderately well drained or somewhat poorly drained; excess soluble salts in unit Sh; slow permeability; moderately high water table.	Moderate available water capacity; very low or low intake rate; slow permeability; excess soluble salts in unit Sh.	Nearly level.[3]

TABLE 6.—*Interpretation of*

Soil series and map symbols	Degree and kind of limitation for—						Suitability as source of—
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with or without basements	Sanitary landfill[1]	Local roads and streets	Road fill
*Uly: UbE, UcF, UhD, UmD2. For Coly part of UcF and UmD2, see Coly series. For Holdrege part of UhD and UmD2, see Holdrege series.	Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate: moderate permeability where slopes are less than 7 percent; severe permeability where slopes are more than 7 percent.	Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate where slopes are less than 15 percent; severe where more than 15 percent.	Trench type—Slight where slopes are less than 15 percent; moderate where 15 to 25 percent; severe where more than 25 percent. Area type—Moderate where slopes are 8 to 15 percent; severe where more than 15 percent.	Moderate: low strength where slopes are less than 15 percent; severe where more than 15 percent.	Fair where slopes are less than 25 percent; poor where more than 25 percent; erosion by water needs good compaction control.
Valentine: VaB, VaC, VaE.	Slight where slopes are less than 8 percent; moderate where more than 8 percent.[2]	Severe: rapid permeability.	Severe: sandy material; subject to caving.	Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Trench type—Severe: rapid permeability. Area type—Severe: rapid permeability.	Slight where slopes are less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent; wind and water erosion.	Good: needs confinement.
Wann: Wa, Wb.....	Severe: seasonal high water table at a depth of 2 to 3 feet; subject to flooding.[2]	Severe: moderately rapid permeability; subject to flooding; seasonal high water table at a depth of 2 to 3 feet.	Severe: seasonal high water table at a depth of 2 to 3 feet; cutbanks may cave.	Severe: subject to flooding; seasonal high water table at a depth of 2 to 3 feet.	Trench type—Severe: seasonal high water table at a depth of 2 to 3 feet. Area type—Severe: seasonal high water table at a depth of 2 to 3 feet.	Moderate: subject to frost action.	Poor: seasonal high water table at a depth of 2 to 3 feet; subject to frost action; may need dewatering.
Wood River: Wo, Wr.	Severe: slow permeability.	Moderate: moderate permeability below a depth of 2.5 feet.	Moderate: claypan type subsoil; moderately well drained.	Severe: high shrink-swell potential in subsoil.	Trench type—Moderate: too clayey. Area type: Slight.	Severe: high shrink-swell potential.	Poor: high shrink-swell potential; high compressibility.

[1] Onsite, deep studies of the underlying strata, water table, and hazards of aquifer pollution and drainage into ground water should be made for landfills deeper than 5 or 6 feet.

roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and the relative ease of excavating the material at borrow areas.

Sand is used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources. A soil rated as good or fair source of sand generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the material, and neither do they indicate quality of the deposit.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or its response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and content of stone fragments are characteristics that affect suitability. Also considered is the damage that results at the areas from which topsoil is taken.

Cover material for sanitary landfill should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better

engineering properties of the soils—Continued

Suitability as source of—Cont.			Soil features affecting—				
Sand	Topsoil	Cover material for landfill	Pond reservoir areas	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Not suitable; no sand available.	Fair where slope is less than 15 percent; poor where more than 15 percent.	Slight where slope is less than 8 percent; moderate where 8 to 15 percent; severe where more than 15 percent.	Moderate seepage; slope is from 6 to 30 percent.	Good to fair stability; highly erodible; good to fair compaction if moisture content is controlled.	Well drained to somewhat excessively drained.[3]	High available water capacity; not suitable in units UbE and UcF.	Erodible where soils slope; units UbE and UcF not suited to terraces because of slope.
Fair: excess fines; poor gradation.	Poor: too sandy....	Poor: too sandy; borrow area difficult to reclaim.	High seepage.....	Good stability; good to fair workability; subject to soil blowing and water erosion when not protected.	Excessively drained.[3]	Low available water capacity; subject to severe soil blowing; very high intake rate; rapid permeability.	Erodible by water; subject to severe soil blowing.[3]
Fair: check below a depth of 5 feet.	Good in unit Wb; poor in unit Wa; saline-alkaline soil.	Good.....	Moderate to high seepage; seasonal high water table at a depth of 2 to 3 feet.	Subject to piping; fair to good compaction characteristics; fair stability.	Somewhat poorly drained; suitable outlets may be difficult to obtain.	Moderate available water capacity; moderately high intake rate.	Nearly level.[3]
Not suitable; no sand available.	Poor: claypan type subsoil; borrow area difficult to reclaim.	Poor: too clayey; borrow area difficult to reclaim.	Slow permeability in subsoil; moderate permeability below a depth of 2.5 feet; limited storage potential because of nearly level soils.	Low permeability when compacted; medium to high compressibility; fair to poor compaction characteristics.	Slow permeability in subsoil; nearly level; outlets may be difficult to obtain.	High available water capacity; low intake rate; excessive soluble salts may be present; claypan type subsoil.	Nearly level.[3]

[2] Hazard of pollution to underground water supply due to moderately rapid, rapid, or very rapid permeability in underlying material.

[3] This practice or structure generally not needed because of slopes, topography, or soil characteristics.

than other soils. Clayey soils are sticky and difficult to spread; sandy soils are subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area type or trench type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to the seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage of cropland and pasture is affected by such

TABLE 7.—*Engineering*

[Tests performed by the Nebraska Department of Roads in accordance with standard procedures

Soil name and location	Parent material	Report Number S272–	Depth from surface	Specific gravity	Mechanical analysis[1]		
					Percentage passing sieve—		
					⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)
			Inches				
Coly silt loam:							
0.55 mile west and 0.47 mile north of the southeast corner of sec. 16, T. 11 N., R. 21 W. (Modal)	Peoria loess	888	0–5	2.58			
		889	15–60	2.69			
Cozad silt loam:							
130 feet east and 264 feet north of the southwest corner of sec. 13, T. 10 N., R. 25 W. (Modal)	Alluvium from loess	890	0–9	2.64			
		891	13–26	2.67			
		892	26–44	2.67			
Gosper loam:							
0.2 mile north and 0.47 mile east of the southwest corner of sec. 26, T. 7 N., R. 10 W. (Modal)	Alluvium	829	0–7	2.59		100	99
		830	13–22	2.65	100	99	97
		831	22–30	2.65	100	99	97
Hall silt loam:							
90 feet east and 1,322 feet south of the northwest corner of sec. 25, T. 12 N., R. 25 W. (Modal)	Alluvium from loess	893	0–7	2.60			
		894	12–24	2.66			
		895	40–60	2.66			
Hord silt loam:							
175 feet east and 200 feet north of the southeast corner of sec. 33, T. 11 N., R. 25 W. (Modal)	Alluvium from loess	899	0–7	2.59			
		900	25–33	2.67			
		901	43–60	2.68			
Uly silt loam:							
0.3 mile east and 0.23 mile north of the southwest corner of sec. 18, T. 11 N., R. 20 W. (Modal)	Peoria loess	909	0–8	2.61			
		910	8–15	2.67			
		911	15–40	2.67			

[1] Mechanical analyses according to the American Association of State Highway and Transportation Officials (AASHTO) Designation T 88-47 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechancial analyses used in this

soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope, stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of the layer below the surface layer or other layers that restrict movement of water; amount of water available to plants; and need for drainage or depth to water table or bedrock.[5]

Terraces and diversions are embankments or ridges constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

[5] Further information on soil use for irrigation is contained in "Irrigation Guide for Nebraska," Soil Conservation Service, 1971.

