Soil Survey of

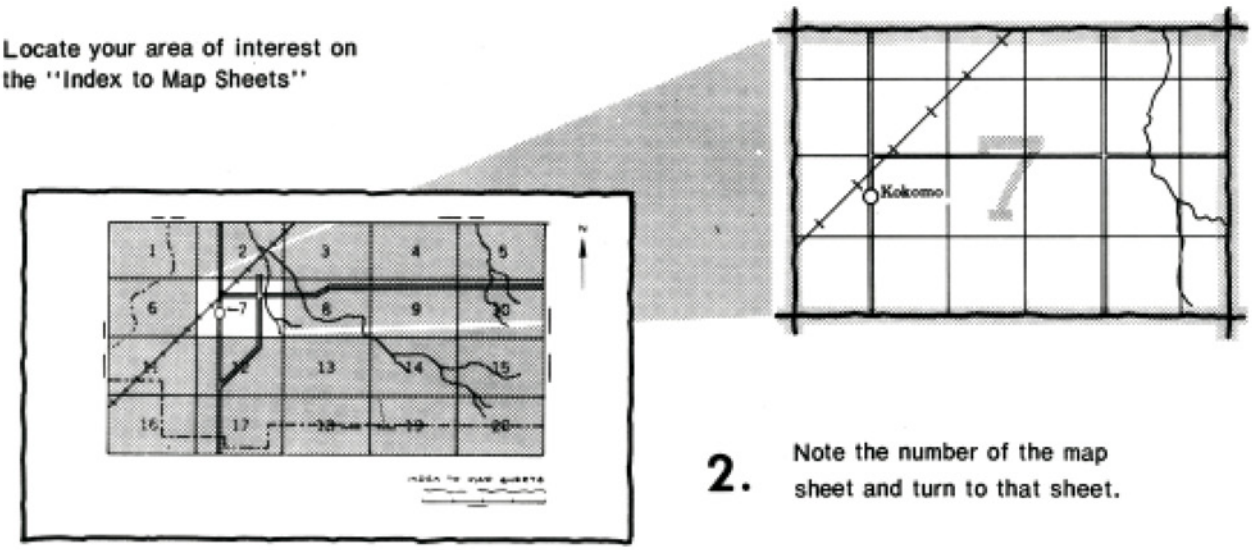
MERRICK COUNTY, NEBRASKA

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

16 MAR 1981

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"



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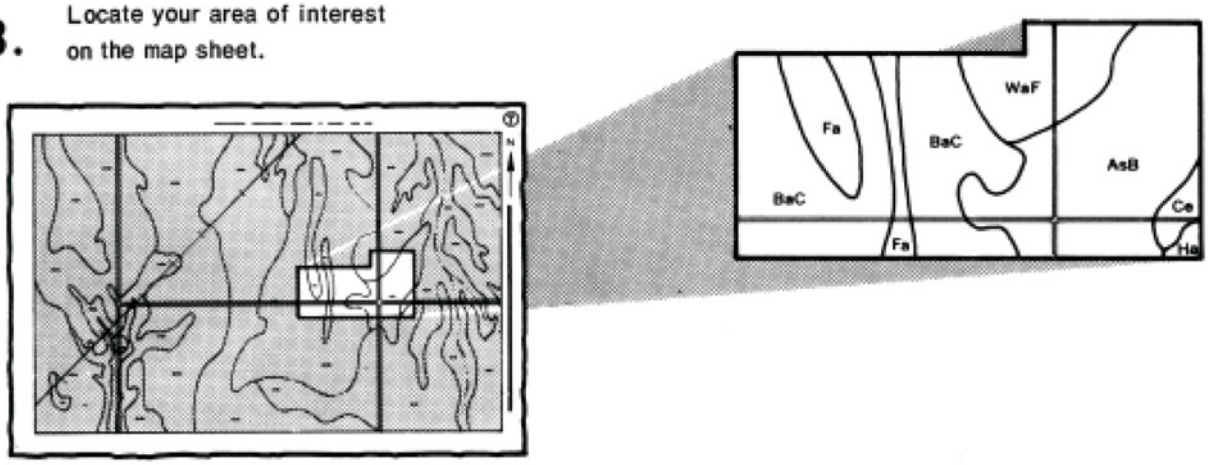

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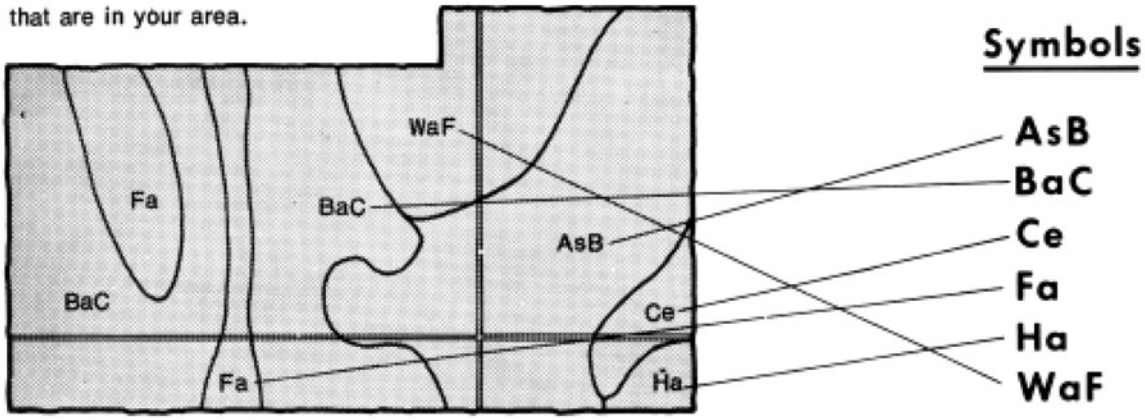
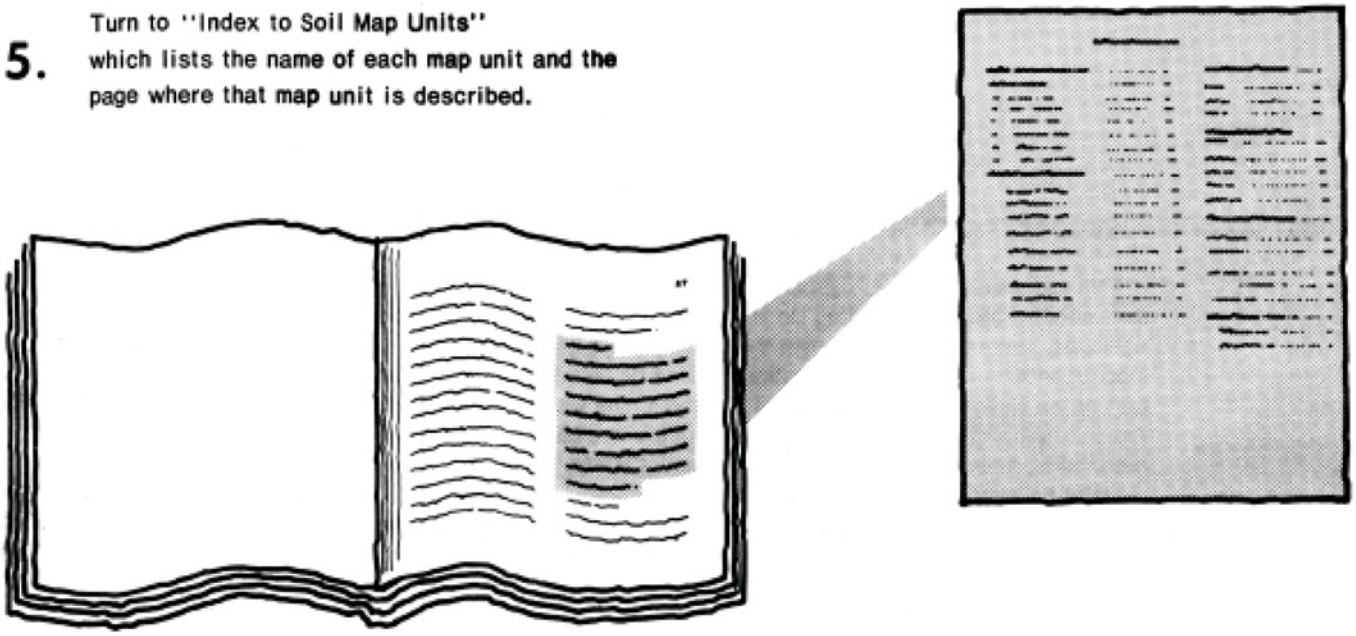
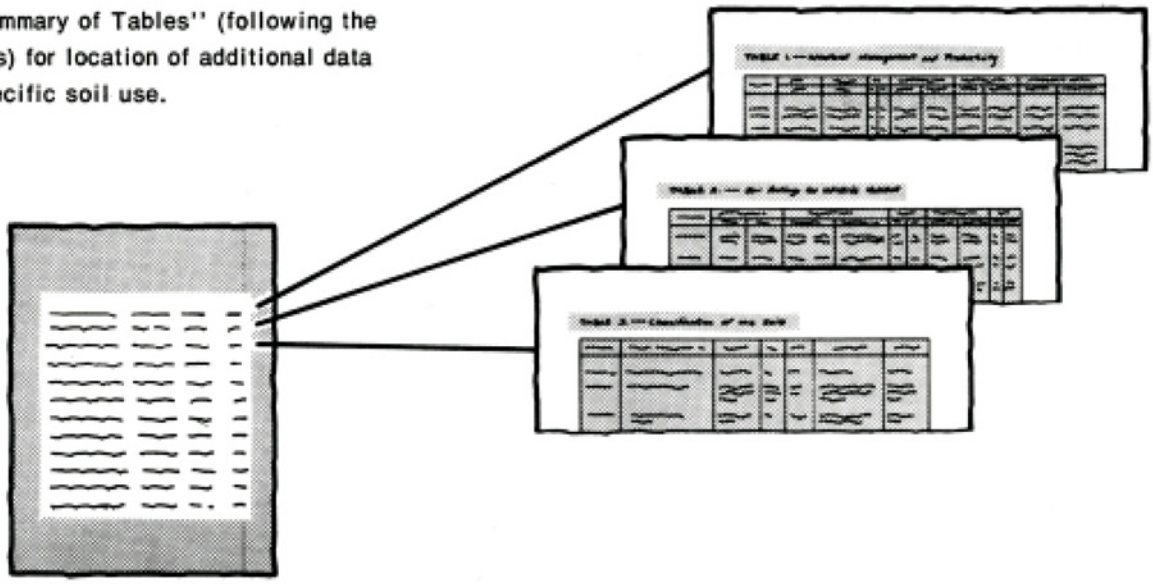


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies, the Merrick County Board of Supervisors, and the Central Platte Natural Resources District. 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, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork was performed in the period 1973-77. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This soil survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Central Platte and Lower Loup Natural Resources Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Irrigated corn grown for seed production in an area of the Lockton association.

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foreword

This soil survey contains information that can be used in land-planning programs in Merrick County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to mixed sand and gravel. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Benny Martin
State Conservationist
Soil Conservation Service

soil survey of
Merrick County, Nebraska

By Robert S. Pollock, Soil Conservation Service, and Isaac Knapton and
Michael Petersen, University of Nebraska, Conservation and Survey Division

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

MERRICK COUNTY is in the east-central part of Nebraska (fig. 1) and is roughly triangular. It is bordered on the south by Hamilton and Polk Counties. The county line to the south is nearly parallel to the Platte River in a southwest-northeast direction. Merrick County is bordered on the west by Hall and Howard Counties, on the north by Nance and Platte Counties, and on the east by a short segment of Platte County. Merrick County has 498 square miles and a total land area of 307,264 acres. Central City is the largest town and the county seat.

The economy is based on farming and farm related industries, and these are the leading occupations in Merrick County. Other industries are also important, however, especially in and around Central City and that part of Merrick County adjacent to the city of Grand Island. Corn, grain sorghum, and alfalfa are grown extensively, with lesser amounts of soybeans, small grain, and native hay. These crops provide feed for cattle, hogs, and sheep, as well as for cash income. Agriculture has produced a stable and prosperous foundation for the economy of Merrick County.

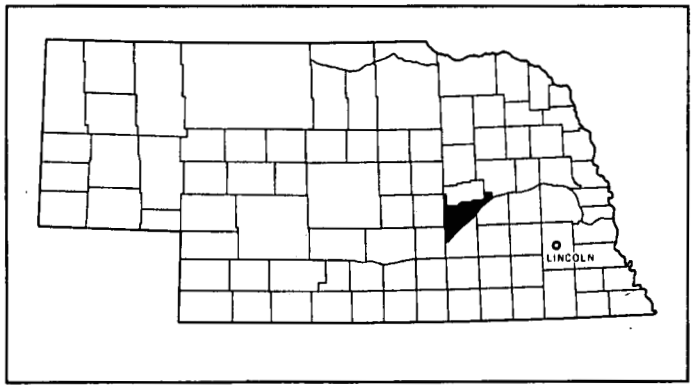

Figure 1.—Location of Merrick County in Nebraska.

Most soils in Merrick County are sandy, loamy, or silty. A few areas on the bottom lands are clayey. The soils range from deep over loess, sand, and alluvium to shallow over alluvium of gravelly sand and coarse sand. They range in drainage from excessively drained to very poorly drained and in slope from nearly level to steep.

Merrick County has good facilities for transportation. Rail transportation is provided by two railroads. The main line of the Union Pacific Railroad follows the north side of the Platte River and serves the towns of Central City, Chapman, Clarks, and Silver Creek. The Burlington Northern Railroad serves the towns of Archer and Palmer in the central and northwestern parts of the county.

Excellent highways serve the people in the county. U.S. Highway 30 provides a southwest-northeast route in the southern part of the county. U.S. Highway 92 provides an east-west route in the northern part of the county. Nebraska Highway 14 provides a north-south route in the central part of the county. Nebraska Highway 39 provides a north-south route in the eastern part of the county.

The railroads and highways provide a good, fast means of transporting grain and livestock to main marketing terminals.

The rural road system is well developed. The county is traversed by all weather, hard surface roads east to west in the central part and north to south in the western part.

Gravel roads are generally on most section lines, except in the sandhills and areas adjacent to the Platte River.

Modern elementary schools are in nearly all towns in the county. Several elementary schools are in rural areas. High schools are in Central City, Clarks, Palmer, and Silver Creek. Many of these schools offer adult education courses.

The first soil survey of Merrick County was made in 1926 (*3*). This survey updates the older soil survey and provides additional information and larger maps that show the soils in greater detail.

general nature of the county

This section provides general information about Merrick County. It discusses history and population; climate; geology; ground water supply; physiography, relief, and drainage; manufacturing and business services of agriculture; and trends in farming and soil use.

history and population

The earliest permanent settlement was made in 1859, near the old station of Lockwood, in the extreme southwestern corner of the county. Settlement spread throughout the Platte Valley, and in 1864 the County was organized. The early settlers came largely from Illinois and Pennsylvania.

The population reached a peak of about 10,763 in 1920, after which it declined. It is concentrated largely in towns and villages. The population of Vieregg Township in the southwestern corner of Merrick County has increased rapidly in recent years. This area has several housing developments for people who work in nearby Grand Island.

In 1970, the population of Merrick County was 8,750, and that of Central City was 2,850.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Merrick County is cold in winter. Summer is hot with occasional cool spells. Precipitation in winter frequently occurs as snowfall; in warm months it is chiefly showers that are commonly heavy when moist air moves in from the south.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Central City, Nebraska, in the period 1951 to 1973. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 26 degrees F, and the average daily minimum temperature is 15 degrees. The lowest temperature on record, which occurred at Central City on January 27, 1963, is -28 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 11, 1954, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 25 inches. Of this, 80 percent usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 4.83 inches at Central City on June 14, 1967. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 26 inches. The greatest snow depth at any one time during the period of record was 33 inches. On an average of 20 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in spring.

Merrick County has occasional tornadoes and severe thunderstorms. These storms are local and of short duration and result in damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

geology

Merrick County is mainly in the Platte River Valley. A long narrow strip in the northwestern corner of the county is loess mantled uplands. This area is about 5 square miles.

Unconsolidated deposits are on the Pierre Shale Formation at the southwestern part of the county, on the Ogallala Formation at the northwestern corner of the county, and on the Niobrara Formation throughout the remainder of the county. The thickness of the unconsolidated deposits over the bedrock varies from about 50 to 300 feet, but only the upper part is recently deposited alluvium, loess, or eolian sand.

The segment of the Platte River in the vicinity of Merrick County did not occupy its present valley until rather late in the Pleistocene Period. The earlier Pleistocene deposits were in place long before the river carved its present valley. They are beneath the

present valley and extend beneath the adjacent uplands. Local reworking of the unconsolidated deposits by wind resulted in areas of wind deposited sands resembling the dunes and hills in areas of the Sand Hills. It also resulted in the loess and loesslike silty materials on some of the nearly level terraces, and in undulating areas that have mixed loess and sand materials. These unconsolidated materials and fine to coarse alluvium make up the present surface.

The narrow strip of uplands in the northwestern corner of the county is an eroded remnant of the central Nebraska loess plain. Peoria Loess of Wisconsin age is the principal material at the surface, and Loveland Loess crops out on the slopes. Narrow strips of silty alluvial material, washed from the adjacent slopes, are along the upland drainageways.

ground water supply

Ground water is at a shallow depth throughout much of the county. The depth to the water table ranges from less than 1 foot to about 70 feet and is less than 10 feet in about three-fourths of the county. Throughout the county the static water level is closely related to topography.

In the first bottoms or flood plains, the water table is generally within a depth of 5 feet and during wet seasons may be at or near the surface. The depth to the water table is more than 20 feet on the higher stream terraces through the central part of the county, south of Prairie Creek near Grand Island to the southeastern corner of Nance County.

Nearly all rural residents of the county obtain water for domestic and livestock use from privately owned wells. Water for industry and farm irrigation is available from wells designed to yield large volumes of water. In general, irrigation wells yielding 500 to 2,000 gallons per minute can be developed south of Prairie Creek at nearly all sites. In the Archer area, irrigation wells generally have yields under 300 gallons per minute and are subject to large drawdown during pumping. At some sites in this area, adequate quantities of water for irrigation cannot be obtained. Some farmers in the Archer area have connected several low producing wells to obtain enough water for irrigation. The number of wells in these clusters ranges from 3 to 15.