Soil test data

Table 7 contains engineering test data for some of the major soil series in Dawson County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine the liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material as was explained for table 5.

Specific gravity is the ratio of the unit weight of the soil solids to the unit weight of water. It is a measure of, and a means of expressing, the heaviness of

test data

of the American Association of State Highway and Transportation Officials (AASHTO)]

Mechanical analysis[1]—Cont.							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Cont.			Percentage smaller than—						AASHTO[2]	Unified[3]
No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm				
							Percent			
.....	100	97	90	37	23	18	38	8	A-4(8)	ML
.....	100	98	92	34	18	14	32	7	A-4(8)	ML
.....	100	96	85	39	24	21	34	10	A-4(8)	ML
.....	100	95	87	25	16	13	27	2	A-4(8)	ML
.....	100	89	74	24	15	13	26	3	A-4(8)	ML
90	82	63	53	28	16	14	24	5	A-4(6)	CL-ML
85	76	52	45	28	21	19	32	15	A-6(5)	CL
85	75	44	37	23	17	16	25	7	A-4(2)	SC
.....	100	96	89	45	29	25	32	9	A-4(8)	ML
.....	100	98	92	58	41	34	48	25	A-7-6(16)	CL
.....	100	92	85	42	27	21	36	15	A-6(10)	CL
.....	100	94	85	32	21	16	32	7	A-4(8)	ML
.....	100	94	83	32	22	19	32	9	A-4(8)	ML
.....	100	93	81	27	16	13	28	4	A-4(8)	ML
.....	100	97	88	47	29	24	45	19	A-7-6(13)	CL
.....	100	98	91	49	31	26	41	17	A-7-6(11)	CL
.....	100	98	91	45	21	15	32	8	A-4(8)	ML

table are not suitable for use in naming textural classes for soil.

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8). The Classification of soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHTO Designation M 145-49.

[3] Based on the Unified Soil Classification System (*2*), Technical Memo No. 3-357, Volume 1, Waterways Experiment Station, U.S. Army Corps of Engineers, March 1953.

soil. The specific gravity of the solid particles of a soil, exclusive of the void spaces, is also called the "true" or "real" specific gravity. This property has an important influence on the density of the soil.

How the Soils of Dawson County Were Formed and How They Are Classified

This section consists of two main parts. The factors of soil formation and how they have affected the development of the soils in Dawson County are discussed in the first part. The system of soil classification currently used is given and each soil series is placed in the classes of that system in the second part.

Factors of Soil Formation

Soil is produced by soil forming processes acting on material that is deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, mainly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The affects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little but some time is always required for differentiation of soil horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely inter-

related in their affects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material is the earth material from which a soil forms and is largely responsible for the mineralogical composition of the soil. The soils in Dawson County developed in three different parent materials—loess, eolian sand, and alluvium.

Peoria Loess is the most extensive of the soil forming materials in the county. This grayish to brownish colored silt loam material ranges from a few feet to about 70 feet in thickness. Coly, Holdrege, Fillmore, and Uly soils formed in this loess on uplands. Cozad, Hord, Rusco, and Wood River soils formed on stream terraces in alluvial material derived mainly from Peoria Loess. Hall soils formed in loess on uplands and stream terraces.

Eolian sand is in the Platte Valley at a number of locations. The most prominent area is about 9 square miles and is just north of Gothenburg. The eolian sand in this area covers the stream terrace to a depth varying from a few feet to more than 30 feet. An area less than a square mile in size is in the northeast corner of the county, and a small area is north of Johnson Lake. Anselmo and Valentine soils formed in eolian sand. Elsmere and Ovina soils formed in sand that is alluvial or eolian in origin.

Hobbs soils formed in silty alluvium along drainageways on stream terraces and on uplands. Loamy alluvium, 1 inch to 60 inches thick over sand and gravel, is present on the bottom land and stream terraces in the Platte River Valley. Gibbon, Gosper, Gothenburg, Lawet, Lex, Platte, Silver Creek and Wann soils formed in this alluvium.

Climate

Climate is an active factor in the formation of soils. Its influence is both direct and indirect. It affects the weathering and reworking of soil material directly through rainfall, temperature, and wind. It affects the soils indirectly through the amount and kind of vegetation and animal life sustained.

The climate of Dawson County is characterized by moderately long and cold winters with temperatures commonly below 0° F. Springs are cool with considerable precipitation. The summers are warm with temperatures commonly higher than 95° F. Thunderstorms are also common during summer and late spring. Autumns are mild with occasional rainy periods. The average precipitation is about 21 inches.

The prevailing wind direction during spring and summer is from the south or southeast, and during fall and winter it is from the north or northwest. The average wind speed is 11 miles per hour, but during March and April, it averages about 20 miles per hour.

Water received as rainfall moves through the drainageways and continually shifts, sorts, and reworks unconsolidated material of all kinds. This sediment is deposited many times by flowing streams. The Alda, Gibbon, and Wann soils are examples of soils that formed in water deposited sediment. The amount of rainfall in the county is not enough to leach the soils deeply, except in areas of sandy soils. Most of the silty soils have a horizon where calcium carbonate accumulated at a depth of ½ foot to 4 feet. The Holdrege and Wood River soils are examples of soils that have a subsoil that formed at least in part by movement of clay particles. Depth to calcium carbonate and the amount of clay in the subsoil have been modified by variations in slope.

Wind is continually reworking unconsolidated materials of all kinds. Wind deposits all the loess in which such soils as Uly and Holdrege formed. It moved the sand onto the Platte River stream terraces and formed the Valentine and Anselmo soils. Soil blowing is most common in March and April when wind velocities are high and many fields are bare.

Alternate freezing and thawing hasten mechanical disintegration of parent material. Summer heat and humidity speed chemical weathering.

Climate affects the soil indirectly through its influence on the number and kinds of plant and animal life that exists. Plants are the main source of organic matter, and animals and micro-organisms break down the organic matter into humus and help in mixing the soils. Severe electrical storms and their resulting prairie fires were common before this area was settled. Fire kills trees but has little permanent effect on grass. This is one reason why the dominant vegetation has remained grass instead of trees.

Plant and animal life

Grass, trees, animals, micro-organisms, earthworms, man, and various other forms of plant and animal life live on and in the soil and are active in the soil forming processes. The kinds of plants and animals present in the soil depend upon environmental factors, such as climate, parent material, age of soil relief, and drainage.