Ground water is predominately of the calcium bicarbonate type. It is highly variable throughout the county in total dissolved solids and mineral composition. Water samples from wells in Pleistocene deposits commonly indicate a nitrate level sufficient to downgrade the quality for domestic use.

The water is of excellent quality for irrigation. The quality of water required for industry varies with the industry, but the total dissolved solids, silica content, or iron content could be limiting for certain industries. Water from the deeper wells contains less iron and more total dissolved solids than water from shallow wells. The silica content is relatively high in ground water from the central and northwestern parts of the county.

physiography, relief, and drainage

Merrick County is in the Great Plains physiographic province. The strongest relief in Merrick County is in the narrow strip of uplands extending north from the Loup River between Nance and Howard Counties. The topography ranges from nearly level to steep. Maximum relief between ridgetops and bottoms of the intermittent drainageways is about 90 to 120 feet. This upland area has a general slope to the south.

An extensive area of sandhills is in the north-central and northeastern parts of the county. Most of this area has undulating to rolling topography. The relief ranges from 3 to 30 feet in the undulating areas and from 20 to 60 feet in the rolling areas. Much of the surface drainage is not well defined, but flow is directly or indirectly to the Loup and Platte Rivers.

The Platte and Loup River valleys are mainly nearly level or very gently sloping. The difference in elevation between the stream terraces and bottom lands in some areas is so gradual as to be almost imperceptible. Generally, the relief ranges from 1 to 10 feet. This is modified in places by shallow stream channels. The depth to the water table is normally below 20 feet on the stream terraces. The seasonal high water table on the bottom land is generally above a depth of 5 feet. Surface drainage is slow because natural drainageways are not well defined or have been modified by land grading.

Merrick County is drained by the Platte and Loup Rivers and their tributaries. Generally, the streams flow toward the northeast and east. Prairie Creek, Silver Creek, Moores Creek, and Warm Slough are the main tributaries of the Platte River in Merrick County. The Loup River enters the Platte River in adjacent Platte County. Nearly all the rivers and major creeks have low gradients and flow constantly, except during times of prolonged drought or during the irrigation season when the water table is lowered by pump irrigation.

The lowest elevation in the county is on the county line northeast of Silver Creek and is about 1,500 feet above sea level. The highest point is in the narrow strip of uplands between Howard and Nance Counties and is about 2,000 feet above sea level. Central City has an elevation of about 1,700 feet.

manufacturing and business services of agriculture

Farming and businesses associated with farming are the main industries in Merrick County. Industries related to farming include a sawmill, precast concrete bunk silos and feed bunks, a meat processing plant, animal feeds, fertilizer blending plants, and seed corn production. Popcorn is grown and processed for retail distribution.

Central City supports several firms that engage in the manufacture of products for national markets. A manufacturer of mobile homes is one of the larger employers. Many businesses produce, sell, and service machinery used in agriculture.

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 market terminals, such as Omaha.

Grain and feed products not used or stored on farms are sold to local grain elevator operators who transport them by rail or truck to large markets. Dairy and poultry products produced on the farm are marketed locally and outside the county.

trends in farming and soil use

Farming has been a major part of the economy in Merrick County since it was settled. The 1970 Nebraska Agricultural Statistics listed 830 farms in Merrick County, but by 1977 the number had dropped to 760. The general trend is to larger farms that use larger machinery. The average farm in 1969 was 354 acres, and in 1977 it increased to 390 acres. The drop in the number of farms is due partly to urbanization, mainly from the city of Grand Island in adjacent Hall County. The use of farmland for urban expansion, industrialization, and roads can be expected to continue in the immediate future.

The largest recent change in soil use in Merrick County has been the increase in acres irrigated. In recent years, center-pivot sprinklers have contributed greatly to this increase. This method of irrigation is well adapted to the undulating, hummocky, loamy and sandy soils in the northwestern part of the county. According to the Nebraska Agricultural Statistics, the total irrigated land in 1969 was 87,500 acres and in 1977 was 173,000 acres. The total number of irrigation wells in Merrick County was 2,416 in 1969 and 3,403 in January, 1978. Merrick County is one of the top counties in the state for the number of irrigation wells and the number of wells per square mile. The people of Merrick County claim it is the "pump irrigation center of the world."

The increased irrigation has increased the use of commercial fertilizers. In 1977, 68,014 tons of commercial fertilizers were sold in Merrick County.

Corn is the main crop in the county. The acreage of all planted corn increased from 96,910 acres in 1969 to 151,000 acres in 1977. The acreage of irrigated corn increased about 69 percent in this period, from 79,000 acres in 1969 to 134,000 acres in 1977. The acreage of sorghum planted increased from 3,980 acres in 1969 to 5,200 acres in 1977. During this period the acreage of winter wheat planted decreased from 13,720 acres to 7,200 acres.

According to Nebraska Agricultural Statistics, the acreage of alfalfa decreased from 17,000 acres in 1969 to 11,500 acres in 1977. The acreage of harvested wild hay decreased from 9,300 acres in 1969 to 6,600 acres in 1977. Some of the soils that were previously in winter wheat, alfalfa, and wild hay have been developed for irrigated crops. There has been a downward trend in the number of acres used for dryland crops.

The number of cattle on farms decreased from more than 62,605 in 1969 to 54,993 in 1974. The number of swine on farms increased from 31,310 in 1969 to 33,100 in 1977. The number of sheep and chickens decreased gradually from 1969 to 1977.

Machines are used for much of the work formerly done by hand. New ideas are accepted more readily than in the past. The price of farmland more than tripled from the early 1960's to the late 1970's.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams, the general pattern of drainage, and the kinds of native plants or crops. They dug many holes to study 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, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated

on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each soil association on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one soil association can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

silty soils on uplands

These soils are strongly sloping to steep and well drained and somewhat excessively drained. Most areas of these soils are in native grassland and are grazed by cattle. The smooth, less sloping areas are used for dryland crops. The principal hazard is erosion by water.

One association is in this group.

1. Crofton-Nora association

Deep, strongly sloping to steep, well drained and somewhat excessively drained, silty soils formed in loess; on uplands

This association consists mainly of strongly sloping ridges of loess that are dissected by deeply entrenched drainageways that have moderately steep and steep side slopes (fig. 2). It is in a narrow strip in the loess uplands north of the Loup River.

This association occupies about 3,100 acres or about 1 percent of the county. Crofton soils make up about 73 percent of this association and Nora soils 16 percent. The remaining 11 percent is soils of minor extent.

The Crofton soils are on side slopes of intermittent drainageways on loess uplands. They are strongly sloping to steep and well drained and somewhat excessively drained. Areas are long or irregular in shape. Typically, the surface layer is grayish brown silt loam about 4 inches thick. Beneath this is a transitional layer of light brownish gray silt loam about 4 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of 60 inches or more.

The Nora soils are associated with Crofton soils on smooth ridgetops and side slopes on the loess uplands. They are strongly sloping or moderately steep and well drained. Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is grayish brown and brown silt loam about 14 inches thick. The underlying material is pale brown, calcareous silt loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Holder and Hobbs soils. The Holder soils are nearly level on ridgetops and are well drained. The Hobbs soils are on the narrow bottom lands of intermittent drainageways and are occasionally flooded.

Farming in this association is diversified but is mainly a combination of cash-grain and livestock enterprises. Most of the steeper areas are native grasslands and are used by beef cattle for grazing. The smoother slopes are used for dryland cultivated crops, chiefly grain sorghum and wheat.

Water erosion is a serious hazard in the cultivated areas. Much of the original surface layer has been removed from these soils, and many small gullies form after heavy rains. Maintaining soil fertility and conserving moisture are the main concerns of management. The areas of native grassland support stands of mid and short grasses.

Farms in this association average about 480 acres. Good gravel roads are few. Some section lines do not have roads or trails.

sandy soils on uplands and stream terraces and in sandhill valleys

These soils are nearly level to moderately steep and somewhat poorly drained to excessively drained. Most areas of these soils are in native grassland and are grazed by beef cattle. Some areas are cultivated and are irrigated. Irrigation is mainly by center-pivot sprinklers. The principal hazard is soil blowing, and the principal limitation is wetness in spring.

Two associations are in this group.

2. Valentine-Thurman-Boelus association

Deep, nearly level to moderately steep, excessively drained to well drained, sandy soils formed in eolian sand and loess; on uplands and stream terraces

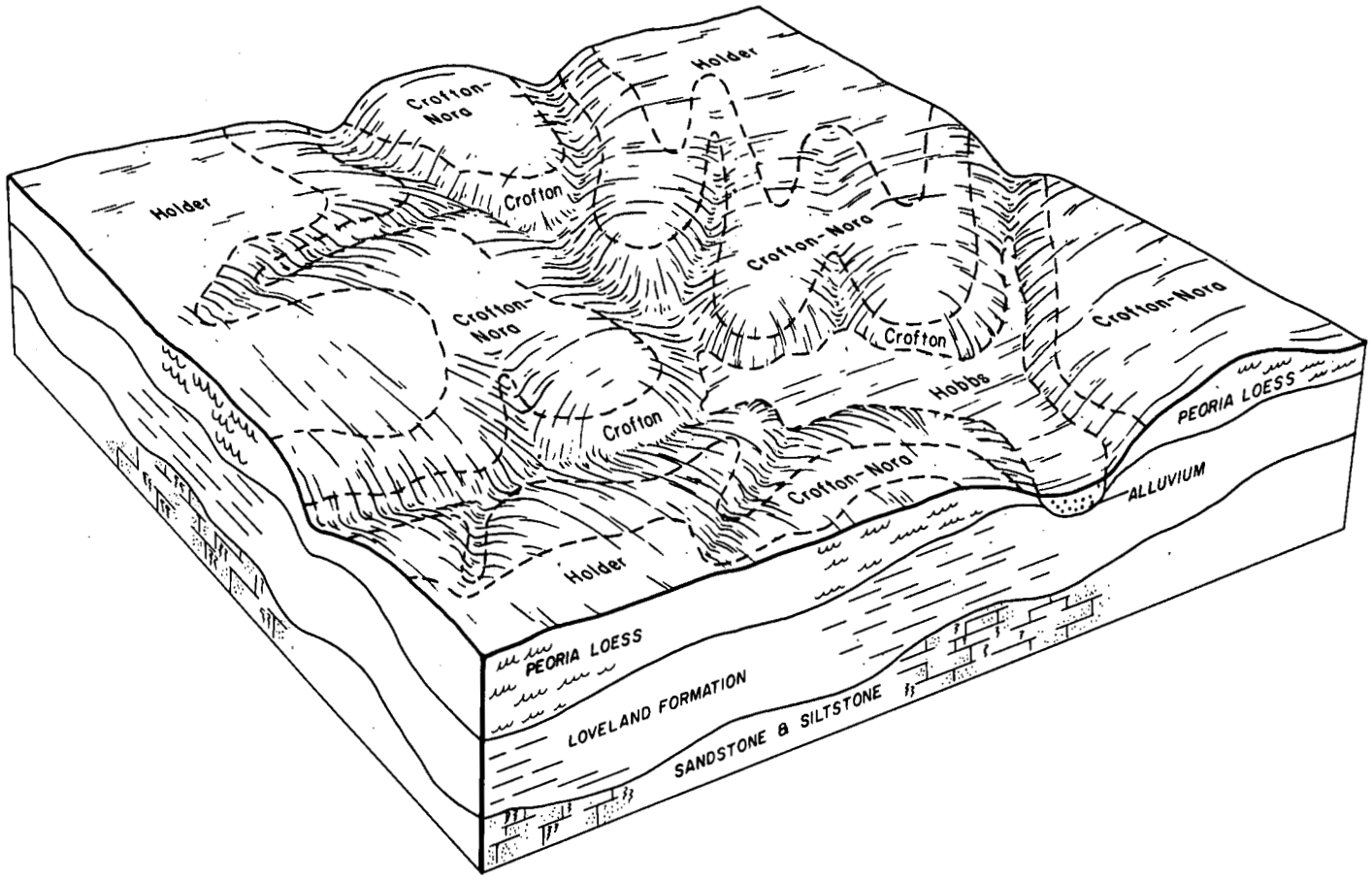

Figure 2.—Pattern of soils in the Crofton-Nora association and their relationship to topography and parent materials.

This association consists mainly of nearly level to moderately steep soils on uplands and high stream terraces (fig. 3). Natural surface drainageways are generally not well defined.

This association occupies about 28,000 acres or about 9 percent of the county. Valentine soils make up about 63 percent of this association, Thurman soils 12 percent, and Boelus soils 11 percent. The remaining 14 percent is soils of minor extent.

The Valentine soils are on uplands and stream terraces. They are excessively drained and range from very gently sloping to moderately steep. Most areas are rolling. Typically, the surface layer is grayish brown fine sand about 4 inches thick. Beneath this is a transitional layer of pale brown fine sand about 4 inches thick. The underlying material is very pale brown fine sand to a depth of 60 inches or more.

The Thurman soils are on stream terraces. They are somewhat excessively drained and very gently sloping or gently sloping. Most areas are undulating to hummocky. Typically, the surface layer is dark gray and dark grayish brown loamy fine sand about 14 inches thick. Beneath this is a transitional layer of grayish brown loamy fine sand about 5 inches thick. The underlying material is brown and pale brown loamy fine sand to a depth of 60 inches or more.

The Boelus soils are on the lower part of side slopes and swales on stream terraces. They are in complex landscapes with Valentine soils. These soils are well drained and nearly level to strongly sloping. Most areas are hummocky. Typically, the surface layer is grayish brown and brown loamy fine sand about 12 inches thick. Beneath this is light yellowish brown fine sand about 16 inches thick. The subsoil is very pale brown silt loam 24 inches thick. The underlying material is very pale brown silt loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Blendon, Ipage, Kenesaw, Loretto, and Simeon soils. These soils are at a lower elevation than the major soils.

Most areas of this association are in native grassland and are used by beef cattle for grazing. Farming is diversified but consists mainly of a livestock enterprise

that is supplemented with cash grain grown in nearby associations. In recent years, considerable grassland in this association has been cultivated and used for irrigated crops. Irrigation is by pivot sprinklers. Corn and alfalfa are the main irrigated crops.

Soil blowing is moderate or severe if the soils are cultivated or if the native grasses are overgrazed. Controlling soil blowing, maintaining high fertility, and conserving moisture are the main concerns of management in the cultivated areas. Good range management practices, such as proper grazing use, deferred grazing, and planned grazing systems of use and rest, are important on rangeland.

Farmsteads are few. Fewer than 20 percent of the farm operators have headquarters in areas of this association. Most operators and owners live in other areas that are better suited to cultivation. The part of the farm operating unit that is in this association averages about 800 acres. Good gravel roads are few. Trails are on some section lines.

3. Ipage-Els-Libory association

Deep, nearly level and very gently sloping, moderately well drained and somewhat poorly drained, sandy soils formed in eolian sand, alluvium, and loess; in sandhill valleys and on stream terraces

This association consists mainly of undulating low ridges on stream terraces and in intervening swales and depressions in sandhill valleys.

This association occupies about 20,000 acres or about 6 percent of the county. Ipage soils make up about 39 percent of this association, Els soils 18 percent, and Libory soils 17 percent. The remaining 26 percent is soils of minor extent.

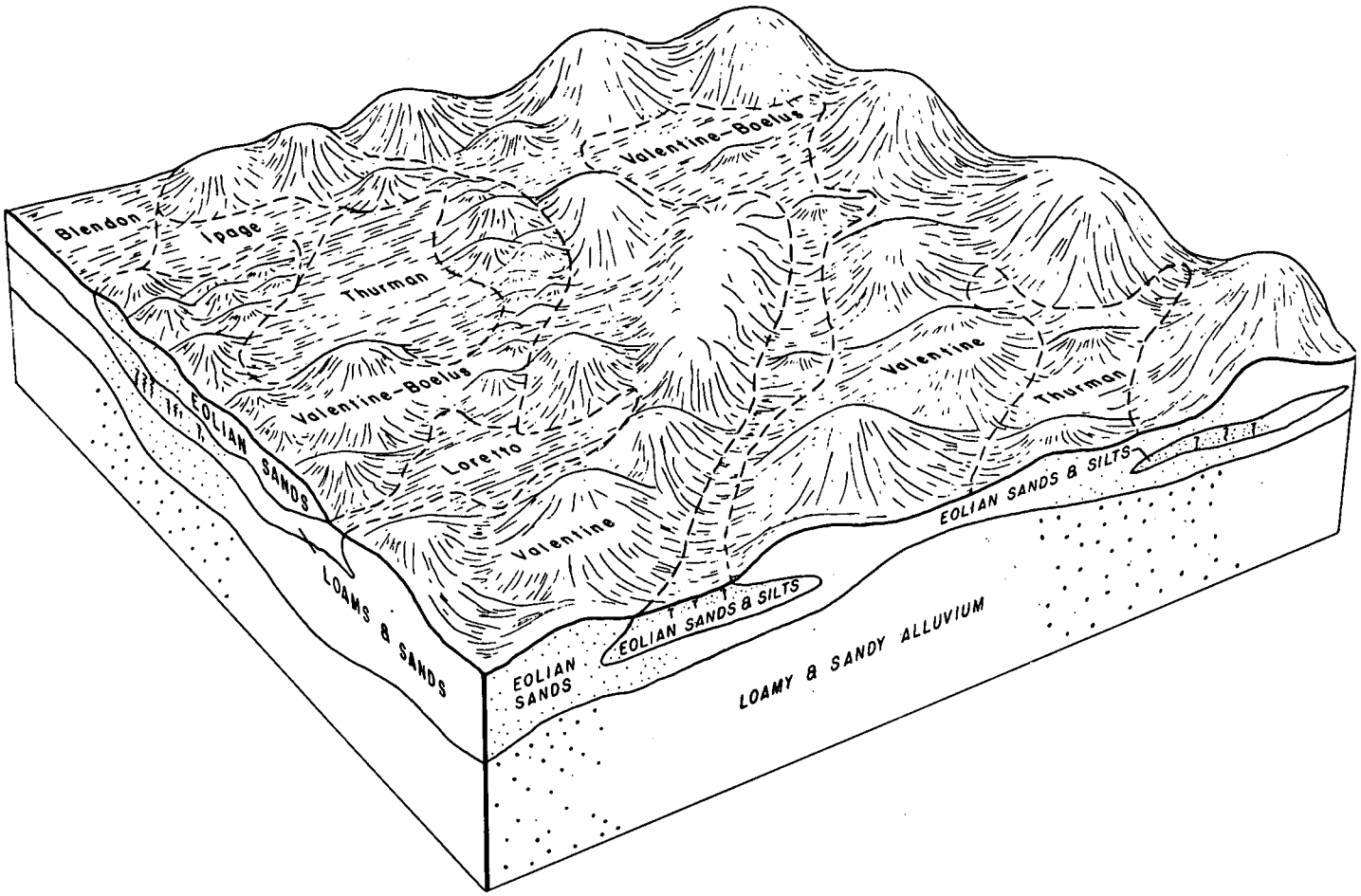

Figure 3.—Pattern of soils in the Valentine-Thurman-Boelus association and their relationship to topography and parent materials.