Before the soils were cultivated, the dominant vegetation was short, mid, and tall grasses. These grasses take up nutrients from the soil and form a thick nutrient rich cover of residue when they die. Micro-organisms decompose the residue, and thereby return the nutrients to the soil to be used again. Most of the fibrous grass roots are in the upper part of the soil. They help to stabilize the soil and keep it open for ready intake of water. Part of the organic matter in the soil is the result of the decomposition of plant roots. Organic matter causes the surface layer to darken. Hall and Hobbs soils are among the highest in content of organic matter in the county.

Small rodents, earthworms, and some insects burrow into the soil, loosening and mixing it and making openings and channels, which promote aeration. They also add to the organic matter content when they die.

Man, through his management, has a great effect on soil development. Altering surface and subsurface drainage conditions, maintaining fertility, and changing the kinds of vegetation, have an immediate effect upon both the rate and direction of soil formation pro-

cesses. Man also affects soil development by controlling erosion and such management practices as irrigation.

Relief

Relief, or lay of the land, influences the formation of soil through its effect on runoff and drainage. Runoff is more rapid on steep and very steep slopes than on the more gentle slopes. Less water penetrates the soil on areas that have rapid runoff and reduces the amount of vegetation produced. Water can remove soil almost as fast as it is formed, which causes weak development and immature soils.

Runoff of water and soil erosion are not particularly severe problems on nearly level and very gently sloping soils on the loessial uplands. Runoff is slow and, as a result, most of the precipitation enters the soil. These areas have such well developed, mature soils as Holdrege and Hall soils.

Soils that are in depressions, such as Fillmore soils, collect run-in water and have characteristics that are a result of deep percolation of additional amounts of moisture. Clay colloids are leached to form a grayish leached subsurface layer and are then deposited as a dark, clayey subsoil. Permeability is very slow in these claypan soils.

Soils on bottom land are nearly level or very gently sloping. These areas are affected more by internal drainage than by relief. Where the water table is highest, the soil is somewhat poorly drained or poorly drained, and the native vegetation is limited to those species that can tolerate wetness. It can also change the chemical composition of the nutrients of the parent material. Somewhat poorly drained soils, such as Alda, Lex, and Gibbon soils, have a calcareous surface layer and lime content is maintained by capillary action of moisture above the water table. Where the water table is slightly lower, the soils are moderately well drained. Gosper soils are examples.

On such sandy soils as Valentine soils where the water table is deep, relief does not affect drainage because permeability is rapid and there is little runoff. Strongly sloping to moderately steep sandy soils are generally more susceptible to soil blowing than nearly level to gently sloping sandy soils. Soil formation on the sandy soils is influenced more by the parent material and time than by relief.

Time

Time is required for the formation of soil. The amount of time needed for a well developed profile to form depends on the influence of the other four soil forming processes.

In Dawson County, most of the nearly level to gently sloping soils on uplands and stream terraces have been in place for a long time. These soils are mature and have a well defined sequence of genetic horizons. They are approaching an equilibrium with their environment. Examples are the Holdrege and Wood River soils.

Many soils on bottom land have been in place for only a short time. These young or immature soils have not had sufficient time to form distinct horizons. Hobbs and Lawet soils are examples. Steep, silty soils, such as Coly soils, are immature also. It is difficult for soil development to keep pace with loss of material because of erosion and because much of the rainfall does not enter the soil but runs off rapidly.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in development of the current system should search the latest literature available (*3*, *6*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. The same property or subdivisions of this property may be in several different categories. In table 8 the soil series of Dawson County are placed in 3 categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. Three exceptions to this are Entisols, Histosols, and Vertisols, which occur in many different climates. Each order is identified by a word of three or four syllables ending in *sol*. An example is Moll-i-sols.

SUBORDER. Each order is divided into suborders based primarily on characteristics that seem to produce classes with the greatest genetic similarity. The suborders are more narrowly defined than are the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of a water table at a shallow depth; soil climate; the accumulation of clay, iron, or organic carbon in the upper solum; cracking of soils caused by a decrease in soil moisture; and fine stratification. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquoll* (*Aqu*, meaning water or wet, and *oll*, from Mollisols).

TABLE 8.—*Soil series classified according to the current system*

Series	Family	Subgroup	Order
Alda[1]	Coarse-loamy, mixed, mesic	Fluvaquentic Haplustolls	Mollisols.
Anselmo	Coarse-loamy, mixed, mesic	Typic Haplustolls	Mollisols.
Coly	Fine-silty, mixed (calcareous), mesic	Typic Ustorthents	Entisols.
Cozad	Fine-silty, mixed, mesic	Typic Haplustolls	Mollisols.
Elsmere[2]	Sandy, mixed, mesic	Aquic Haplustolls	Mollisols.
Fillmore[3]	Fine, montmorillonitic, mesic	Typic Agrialbolls	Mollisols.
Gibbon[4]	Fine-silty, mixed (calcareous), mesic	Fluvaquentic Haploquolls	Mollisols.
Gosper	Fine-loamy, mixed, mesic	Typic Argiustolls	Mollisols.
Gothenburg	Mixed, mesic	Typic Psammaquents	Entisols.
Hall	Fine-silty, mixed, mesic	Pachic Argiustolls	Mollisols.
Hobbs	Fine-silty, mixed, nonacid, mesic	Mollic Ustifluvents	Entisols.
Holdrege	Fine-silty, mixed, mesic	Typic Argiustolls	Mollisols.
Hord	Fine-silty, mixed, mesic	Cumulic Haplustolls	Mollisols.
Lawet	Fine-loamy, mesic	Typic Calciaquolls	Mollisols.
Lex	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic.	Fluvaquentic Haplaquolls	Mollisols.
Ovina[5]	Coarse-loamy, mixed, mesic	Fluvaquentic Haplustolls	Mollisols.
Platte	Sandy, mixed, mesic	Mollic Fluvaquents	Entisols.
Rusco	Fine-silty, mixed, mesic	Aquic Argiustolls	Mollisols.
Silver Creek[6]	Fine, mixed, mesic	Typic Natraquolls	Mollisols.
Uly	Fine-silty, mixed, mesic	Typic Haplustolls	Mollisols.
Valentine	Mixed, mesic	Typic Ustipsamments	Entisols.
Wann	Coarse-loamy, mixed, mesic	Fluvaquentic Haplustolls	Mollisols.
Wood River	Fine, montmorillonitic, mesic	Typic Natrustolls	Mollisols.

[1] The Alda soils in Dawson County are taxadjuncts to the Alda series because they have a thinner A horizon than is defined in the range of the series.

[2] The Elsmere soils in Dawson County are taxadjuncts to the Elsmere series because they have a loamy texture in the lower part of the C horizon, which is not typical of the series. They are also lower in reaction and lack mottles within a depth of 40 inches as defined in the range of the series.

[3] The Fillmore soils in Dawson County are taxadjuncts to the Fillmore series because they have an A or Ap horizon that is less than 6 inches thick and they lack an A2 horizon as defined in the range of the series.

[4] The Gibbon soil in Dawson County is a taxadjunct to the Gibbon series because it contains more sand in the control section than is defined in the range of the series.

[5] The Ovina soil in Dawson County is a taxadjunct to the Ovina series because it is better drained, is more acid, and lacks free carbonates as defined in the range of the series.

[6] The Silver Creek soil in Dawson County is a taxadjunct to the Silver Creek series because it lacks mottles or chroma colors of Aquolls without mottles as defined in the range of the series.

GREAT GROUP. Each suborder is divided into great groups on the basis of uniformity in kind and sequence of soil horizons and features. The horizons used to make separations are those in which clay, carbonates, and other constituents have accumulated or have been removed; and those that have pans that interfere with growth of roots, movement of water, or both. Some features used are acidity, climate, composition, and color. Each great group is identified by a word of three or four syllables; a prefix is added to the name of the suborder. An example is Haplaquoll (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *oll,* from Mollisols).

SUBGROUP. Each great group is divided into subgroups. One represents the central (typic) segment of the great group and others are called intergrades that have properties of the great group and also one or more properties of another great group, suborder, or order. Other subgroups may have soil properties unlike those of any other great group, suborder, or order. Each subgroup is identified by the name of the great group preceded by one or more adjectives. An example is Typic Haplaquolls (a typical Haplaquoll).

FAMILY. Soil families are established within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, temperature, permeability, depth, and consistence. A family name is the subgroup name preceded by a series of adjectives. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiate in table 8. An example is the coarse-loamy, mixed, mesic family of Typic Haplaquolls.

Use of data obtained by physical and chemical analyses

Much data on mechanical and chemical properties can be obtained by analyses of the soils in a laboratory. This information is useful to soil scientists in classifying the soils and in developing concepts of soil genesis. It is also helpful in estimating available water capacity, soil blowing, fertility, tilth, and other practical aspects of soil management. Data on reaction, electrical conductivity, and percentage of exchangeable sodium are helpful in evaluating the possibility of reclaiming and managing saline-alkali areas.

Useful data on soils in Dawson County, that were sampled in nearby counties, are recorded in Soil Sur-

vey Investigations Report Number 5 (*7*). In this report are Anselmo, Hall, Holdrege, Hord, Silver Creek, Wann, and Wood River soils.

Environmental Factors Affecting Soil Use

This section provides information about the natural and cultural features of Dawson County. Included are facts about climate, water supplies, natural vegetation, and geology. Information is also given about the physiography, relief, and drainage. Transportation, school facilities, markets, manufacturing, and business services related to farm statistics and trends are also discussed.

Geology

The geologic formations on the surface of the soils in Dawson County are unconsolidated material of Pleistocene and Recent age. Underlying the whole county is the Ogallala Formation of Tertiary age. It is composed of calcareous sandstone and clayey, silty, and sandy material containing lenses of coarse sand and gravel.

Sand and gravel of Pleistocene age rests on the Ogallala Formation throughout most of the county. This deposit is thickest, as much as 100 feet, along the Platte River. In the uplands the deposit varies in thickness, from 0 to more than 60 feet.

Eolian sands of middle to late Pleistocene age mantle small areas in the Platte River Valley and small upland areas north of Johnson Lake and in the northeastern corner of the county. Loess covers most of the upland and stream terraces. The lower and older loess is a part of the Loveland Formation. It is brown or reddish brown in color and crops out on the lower slopes of hillsides bordering the major upland drainageways. The Peoria loess is grayish to brownish in color and ranges from a few feet to about 70 feet in thickness.

The material of Recent age is the alluvial deposits on the flood plains of the present streams.

Physiography, Relief, and Drainage

Dawson County is part of the central part of the Great Plains. The county has about an equal area of uplands and valleys.

The uplands consist of a thick mantle of loess and are dissected by many intermittent drainageways. The topography ranges from nearly level to very steep. The sharpest relief occurs between the Platte River Valley and the upland breaks on the western side of West Smith Canyon. Most of the loessial uplands are well drained to excessively drained, except for a few small depressions. These depressions are occasionally flooded by runoff from adjacent higher lying areas and they are poorly drained.

The Platte River Valley crosses the county in a northwest to southeast direction. It ranges between 10 and 15 miles wide, and consists of alluvial bottom land and stream terraces. The bottom land is from 1 mile to 3 miles wide, is moderately well drained to poorly drained, and has a water table generally above a depth of 8 feet. The stream terraces consist of nearly level, silty, and well drained soils, but also include a few small areas of undulating to rolling sandy soils.

Along the western county line, north of the Platte River, the stream terraces are covered by eolian sands to a depth of 5 to 30 feet. This area is an extension of the "Nebraska Sandhills," and has hummocky topography. In Dawson County, these sandhills cover about 9 square miles.

The Platte River is the largest and most important stream in the county. In most places, it consists of braided channels separated by sand bars. These channels are 1 foot to 3 feet deep and are commonly dry during the summer. The river has a fall of approximately 7 feet per mile.

Dawson County is drained by the Platte River, Plum Creek, Buffalo Creek, Elm Creek, Wood River, and minor tributaries that flow to the South Loup River. All the surface flow, with the exception of that in the South Loup tributaries, moves to the Platte River.

The general slope of the county is to the southeast. The lowest altitude is about 2,260 feet above sea level, and is in the southeastern corner, where the Platte River leaves the county. The highest elevation is 2,940 feet along the western county line in section 18, T. 10 N., R. 25 W. Elevation at the city of Lexington is 2,389 feet.

Climate[6]

Dawson County is located in south-central Nebraska and lies in the third tier of counties north of the Nebraska-Kansas border. The climate is continental with cold winters, warm summers, and frequent temperature changes. Rainfall is moderate and highly variable. About 80 percent of the annual precipitation occurs during April through September. The Rocky Mountains to the west block most of the moisture from the Pacific Ocean and the chinook winds on the eastern side of the mountains bring warm air for occasional sudden rises in temperature during the cold season.

Most of the precipitation that falls in the county originates in the Gulf of Mexico and the Caribbean Sea. Drought develops when these wind currents maintain a more easterly position. In 78 years of record at Gothenburg, precipitation was 12.84 inches in the driest year, 1952, and 37.26 inches in the wettest year, 1915.

Early spring precipitation is generally slow, steady, and well distributed. As spring advances into summer, more precipitation falls during erratic thundershowers and distribution becomes irregular. The thunderstorms are severe at times and are accompanied by local downpours, hail, and damaging winds. Crop damage in the

[6]Furnished by the Climatology Office, Conservation and Survey Division, University of Nebraska.

hail strips is often severe, but the damaged area is generally small.

Late in summer and in fall, showers gradually become lighter and further apart. Fall weather generally has abundant sunshine, mild days, and cool nights.

Winter precipitation is generally light, nearly all of it falls as snow. Many winters, however, have one or more periods of freezing rain. The snow is often accompanied by northerly winds and a change to colder weather. Average annual snowfall is about 28 inches, but it is variable. Often, the snow melts before the next snowfall. During an average winter, the ground is covered by snow about 45 days.