The Ipage soils are in sandhill valleys and on stream terraces. They are moderately well drained and nearly level and very gently sloping. Typically, the surface layer is gray loamy fine sand about 9 inches thick. The underlying material is brown and gray fine sand to a depth of 60 inches or more. It is mottled in the lower part.

The Els soils are in smooth sandhill areas in valleys and on stream terraces. They are nearly level and somewhat poorly drained. Typically, the surface layer is dark gray loamy fine sand about 8 inches thick. Beneath this is a transitional layer of pale brown, mottled loamy fine sand about 3 inches thick. The underlying material is pale brown and light gray loamy fine sand and loamy sand to a depth of 60 inches or more.

The Libory soils are in smooth areas of stream terraces. They are moderately well drained and nearly level or very gently sloping. Typically, the surface layer is gray and grayish brown loamy fine sand. The subsoil is pale brown, mottled silt loam about 14 inches thick. The underlying material is light gray, mottled silt loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Lamo, Leshara, Marlake, Ovina, Platte, Gothenburg, Simeon, and Valentine soils. The Lamo, Leshara, and Ovina soils are on bottom lands. The Marlake soils are in basins on bottom lands and stream terraces. Water ponds in these basins. The Platte and Gothenburg soils are on bottom lands of major drainageways and are frequently flooded. The Simeon soils are nearly level and on stream terraces. The Valentine soils are excessively drained and occupy rolling areas on uplands and stream terraces.

Farming is diversified but is mainly a combination of cash-grain and livestock enterprises. About 60 percent of the areas in this association is cultivated. Nearly 30 percent of the cultivated cropland is irrigated, mainly by sprinklers. Wheat, grain sorghum, and corn are the main dryland crops, and corn and grain sorghum are the principal irrigated crops. The remaining 40 percent of this association is in native grassland and is used for haying or for grazing by beef cattle. The grassland is mid and tall grasses. A fluctuating water table is sufficiently high to provide moisture for grasses in the low areas.

Wetness in spring and droughtiness in the coarse textured soils are the main limitations in this association. Soil blowing during dry periods is a severe hazard. Wetness delays planting in the low areas in spring. Maintaining fertility and controlling soil blowing are the principal concerns of management. Installation of good range management practices, such as proper grazing, deferred grazing, and a planned grazing system of use and rest, are needed on the native rangeland.

Farms in this association average about 640 acres. Nearly all of the farms have access to good gravel roads or hard surface roads. Some section lines do not have roads or trails. A few highways cross areas of this association.

sandy, loamy, and silty soils on uplands and stream terraces

These soils are nearly level to strongly sloping and excessively drained and well drained. Most areas are cultivated. They are used for both dryland and irrigated crops. Irrigation is mainly by center-pivot sprinklers. The principal hazards are soil blowing and water erosion.

One association is in this group.

4. Valentine-Loretto-Kenesaw association

Deep, nearly level to strongly sloping, excessively drained and well drained, sandy, loamy, and silty soils formed in eolian sand, loess, and alluvium; on uplands and stream terraces

This association consists of low, hummocky to rolling hills on uplands and stream terraces. Natural surface drainageways are not well defined.

This association occupies about 15,000 acres or about 5 percent of the county. Valentine soils make up about 40 percent of this association, Loretto soils 37 percent, and Kenesaw soils 15 percent. The remaining 8 percent is soils of minor extent.

The Valentine soils are on long, hummocky ridges on uplands and stream terraces. They are gently sloping to strongly sloping and excessively drained. Typically, the surface layer is grayish brown fine sand about 4 inches thick. Beneath this is a transitional layer of pale brown fine sand about 4 inches thick. The underlying material is very pale brown fine sand to a depth of 60 inches or more.

The Loretto soils are in low, undulating areas on stream terraces. They are nearly level to strongly sloping and well drained. Typically, the surface layer is brown and grayish brown fine sandy loam about 19 inches thick. The subsoil is brown silty clay loam about 25 inches thick. The underlying material is pale brown silty clay loam to a depth of 60 inches or more.

The Kenesaw soils are on stream terraces. They are nearly level to gently sloping and well drained. Typically, the surface layer is grayish brown silt loam 8 inches thick. The subsoil is brown silt loam 7 inches thick. The underlying material is light yellowish brown and pale brown silt loam and very fine sandy loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Janude, Ipage, and Rusco soils. The Janude soils are moderately well drained and on bottom lands. The Ipage soils are moderately well drained and on high stream terraces. The Rusco soils are moderately well drained and on stream terraces.

Farming in this association is diversified but is mainly a combination of cash-grain and livestock enterprises. About 70 percent of the areas in this association is used for cultivated crops, and of this nearly 40 percent is irrigated, mainly by sprinklers. The remaining 30 percent is in native grassland and is used for grazing primarily by

beef cattle. The native grassland consists of tall, mid, and short grasses. Wheat, grain sorghum, and alfalfa are the main dryland crops. Corn, grain sorghum, and alfalfa are the principal irrigated crops.

Soil blowing is a hazard in sandy areas that are cultivated. Controlling soil blowing, maintaining high fertility, and conserving moisture are the main concerns of management. Good range management practices, such as proper grazing use, deferred grazing, and a planned grazing system of use and rest, are the principal needs on grassland.

Farms in this association average about 480 acres. Nearly all of the farms have access to gravel roads or hard surface roads. Trails are on some section lines. Paved highways cross this association. The town of Palmer is in this association.

silty and loamy soils on stream terraces

These soils are nearly level to gently sloping and well drained. Nearly all areas of these soils are used for cultivated crops, and most of the cropland is irrigated. Irrigation is mainly by gravity. Soil blowing is the principal hazard. Many areas are droughty.

Two associations are in this group.

5. Hord-Hall association

Deep, nearly level, well drained, silty soils formed in alluvium and loess; on stream terraces

This association consists mainly of nearly level, long smooth areas on stream terraces.

This association occupies 10,500 acres or about 3 percent of the county. Hord soils make up about 65 percent of this association and Hall soils about 26 percent. The remaining 9 percent is soils of minor extent.

The Hord soils are on stream terraces. They are nearly level and well drained. Typically, the surface layer is dark gray and dark grayish brown silt loam about 21 inches thick. The subsoil is dark grayish brown and brown silt loam about 21 inches thick. The underlying material, to a depth of 60 inches or more, is very pale brown gravelly sand.

The Hall soils are on stream terraces. They are nearly level and well drained. Typically, the surface layer is dark gray silt loam about 16 inches thick. The subsoil is dark grayish brown and grayish brown silty clay loam about 24 inches thick. The underlying material is pale brown silt loam to a depth of about 46 inches. Below that, it is pale brown fine sand to a depth of 60 inches or more.

Of minor extent in this association are mainly the Blendon and Brocksburg soils. The Blendon soils are nearly level to gently sloping and generally at the highest elevation. The Brocksburg soils are nearly level and at about the same elevation as the major soils.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises; however, some enterprises are only cash grain. Nearly all areas of this association are used for cultivated crops and are irrigated by a gravity system. Corn and grain sorghum are the principal irrigated crops. A few areas are dryfarmed to wheat and grain sorghum.

The main concerns of management are maintaining high fertility and conserving soil moisture. Water erosion is a hazard in a few areas where slope gradient increases rapidly within a short distance.

Farms in this association range widely from 80 to 960 acres in size, averaging about 400 acres. Nearly all farms have access to good gravel roads or hard surface roads. Some section lines do not have roads or trails.

6. O'Neill-Brocksburg-Blendon association

Nearly level to gently sloping, well drained, loamy soils that are moderately deep or deep over sand and gravel and formed in alluvium and mixed eolian materials; on stream terraces

This association consists mainly of nearly level, long smooth areas on stream terraces (fig. 4). Gently sloping breaks are between the stream terraces and the adjacent bottom land.

This association occupies 37,000 acres or about 12 percent of the county. O'Neill soils make up about 49 percent of this association, Brocksburg soils 28 percent, and Blendon soils 12 percent. The remaining 11 percent is soils of minor extent.