Maximum temperatures of 100° or higher are reached nearly every summer and subzero temperatures are common during winter. Temperature records began at Gothenburg in 1895 and show the highest reading ever recorded was 116° F on July 11, 1954. The lowest temperature ever recorded was 33° below zero on February 11, 1899.

At Gothenburg, the average date of the last 32° temperature in spring is May 6. The average date of the first 32° temperature in fall is October 3. Data on temperature and precipitation are given in table 9.

Local topography has little effect upon average temperature over a long period of time. Long term average temperatures recorded on flat land, for example, do not differ greatly from those recorded on rolling hills or in valleys in the immediate area. Records based on dates when specific temperatures were reached can, however, differ markedly over short distances.

Probabilities for the last freezing temperature in spring and the first in fall are given in table 10. When freeze data are used, dates should be adjusted to fit the particular exposure. The last spring freeze is at an earlier date and the first fall freeze is at a later date in less exposed areas.

Annual evaporation from the free surface of the water in small lakes and farm ponds average 48 inches; about 77 percent occurs from May through October.

Water Supplies

The principal source of surface water in Dawson County is the Platte River. Water is diverted from the river for irrigation and the Tri-County Canal supplies water for Midway, Gallagher, Plum Creek, and Johnson reservoirs. These reservoirs are in the uplands south of the Platte River and the water is used for irrigation and recreation. More than 50 sand pit lakes that formed by mining sand and gravel are on the flood plain of the Platte River. Flooding on low bottom land occurs in some years early in spring.

The underground deposits of sand and gravel yield large quantities of good quality water for industrial, household, and farming use. Water for irrigation was supplied by 2,602 registered wells in 1975. The ground water is recharged, or resupplied, by streamflow of the Platte River and its tributaries, local precipitation,

TABLE 9.—*Temperature and precipitation*

[All data from Gothenburg, Nebraska]

Month	Temperature				Precipitation				
			Two years in 10 will have at least 4 days with—			One year in 10 will have—			
	Average daily maximum[1]	Average daily minimum[1]	Maximum temperature equal to or higher than[2]—	Minimum temperature equal to or lower than[2]—	Average monthly total[1]	Equal to or less than[3]—	Equal to or more than[3]—	Days with 1 inch or more of snow[1]	Average depth of snow cover[1]
	°F	°F	°F	°F	Inches	Inches	Inches	Number	Inches
January	38	12	59	—10	.5	(4)	1.0	12	4
February	43	17	64	— 4	.5	.1	1.4	11	3
March	51	24	75	6	1.2	.2	2.1	7	5
April	65	36	84	22	2.0	.4	4.9	1	3
May	74	47	90	33	3.4	.9	6.3	(5)	2
June	84	57	98	45	4.2	1.6	7.6		
July	89	62	101	52	3.0	.9	4.8		
August	89	61	99	50	2.5	1.0	4.7		
September	79	50	95	35	1.9	.4	4.3		
October	68	38	87	24	1.2	.2	3.0	(5)	2
November	51	25	72	11	.7	(4)	1.8	4	3
December	40	16	61	— 4	.5	(4)	1.2	10	4
Year	64	37	[6]104	[7]—17	21.6	15.3	28.3	45	3

[1]Based on period 1944-1973.
[2]Based on computer study, for period 1894-1963.
[3]Based on period 1895-1973.
[4]Trace.
[5]Less than 0.5 day.
[6]Average annual highest maximum.
[7]Average annual lowest minimum.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Gothenburg, Nebraska]

Probability	Dates for given probability and temperature[1]				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than....	Apr. 10	Apr. 18	Apr. 29	May 11	May 22
2 years in 10 later than....	Apr. 4	Apr. 12	Apr. 24	May 6	May 16
5 years in 10 later than....	Mar. 25	Apr. 2	Apr. 13	Apr. 25	May 6
Fall:					
1 year in 10 earlier than..	Oct. 22	Oct. 20	Oct. 9	Sept. 27	Sept. 19
2 years in 10 earlier than..	Oct. 28	Oct. 24	Oct. 14	Oct. 3	Sept. 24
5 years in 10 earlier than..	Nov. 8	Nov. 4	Oct. 24	Oct. 13	Oct. 3

[1]All freeze data are based on temperatures measured in a standard National Weather Service thermometer shelter. The thermometers are placed approximately 5 feet above the ground, and the exposure is believed representative of the surrounding area. Lower temperatures exist at times nearer the ground and in local areas subject to extreme air drainage on calm nights.

underground movement of water, and seepage of water from irrigation, canals, and reservoirs.

The depth to the water table varies considerably throughout the county (fig. 15). In part of the loessial uplands, it is below a depth of 250 feet. Where the water table is less than 20 feet, subirrigation is an important factor in growing alfalfa. However, dry sand and gravel between the alfalfa roots and the water table prevents subirrigation in some areas.

Small changes in the depth to the water table take place daily in summer, but larger fluctuations occur seasonally. The water table is generally lowest late in summer after large amounts of water have been removed by irrigation wells and by the evaporation transpiration of plants. During winter and spring, the water table is at its highest yearly level. Fluctuations are also associated with cycles of wet and dry weather.

From 1945 to 1973, water levels and their departure from the assumed normal has not changed significantly in most areas. However, small areas in the Platte River Valley have had a decline of 5 to 10 feet in depth to the water table. In some upland areas south of the Platte River Valley, the water table has raised as much as 10 to 20 feet. This is in areas where surface water has been brought into the area for irrigation.

Natural Vegetation

The native vegetation in Dawson County is mainly short, mid, and tall grasses. Big bluestem, little bluestem, indiangrass, switchgrass, side-oats grama, blue grama, buffalograss, and western wheatgrass are examples. Needleandthread, prairie sandreed, and dropseed grow on the sandy soils. Cattails, sedges, and prairie cordgrass are native in wet areas. Shrubs are on protected sites in north facing canyons.

Man has changed the type and composition of vegetation in most areas. Although many well managed pastures and hay meadows contain the more desirable native grasses, invasion of less productive grasses has resulted from overgrazing.

Water diverted from the Platte River for irrigation has reduced the flow of the river and made it more stable. Eastern cottonwood and willows now grow on land that was once part of the channeled areas.

Prairie fires once common to this area are now controlled by man. This change has made it possible for trees to grow along most of the streams in the county. Man has also planted trees in windbreaks that provide shelter for wildlife and livestock.

Transportation Facilities

Railroad freight transportation is provided by two railroads. The main line of the Union Pacific railroad serves all the towns in the Platte River Valley. A Union Pacific branch line serves Sumner and Eddyville. It connects to the main line at Kearney in adjacent Buffalo County. The Burlington Northern Railroad serves the town of Farnam in the southwestern corner of the county.

Excellent highways serve the people in the county. The east-west roads are U.S. Interstate Highway 80 and U.S. Highway 30. These two highways serve all of the towns in the Platte River Valley. Nebraska Highway 40 intersects the northeastern corner of the county and serves Eddyville and Sumner. The north-south roads are U.S. Highway 283 south of Lexington and Nebraska Highways 21 and 47 in the central and western parts of the county. The railroads and highways provide good, fast means of transporting grain and cattle to main market terminals in Omaha and Chicago.

Daily bus service is provided to Overton, Lexington, Cozad, and Gothenburg. Chartered air service is provided at airports in Lexington, Cozad, and Gothenburg.

School Facilities

Modern elementary schools are located in nearly all the towns in the county. Many elementary schools are also located in rural areas. High schools are in Cozad, Farnam, Gothenburg, Lexington, Overton, and Sumner. Many of these schools offer adult education courses at night. College and vocational training are available in two adjacent counties.

Markets, Manufacturing, and Business Services Related to Farming

Livestock auctions are held each week in Gothenburg and Lexington. Cattle and hogs are sold to processors or to farmers who feed the livestock to market weight. Cattle and hogs are also marketed in adjacent counties or larger terminal markets, such as Omaha. Ranchers and farmers buy cattle at auctions for cow and calf herds.

Grain and feed products not used or stored on farms

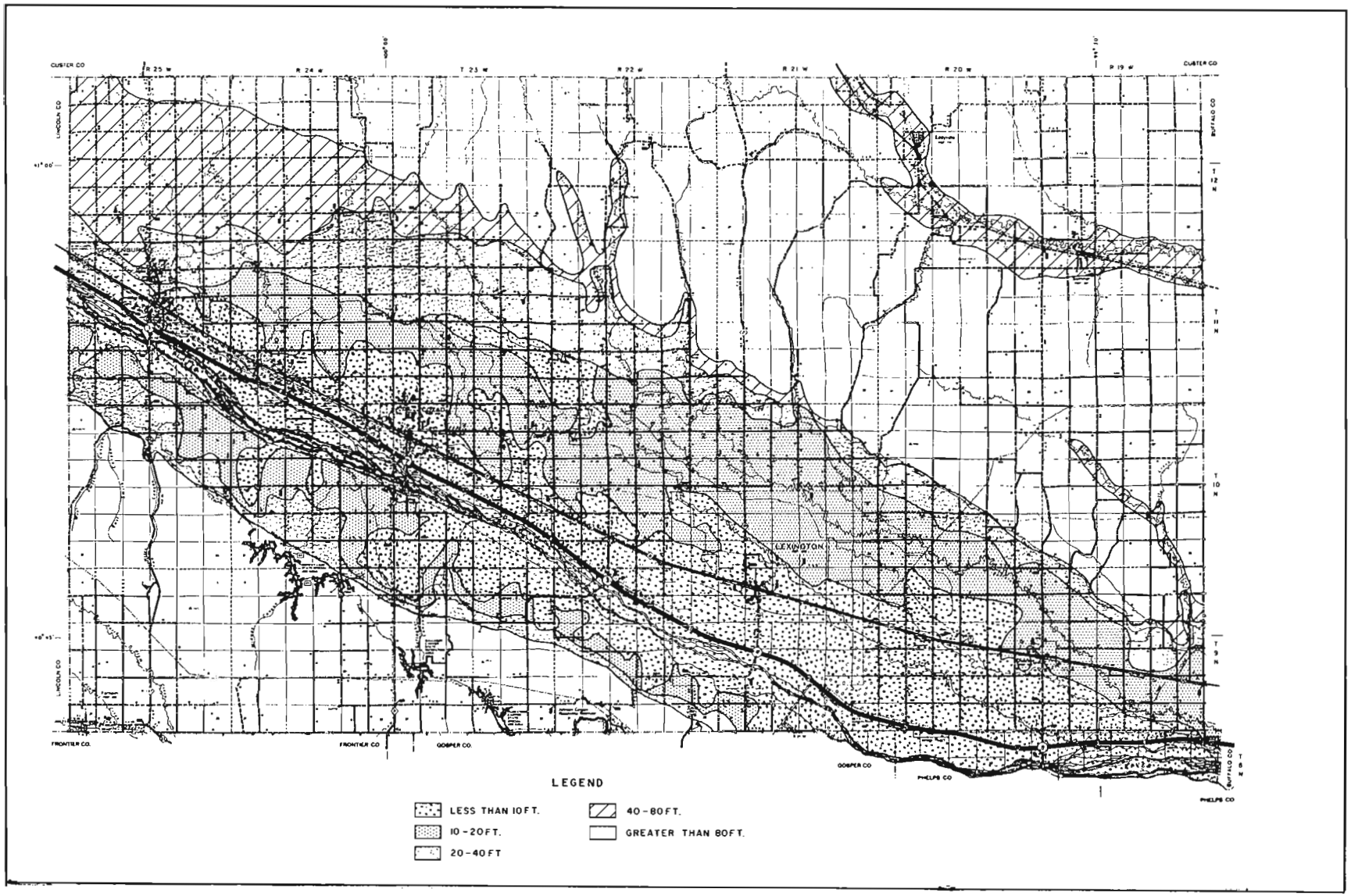

***Figure 15.*—Depth to water table in Dawson County.**

are sold to local grain elevator operators, who transport them by rail or truck to large markets. Some of the grain is stored in local elevators. Sugar beets are shipped by railroad to Colorado for processing. Dairy products are sold through farmer cooperatives.

Dawson County leads all counties in the nation in production and sale of dehydrated alfalfa. At least one alfalfa dehydrating plant is located in every village and town in the Platte River Valley of Dawson County. Alfalfa not sold to dehydration plants is fed as hay or silage to cattle on the farms.

Several factories that manufacture farm machinery are located in the county. Manufacturing related to farming includes meat processing plants at Darr, Cozad, and Lexington and a plastic pipe company at Cozad.

Veterinarians are located at Lexington, Gothenburg, Cozad, Overton, and Eddyville to provide medical services for livestock. Other services related to farming are a soil testing service and sales of livestock feed and farm equipment.

Farming and agri-business are the main industries in the county. An auto equipment factory, however, in Cozad is the largest single employer in the county. Electrical equipment is manufactured in plants located at Lexington and Overton.

Farm Statistics and Trends

Raising livestock and other aspects of farming are the most important enterprises in Dawson County. According to the Nebraska Agricultural Statistics, the total number of cattle on farms increased from 169,560 in 1964 to 223,900 in 1972. Although the number of calves born in the county increased from 35,450 to 41,300 during this period, the most significant increase was the number of grain fed cattle in dry lots. Many of these feeder cattle are shipped into the county. Dairy cows decreased in number from 2,370 to 1,040. Milk production per cow, however, increased about 30 percent. Hogs on farms increased from 54,820 in 1964 to 68,200 in 1972. Sheep and chickens decreased from 300 in 1964 to 210 in 1972.

Corn is the most important cultivated crop in the county. The acreage of corn planted increased from 103,270 acres in 1964 to 133,000 acres in 1972. The acreage of irrigated corn increased about 30 percent over this period. Acreage of sorghum planted decreased from 15,690 in 1964 to 4,500 acres in 1972. During this period, the acreage of winter wheat planted decreased from 17,830 acres to 9,800 acres. Irrigated corn replaced many acres that were formerly planted to sorghum and wheat.