The O'Neill soils are on stream terraces. They are moderately deep over gravelly sand, nearly level to gently sloping, and well drained. Typically, the surface layer is dark gray sandy loam about 23 inches thick. The subsoil is grayish brown loamy coarse sand about 7 inches thick. The underlying material is light brownish gray, light gray, and very pale brown coarse sand to a depth of 60 inches or more.

The Brocksburg soils are on stream terraces. They are moderately deep over gravelly sand, nearly level, and well drained. Typically, the surface layer is dark grayish brown loam about 20 inches thick. The subsoil is grayish brown clay loam about 7 inches thick. The underlying material is pale brown gravelly sand to a depth of 60 inches or more.

The Blendon soils are on stream terraces. They are deep, nearly level to gently sloping, and well drained. Typically, the surface layer is dark grayish brown fine sandy loam about 16 inches thick. The subsoil is dark grayish brown fine sandy loam and sandy loam. The underlying material is pale brown sandy loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Hord, Lockton, and Meadin soils. The Hord soils are deep, nearly level, and on stream terraces. The Lockton soils are moderately deep over gravelly sand, nearly level, and on bottom lands. The Meadin soils are shallow over gravelly sand, gently sloping to strongly sloping, and on breaks between the stream terraces and adjacent bottom lands.

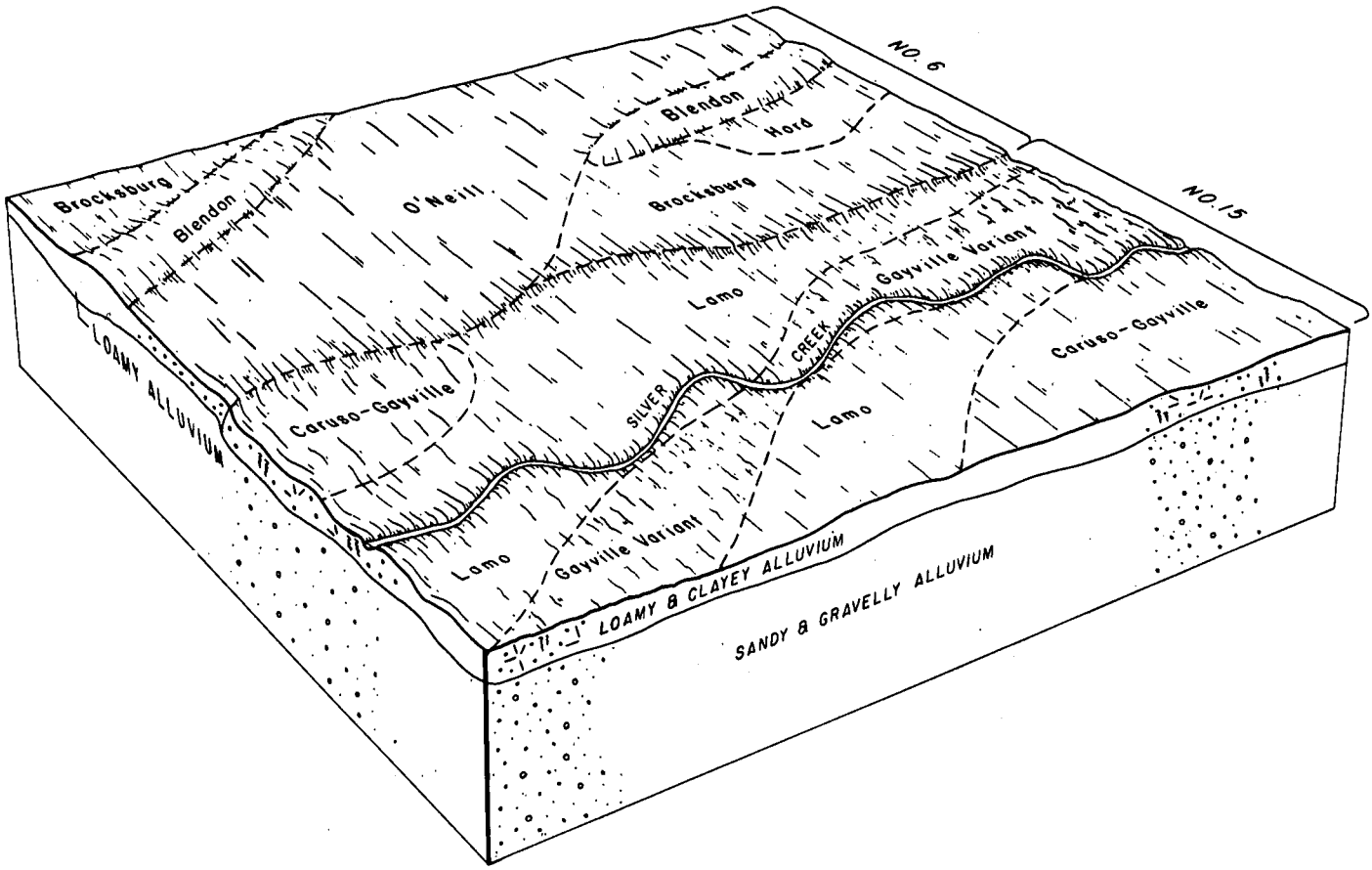

Figure 4.—Pattern of soils in the O'Neill-Brocksburg-Blendon association and the Lamo-Gayville Variant association and their relationship to topography and parent materials.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises; however, a few enterprises are only cash grain. Nearly all areas of this association are cultivated. About 85 percent of these is irrigated, mainly by gravity irrigation. Wheat and grain sorghum are the main dryland crops. Corn and grain sorghum are the principal irrigated crops. The areas of native grassland consist of short and mid grasses.

Soil blowing is a hazard if the soils are cultivated. Water erosion is a hazard on the gently sloping soils. Controlling soil blowing and water erosion, maintaining high fertility, and conserving soil moisture are the main concerns of management in cultivated areas. Generally, some land leveling is necessary for gravity irrigation. Good range management practices, such as proper grazing use, deferred grazing, and a planned grazing system of use and rest, are the chief concerns on rangeland.

Farms in this association range from 80 to 1,280 acres but average about 480 acres. Nearly all the farms have access to good gravel roads or hard surface roads. Some section lines do not have roads or trails.

loamy and silty soils on bottom lands

These soils are nearly level and are poorly drained, somewhat poorly drained, or moderately well drained. These soils are subject to flooding. About 75 percent of the areas of these soils is cultivated and most of this is irrigated, mainly by gravity irrigation. The principal hazard is soil blowing, and the principal limitation is wetness in spring.

Five associations are in this group.

7. Leshara-Lex-Janude association

Nearly level, somewhat poorly drained and moderately well drained, loamy and silty soils that are deep and moderately deep over sand and gravel and formed in alluvium; on bottom lands

This association consists of nearly level, long smooth areas on bottom lands in the Platte River Valley (fig. 5). The fluctuating water table influences plant growth in most areas, except on ridges at a higher elevation. Many of the shallow, intermittent drainageways leading to major tributaries are not well defined because of land grading and shaping that was needed for development of irrigation.

This association occupies about 82,666 acres or about 27 percent of the county. Leshara soils make up about 20 percent of this association, Lex soils 17 percent, and Janude soils 16 percent. The remaining 47 percent is soils of minor extent.

The Leshara soils are in smooth areas on bottom lands. They are deep, nearly level, and somewhat poorly drained. Typically, the surface layer is grayish brown and dark grayish brown silt loam about 12 inches thick. Beneath this is a transitional layer of gray silt loam about 8 inches thick. The underlying material is light brownish gray and light gray silt loam to a depth of about 46 inches. Below that, it is very pale brown coarse sand to a depth of 60 inches or more.

The Lex soils occupy smooth areas on bottom lands. They are moderately deep over coarse sand and gravelly sand, nearly level, and somewhat poorly drained. Typically, the surface layer is dark gray, grayish brown, and gray loam about 17 inches thick. The underlying material is light gray loam to a depth of about 24 inches. Below that it is very pale brown, stratified coarse sand and gravelly sand to a depth of 60 inches or more.

The Janude soils occupy long areas on bottom lands that are slightly higher than the adjacent soils. They are deep, noncalcareous, nearly level, and moderately well drained. Typically, the surface layer is grayish brown and gray sandy loam. Beneath this is a transitional layer of light brownish gray fine sandy loam about 8 inches thick. The underlying material is light gray loamy sand to a depth of 60 inches or more.