According to the Nebraska Agricultural Statistics, the acreage of alfalfa was 91,150 in 1964, and it showed no significant increase or decrease in 1972. The acreage of irrigated alfalfa during this period decreased from 26,840 acres to 16,000 acres. Many acres of alfalfa in the Platte River Valley, however, were subirrigated from the high water table. The acreage of harvested wild hay decreased from 8,480 acres in 1964 to 5,400 acres in 1972. Some of the soils that were previously in wild hay have been developed for irrigated crops.

Sugar beets decreased in acreage from 3,780 acres in 1964 to 1,850 acres in 1972. Soybeans, barley, oats, and rye constitute a small total acreage.

From records of the Nebraska Department of Water Resources, there were 2,228 irrigation wells reported in the county in 1964. By 1972, this increased to 2,530 irrigation wells. The acreage of irrigated land increased from 195,900 acres to 213,600 acres during this period. Although land is irrigated both by wells and by water transported from reservoirs in canals, the land developed for irrigation in recent years is mainly supplied with water from wells. Many of the new irrigation wells are connected to a center pivot irrigation system. Use of commercial fertilizer is also increasing.

With increased use of machinery, the trend is to fewer and larger farms. According to the Nebraska Agricultural Statistics, there were 1,380 farms in 1966 and 1,150 farms in 1973. Many farmers supplement their income by non-farm employment, mainly in Lexington, Cozad, and Gothenburg.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks,

or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expresed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clean tillage. Cultivation to prevent the growth of all vegetation except the particular crop desired.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Depth, soil. The total thickness of weathered soil material over mixed sand and gravel or bedrock. In this survey the classes of soil depth are as follows: very shallow, 0 to 10 inches; shallow, 10 to 20 inches; moderately deep, 20 to 40 inches; and deep, more than 40 inches.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climati moors."

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire that exposes a bare surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Friability. Term for the ease with which soil crumbles. A friable soil is one that crumbles easily.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Immature soil. A soil lacking clearly defined horizons because the soil forming forces have acted on the parent material only a relatively short time since it was deposited or exposed.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and characteristics of the soil profile and underlying layers, and by height of the water table, either permanent or perched. Relative terms for expressing internal drainage are none, very slow, slow, medium, rapid, and very rapid.

Leaching. The removal of soluble material from soil or other material by percolating water.

Legume. A member of the legume or pulse family (Leguminosae)—one of the most important and widely distributed plant families. Includes many valuable forage species, such as peas, beans, peanuts, clover, alfalfa, sweet clover, lespedeza vetch, and kudzu. Practically all legumes are nitrogen fixing plants, and many of the herbaceous species are used as cover and green manure crops. Even some of the legumes that have no forage value (crotalaria and some lupines) are used for soil improvement. Other legumes are locust, honeylocust, redbud, mimosa, wisteria, and many tropical plants.

Lime concretion. An aggregate cemented by the precipitation of calcium carbonate. ($CaCO_3$).

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Mature soil. Any soil with well developed soil horizons having characteristics produced by the natural processes of soil formation and in near equilibrium with its present environment.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Organic matter. A general term for plant and animal material in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition. The following adjectives used in this survey denote various percentages of organic matter.

Percent	
Less than 0.5	Very low
0.5 - 1.0	Low
1.0 - 2.0	Moderately low
2.0 - 4.0	Moderate
4.0 - 8.0	High
8.0 - 16.0	Very high

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the saturated soil. In this particular survey, permeability applies to that part of the soil below the Ap or equivalent layer and above a depth of 60 inches, or to bedrock that occurs at a shallower depth. Where there are two or more permeability classes within a short vertical distance, the classes and depths are stated. Classes of soil permeability in inches of water per hour are as follows:

Very slow	Less 0.06
Slow	0.06—0.2
Moderately slow	0.2—0.6
Moderate	0.6—2.0
Moderately rapid	2.0—6.0
Rapid	6.0—20.0
Very rapid	greater than 20.0

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area is stream channels. The water that flows off the land surface without sink-

ing in is called surface runoff; that which enters the ground before reaching surface streams is called ground water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandy soil. A broad term for soil of the sand and loamy sand classes; soil material that is more than 70 percent sand and less than 15 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.02 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Percent	
0 to 1	Nearly level
1 to 3	Very gently sloping
3 to 6	Gently sloping
6 to 11	Strongly sloping or rolling
11 to 15	Moderately steep
15 to 30	Steep
Greater than 30	Very steep

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Underlying material. In this survey, the C horizon of a soil. It is generally weathered soil material immediately beneath the solum.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent.—A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian.—A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched.—A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

GUIDE TO MAP UNITS

For a full description of a map unit, read both the description of the map unit and that of the soil series to which the map unit belongs. Information about the use and management of each soil is given in the description of the capability unit, range site, and windbreak suitability group to which it is assigned.

Map symbol	Map unit	Page	Capability unit Dryland	Capability unit Irrigated	Range site	Windbreak suitability group
Ad	Alda loam, 0 to 2 percent slopes	12	IIIw-4	IIIw-7	Subirrigated	2
An	Anselmo fine sandy loam, 0 to 1 percent slopes	13	IIe-3	IIe-8	Sandy	3
AnB	Anselmo fine sandy loam, 1 to 3 percent slopes	13	IIe-3	IIe-8	Sandy	3
AnC	Anselmo fine sandy loam, 3 to 6 percent slopes	13	IIIe-3	IIIe-8	Sandy	3
AnD	Anselmo fine sandy loam, 6 to 11 percent slopes	13	IVe-3	IVe-8	Sandy	3
Ap	Anselmo loam, 0 to 1 percent slopes	13	IIc-1	I-8	Sandy	4
CoD2	Coly silt loam, 6 to 11 percent slopes, eroded	14	IVe-9	IVe-6	Limy Upland	5
CoE2	Coly silt loam, 11 to 20 percent slopes, eroded	14	VIe-9	-----	Limy Upland	10
CpG	Coly-Hobbs silt loams, 2 to 60 percent slopes	14	VIIe-7	-----	----------	10
	Coly soil	--	------	-----	Thin Loess	--
	Hobbs soil	--	------	-----	Silty Overflow	--
Cr	Cozad fine sandy loam, 0 to 1 percent slopes	15	IIe-3	IIe-5	Silty Lowland	3
Cs	Cozad silt loam, 0 to 1 percent slopes	15	IIc-1	I-6	Silty Lowland	1
CsB	Cozad silt loam, 1 to 3 percent slopes	16	IIe-1	IIe-6	Silty Lowland	1
CsC	Cozad silt loam, 3 to 6 percent slopes	16	IIIe-1	IIIe-6	Silty	4
CsD2	Cozad silt loam, 6 to 11 percent slopes, eroded	16	IVe-1	IVe-6	Silty	4
Ct	Cozad silt loam, saline-alkali, 0 to 1 percent slopes	16	IVs-1	IIIs-6	Saline Lowland	8
Cv	Cozad silt loam, wet substratum, 0 to 1 percent slopes	17	IIw-4	IIw-6	Subirrigated	2
CvB	Cozad silt loam, wet substratum, 1 to 3 percent slopes	17	IIIw-4	IIIw-6	Subirrigated	2
Cx	Cozad silty clay loam, 0 to 1 percent slopes	18	IIc-1	I-3	Silty Lowland	1
CyF	Cozad-Hobbs silt loams, 2 to 30 percent slopes	18	VIe-7	------	----------	10
	Cozad soil	--	------	------	Silty	--
	Hobbs soil	--	------	------	Silty Overflow	--
Em	Elsmere loamy fine sand, loamy substratum, 0 to 3 percent slopes	19	IVw-5	IVw-11	Subirrigated	2
Es	Elsmere loamy fine sand, saline-alkali, 0 to 3 percent slopes	19	IVs-1	IVs-11	Subirrigated	8
Fm	Fillmore silt loam, 0 to 2 percent slopes	20	IIIw-2	IIIw-2	Clayey Overflow	2
Fo	Fillmore silt loam, drained, 0 to 2 percent slopes	20	IIs-2	IIs-2	Clayey Overflow	2
Gb	Gibbon loam, 0 to 2 percent slopes	21	IIw-4	IIw-6	Subirrigated	2
Gn	Gosper fine sandy loam, 0 to 2 percent slopes	21	IIe-3	IIe-5	Sandy Lowland	3
Go	Gosper loam, 0 to 2 percent slopes	21	IIc-1	I-6	Silty Lowland	1
Gt	Gosper loam, saline-alkali, 0 to 2 percent slopes	22	IVs-1	IIIs-6	Saline Lowland	8
Gu	Gothenburg soils, 0 to 2 percent slopes	22	VIIs-3	------	Subirrigated	10
Ha	Hall silt loam, 0 to 1 percent slopes	23	IIc-1	I-4	Silty	4
HaB	Hall silt loam, 1 to 3 percent slopes	23	IIe-1	IIe-4	Silty	4
Hb	Hall silt loam, terrace, 0 to 1 percent slopes	23	IIc-1	I-4	Silty Lowland	1
Hc	Hall silt loam, wet substratum, 0 to 1 percent slopes	23	IIw-4	IIw-4	Subirrigated	2