Of minor extent in this association are the Alda, Fonner, Gibbon, Inavale, Lamo, Lockton, Merrick,

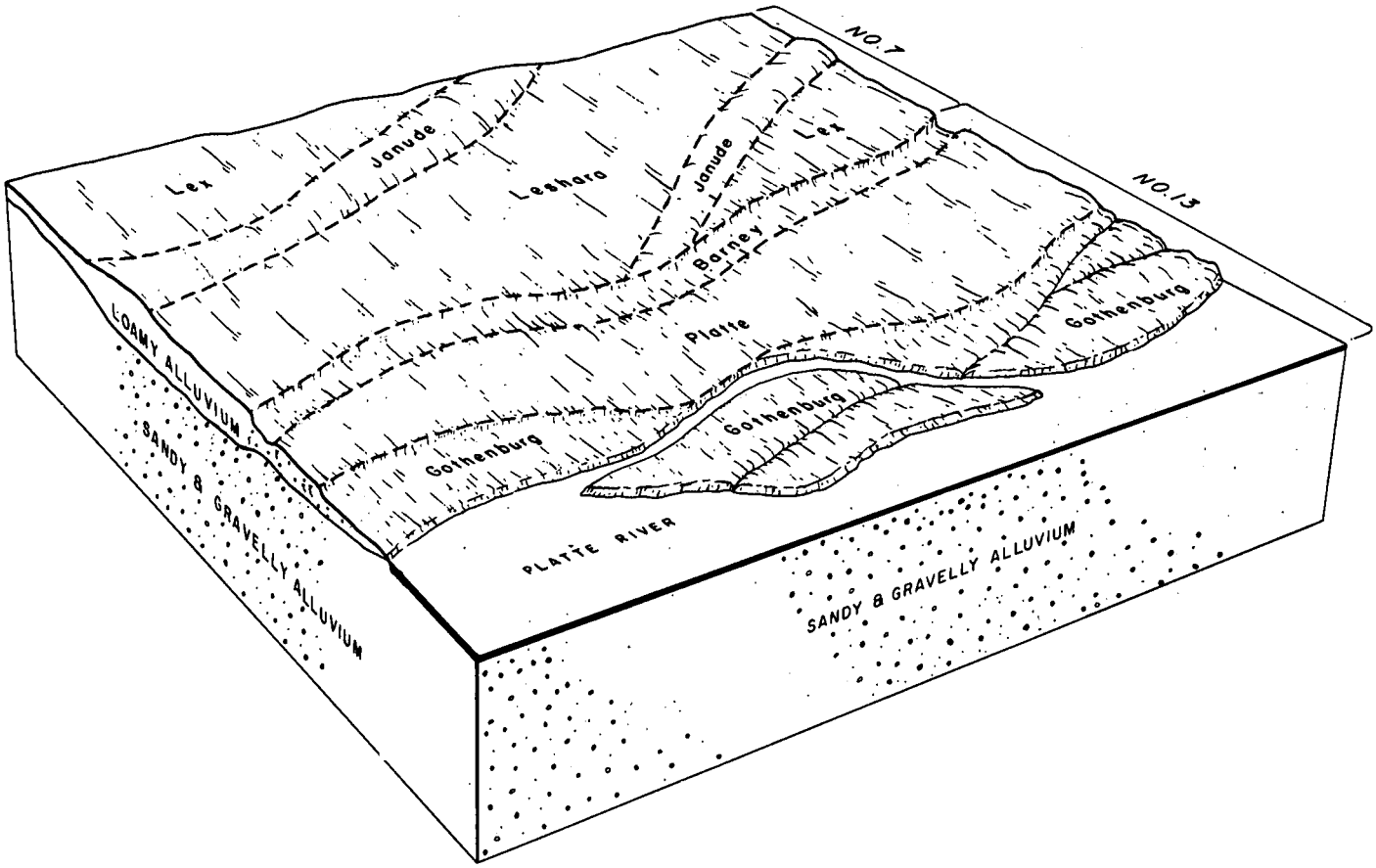

Figure 5.—Pattern of soils in the Leshara-Lex-Janude association and the Gothenburg-Platte-Barney association and their relationship to topography and parent materials.

Novina, Ovina, and Wann soils. The Alda, Gibbon, Lamo, Ovina, and Wann soils are at about the same elevation as the Leshara and Lex soils. The Fonner, Lockton, Merrick, and Novina soils are at a slightly higher elevation similar to that of the Janude soil. The Inavale soils are nearly level to strongly sloping and are at the highest elevation on the bottom lands.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises. About 75 percent of this association is cultivated. Nearly 80 percent of the cultivated acreage is irrigated, mainly by gravity irrigation. Corn, wheat, grain sorghum, alfalfa, and introduced grasses are the main dryfarmed crops. Corn and grain sorghum are the principal irrigated crops, but smaller amounts of soybeans, alfalfa, introduced grasses, popcorn, and potatoes are also grown. Land grading improves the surface drainage and increases efficiency of most irrigation systems. The remaining 25 percent of the association is in native grassland and various land uses. Range consists of mid and tall grasses.

Soil blowing is a hazard in areas of the sandy loam soils that are cultivated. The soils in this association are subject to rare or occasional flooding. The main concerns of management are wetness in spring, the low available water capacity of some soils, controlling soil blowing, maintaining high fertility, and conserving moisture. Good range management practices, such as proper grazing use, deferred grazing, and a planned grazing system of use and rest, are major concerns for maintaining and keeping the native grasses in good condition.

Farms in this association average about 400 acres. Nearly all the farms have access to good gravel roads or hard surface roads. One major highway traverses this association for more than 45 miles. Some section lines do not have roads or trails. The towns of Clarks, Chapman, Silver Creek, and much of Central City are in this association.

8. Lockton association

Nearly level, moderately well drained, loamy soils that are moderately deep over sand and gravel and formed in noncalcareous alluvium; on bottom lands

This association consists mainly of nearly level, smooth areas on high bottom lands. These areas have a fluctuating water table that influences plant growth in the early part of the growing season.

This association occupies about 14,000 acres or about 5 percent of the county. Lockton soils make up about 90 percent of this association. The remaining 10 percent is soils of minor extent.

The Lockton soils are on bottom lands. They are moderately deep over coarse sand or gravelly sand, nearly level, moderately well drained, and noncalcareous. Typically, the surface layer is dark grayish brown and dark gray loam about 13 inches thick. Beneath this is a transitional layer of grayish brown loam about 10 inches thick. The upper 4 inches of the underlying material is grayish brown sandy loam. Below that, the underlying material is very pale brown gravelly coarse sand to a depth of 60 inches or more.

Of minor extent in this association are the Fonner, Janude, and Lex soils. The Fonner and Janude soils are at a slightly higher elevation than the Lockton soils. The somewhat poorly drained Lex soils are at a slightly lower elevation.

Farming in this association is diversified. It is mainly a combination of grain and livestock enterprises; although, some enterprises are only cash-grain. Nearly all the acreage of this association is used for irrigated crops. Irrigation is by gravity. Some of the irrigation wells have a low pumping capacity. Land grading, if needed, increases efficiency of the irrigation system and improves surface drainage. Corn and grain sorghum are the principal irrigated crops. Wheat and grain sorghum are the main dryland crops.

The main concerns of management in this association are maintaining high fertility, the low available water capacity, and conserving soil moisture. Lime is needed for legume crops that do not tolerate a strongly acid soil reaction.

Farms in this association average about 480 acres. Gravel or hard surface roads are along most section lines.

9. Fonner association

Nearly level, moderately well drained, loamy soils that are moderately deep over sand and gravel and formed in noncalcareous alluvium; on bottom lands

This association consists mainly of nearly level, smooth areas on high bottom lands. These areas generally have a fluctuating water table that influences plant growth in the early part of the growing season. These areas are rarely flooded.

This association occupies about 10,000 acres or about 3 percent of the county. Fonner soils make up about 92 percent of this association. The remaining 8 percent is soils of minor extent.

The Fonner soils are on bottom lands. They are moderately deep over gravelly sand, nearly level, moderately well drained, and noncalcareous. Typically, the surface layer is very dark grayish brown sandy loam about 20 inches thick. Beneath this is a transitional layer of gray loamy sand about 6 inches thick. The underlying material is light brownish gray gravelly sand and coarse sand to a depth of 60 inches or more.

Of minor extent in this association are mainly the Inavale and Platte soils. The Inavale soils are nearly level to gently sloping and occupy areas above the Fonner soils. The Platte soils are nearly level and generally at a lower elevation than the Fonner soils.

Farming in this association is diversified. It is mainly a combination of grain and livestock enterprises. About 85

percent of the areas is used for cultivated crops. Nearly all cultivated crops are irrigated by gravity irrigation or sprinklers. Some of the irrigation wells have a low pumping capacity. Corn and grain sorghum are the principal irrigated crops, but smaller amounts of potatoes and soybeans and introduced grasses for pasture are also grown. Wheat and grain sorghum are the main dryland cultivated crops. Land grading, if needed, increases the efficiency of gravity irrigation. The remaining 15 percent of the association is in native grassland and used for haying or for grazing, primarily by beef cattle. The grassland supports short and mid grasses.

Soil blowing is a hazard in this association. The main limitation is the low available water capacity. The principal concerns of management are controlling soil blowing, maintaining high fertility, and conserving soil moisture. Good range management practices, such as proper grazing use, deferred grazing, and a planned grazing system of use and rest, are major concerns for maintaining the native grasses in good condition.

Farms in this association average about 400 acres. Nearly all the farms have access to good gravel roads or improved dirt roads along most section lines.

10. Wann-Novina association

Deep, nearly level, somewhat poorly drained and moderately well drained, loamy soils formed in alluvium; on bottom lands

This association consists mainly of nearly level areas on bottom lands in valleys of the Loup and Platte Rivers. The fluctuating water table influences plant growth on soils in this association.

This association occupies about 15,000 acres, or about 5 percent of the county. Wann soils make up about 51 percent of this association and Novina soils 34 percent. The remaining 15 percent is soils of minor extent.