Map symbol	Map unit	Page	Capability unit Dryland	Capability unit Irrigated	Range site	Windbreak suitability group
Hd	Hobbs silt loam, 0 to 2 percent slopes-----	24	IIw-3	IIw-6	Silty Overflow	1
Ho	Holdrege silt loam, 0 to 1 percent slopes--	26	IIc-1	I-4	Silty	4
HoB	Holdrege silt loam, 1 to 3 percent slopes--	26	IIe-1	IIe-4	Silty	4
HoC	Holdrege silt loam, 3 to 6 percent slopes--	26	IIIe-1	IIIe-4	Silty	4
HoC2	Holdrege silt loam, 3 to 6 percent slopes, eroded----------	26	IIIe-1	IIIe-4	Silty	4
HpB	Hord fine sandy loam, 0 to 3 percent slopes	27	IIe-3	IIe-5	Sandy	3
Hr	Hord silt loam, 0 to 1 percent slopes------	27	IIc-1	I-6	Silty Lowland	1
HrB	Hord silt loam, 1 to 3 percent slopes------	27	IIe-1	IIe-6	Silty Lowland	1
HrC	Hord silt loam, 3 to 6 percent slopes------	27	IIIe-1	IIIe-6	Silty	4
Hs	Hord silt loam, wet substratum, 0 to 1 percent slopes----------	27	IIw-4	IIw-6	Subirrigated	2
Ht	Hord silty clay loam, 0 to 1 percent slopes	28	IIc-1	I-3	Silty Lowland	1
Hx	Hord silty clay loam, wet substratum, 0 to 1 percent slopes----------	28	IIw-4	IIw-3	Subirrigated	2
La	Lawet loam, ponded, 0 to 2 percent slopes--	28	Vw-7	-----	Wet Land	6
Lb	Lawet silt loam, drained, 0 to 2 percent slopes----------	29	IIIw-4	IIIw-4	Subirrigated	2
Ld	Lawet silt loam, saline-alkali, 0 to 2 percent slopes----------	29	IVs-1	IIIs-4	----------	8
	Strongly alkaline part----------	--	-----	------	Saline Subirrigated	--
	Remainder of the mapping unit----------	--	-----	------	Subirrigated	--
Le	Lex loam, 0 to 2 percent slopes----------	30	IIIw-4	IIIw-7	Subirrigated	2
Lf	Lex loam, saline-alkali, 0 to 2 percent slopes----------	30	IVs-1	IIIs-7	----------	8
	Strongly alkaline part----------	--	------	------	Saline Subirrigated	--
	Remainder of the mapping unit----------	--	------	------	Subirrigated	--
OvB	Ovina fine sandy loam, 0 to 3 percent slopes----------	31	IIw-6	IIw-8	Subirrigated	2
Pt	Platte loam, 0 to 2 percent slopes---------	31	VIw-4	IVw-13	Subirrigated	2
Ru	Rusco silt loam, 0 to 1 percent slopes-----	32	IIc-1	I-4	Silty Lowland	1
Sc	Silver Creek silt loam, 0 to 2 percent slopes----------	33	IIIw-2	IIIw-2	Subirrigated	2
Sf	Silver Creek silty clay loam, 0 to 2 percent slopes----------	33	IIIw-2	IIIw-3	Subirrigated	2
Sh	Silver Creek complex, 0 to 2 percent slopes----------	33	IVs-1	IIIs-2	Saline Subirrigated	8
UbE	Uly silt loam, 11 to 15 percent slopes-----	34	VIe-1	------	Silty	4
UcF	Uly-Coly silt loams, 15 to 30 percent slopes----------	34	VIe-1	------	----------	10
	Uly soil----------	--	------	------	Silty	--
	Coly soil----------	--	------	------	Limy Upland	--
UhD	Uly-Holdrege silt loams, 6 to 11 percent slopes----------	34	IVe-1	IVe-6	Silty	4
UmD2	Uly-Holdrege-Coly silt loams, 6 to 11 percent slopes, eroded----------	34	IVe-1	IVe-6	----------	4
	Uly and Holdrege soils----------	--	------	------	Silty	--
	Coly soil----------	--	------	------	Limy Upland	--
VaB	Valentine loamy fine sand, 0 to 3 percent slopes----------	36	IVe-5	IIIe-11	Sandy	3
VaC	Valentine loamy fine sand, 3 to 6 percent slopes----------	36	VIe-5	IVe-11	Sandy	7
VaE	Valentine loamy fine sand, rolling---------	36	VIe-5	------	Sands	7
Wa	Wann fine sandy loam, saline-alkali, 0 to 2 percent slopes----------	37	IVs-1	IIIs-8	Subirrigated	8
Wb	Wann loam, 0 to 2 percent slopes----------	37	IIw-4	IIw-8	Subirrigated	2
Wo	Wood River silt loam, 0 to 1 percent slopes----------	38	IIs-2	IIs-2	Clayey	4
Wr	Wood River complex, 0 to 2 percent slopes	38	IVs-1	IIIs-2	Saline Lowland	8

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