The Wann soils are on bottom lands at a lower elevation than Novina soils. They are deep, nearly level, and somewhat poorly drained. Areas are smooth to undulating. Typically, the surface layer is dark gray and dark grayish brown sandy loam about 14 inches thick. Beneath this is a transitional layer of grayish brown sandy loam about 6 inches thick. The underlying material is light brownish gray sandy loam in the upper part and very pale brown sand in the lower part to a depth of 60 inches.

The Novina soils are on the higher parts of bottom lands. They are deep, nearly level, and moderately well drained. Typically, the surface layer is dark gray and gray sandy loam about 19 inches thick. Beneath this is a transitional layer of gray sandy loam about 7 inches thick. The underlying material is light gray and light brownish gray, mottled loam to a depth of 42 inches. Below that, it is grayish brown and white sandy loam and loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Ipage, Inavale, Lamo, Leshara, Lex, and Ovina soils. The Ipage and Ovina soils are on foot slopes of the high bottom lands. The Inavale soils are in long, narrow areas at the highest elevation in the landscape. The Lamo soils are in low wet areas of the bottom lands. The nearly level Leshara and Lex soils are on bottom lands at about the same elevation as the major Wann soil.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises. About 65 percent of the areas is cultivated. Dryland farming is mainly used because of the difficulty in obtaining adequate irrigation water in the Loup River Valley. Some of the irrigation wells have a low pumping capacity. About 35 percent of the cultivated areas is irrigated, by gravity irrigation or sprinklers. Wheat, grain sorghum, and alfalfa are the main dryland crops, and corn and grain sorghum are the principal irrigated crops. The remaining 35 percent of the areas is in native grassland and used for haying and grazing. The grassland supports mid and tall grasses.

Soil blowing is a hazard in areas that are cultivated. The main limitation is wetness in spring. The main concerns of management are controlling soil blowing, maintaining high fertility, and conserving soil moisture during the later part of the growing season. Good range management practices, such as proper grazing use, deferred grazing, a planned grazing system of use and rest, and timely haying, are the major concerns for keeping the native grasses in good condition.

Farms in this association average about 320 acres. Gravel roads or improved dirt roads are along most section lines. Some section lines do not have roads or trails. Most of the town of Worms is in this association.

11. Cozad association

Deep, nearly level, moderately well drained, loamy soils formed in alluvium; on bottom lands

This association consists mainly of nearly level smooth areas on bottom lands. A long narrow area parallels the drainageway of Warm Slough.

This association occupies about 7,000 acres or about 2 percent of the county. Cozad soils make up about 93 percent of this association. The remaining 7 percent is soils of minor extent.

The Cozad soils are in smooth areas on bottom lands. They are nearly level and moderately well drained. Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is light brownish gray very fine sandy loam about 15 inches thick. The underlying material is light brownish gray silt loam to a depth of about 36 inches. Below that, it is gray and very pale brown loam and fine sandy loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Alda, Hobbs, and Lex soils. The nearly level Alda and Lex soils are at a lower elevation than Cozad soils. The

Hobbs soils are on bottom lands along the entrenched, channeled area of Warm Slough.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises. Nearly all the areas of this association are used for irrigated crops. Irrigation is by gravity systems. Corn, grain sorghum, and alfalfa are the principal irrigated crops. Land grading, if needed, increases the efficiency of gravity irrigation. Wheat, alfalfa, and grain sorghum are the main dryfarmed crops. The channeled areas adjacent to Warm Slough are used for limited grazing and as habitat for wildlife.

Soil blowing is the main hazard in this association. The principal concerns of management are controlling soil blowing, maintaining high fertility, and conserving soil moisture.

Farms in this association average about 400 acres. Nearly all the farms have access to good gravel roads or hard surface roads along section lines.

sandy and loamy soils on bottom lands

Mainly these soils are poorly drained and somewhat poorly drained. Nearly all areas of these soils are in native or introduced grasslands and used for grazing or for haying. Only a small acreage is cultivated. The principal limitation is wetness in spring. Maintaining the grasses in good condition is an important concern of management.

Two associations are in this group.

12. Boel-Inavale association

Deep, nearly level to strongly sloping, somewhat poorly drained and somewhat excessively drained, loamy and sandy soils formed in alluvium; on bottom lands

This association consists mainly of nearly level to very gently sloping, shallow channels and intervening higher areas on bottom lands in the Loup River Valley. The fluctuating water table influences plant growth in most areas.

This association occupies about 800 acres or less than 1 percent of the county. Boel soils make up 81 percent of this association and Inavale soils 13 percent. The remaining 6 percent is soils of minor extent.

The Boel soils are on smooth, alternating low ridge and channel type areas of bottom lands. They are deep, nearly level, and somewhat poorly drained. Typically, the surface layer is dark gray loam about 8 inches thick. The underlying material is light gray very fine sandy loam to a depth of 16 inches. Below that, it is white, mottled fine sand to a depth of 60 inches or more.

The Inavale soils are in long, low ridgelike areas of bottom lands. They are deep, nearly level to strongly sloping, and somewhat excessively drained. Typically, the surface layer is grayish brown loamy fine sand about 7 inches thick. Beneath this is a transitional layer of light brownish gray loamy sand about 13 inches thick. The underlying material is light brownish gray loamy coarse sand to a depth of 60 inches or more. It contains thin strata of finer textured sediment.

Of minor extent in this association are the Barney soils in low channeled areas.

Farming in this association is mainly a livestock enterprise. Nearly all the areas are in native range or introduced grasses and used for haying or for grazing of beef cattle. Most areas of pasture are small. Corn is the principal crop in the small acreage that is cultivated.

The main concerns of management are excessive wetness in spring and soil blowing in areas that are cultivated. Proper haying and grazing practices are needed for maintaining the grasses in good condition.

Most farmsteads or headquarters are on land in other associations that is more suitable for cultivation. That part of the farm operating unit in areas of this association averages about 120 acres. Gravel roads are few, but trails are on most section lines.

13. Gothenburg-Platte-Barney association

Nearly level and very gently sloping, poorly drained and somewhat poorly drained, sandy and loamy soils that are shallow over sand and gravel and formed in recent alluvium; on bottom lands

This association consists mainly of nearly level and very gently sloping, low ridgelike areas intervening with shallow braided channels and areas of riverwash on bottom lands of the Platte River Valley. See figure 5. The fluctuating water table and occasional or frequent flooding influence plant growth in this association.

This association occupies about 23,000 acres or about 8 percent of the county. Gothenburg soils make up about 35 percent of this association, Platte soils 33 percent, and Barney soils 10 percent. The remaining 22 percent is soils of minor extent.

The Gothenburg soils are on bottom lands. They are very shallow or shallow to gravelly sand, nearly level and very gently sloping, and poorly drained. Areas are long and transected by shallow braided channels. Typically, the surface layer is dark gray loamy sand about 3 inches thick. The upper 8 inches of the underlying material is light gray coarse sand. Below that, the underlying material is very pale brown, mottled gravelly sand to a depth of 60 inches or more.

The Platte soils are on bottom lands. They are shallow to coarse sand or gravelly sand, nearly level, and somewhat poorly drained. Areas are long and smooth and have occasional shallow channels or are low and ridgelike. Typically, the surface layer is gray loam about 7 inches thick. Beneath this is a transitional layer of grayish brown loam about 6 inches thick. The underlying material is pale brown gravelly sand to a depth of 60 inches or more.

The Barney soils are in long, low-lying, abandoned channels on bottom lands. They are shallow to gravelly sand, nearly level, and poorly drained. Typically, the

surface layer is gray loam about 9 inches thick. The upper part of the underlying material is light brownish gray, mottled sandy loam 9 inches thick, and the lower part is light gray, mottled gravelly sand to a depth of 60 inches or more.

Of minor extent in this association are mainly the Alda, Inavale, Janude, and Wann soils and Pits and Dumps. The Alda and Wann soils are at a slightly higher elevation on bottom lands than the major soils. The Inavale and Janude soils are in the low ridgelike areas on bottomlands. The Pits and Dumps are on the bottom lands where sand and gravel have been mined and the waste material has been deposited.

Farming in this association is mainly a livestock enterprise. Nearly all areas of the Platte and Barney soils are in native grassland. The areas of Barney soils are suitable for mowing. The areas of Gothenburg soils have mixed vegetation, largely annual grasses, sedges, weeds, shrubs, and cedar trees, and have very limited use for grazing. A small acreage of this association is cultivated and generally irrigated, but yields are mainly poor. The areas in native grassland are used for haying and for grazing, principally by beef cattle. The rest of the areas provide very limited grazing and are used mainly as habitat for wildlife.

Good range management practices, such as proper grazing and a planned grazing system of use and rest, help keep the native grasses in good condition.

Most farmsteads or headquarters are on land in other associations that is more suitable for cultivation. That part of the farm operating unit that is in areas of this association ranges from 80 to 960 acres but averages about 320 acres. Gravel roads are few. Many of the dirt roads and trails are on section lines and extend only to the north channel of the Platte River. Some section lines do not have roads or trails.

silty and loamy, alkaline soils on bottom lands

These soils are nearly level and poorly drained and somewhat poorly drained. They are strongly alkaline or very strongly alkaline. Most of the areas are used for cultivated crops. Some large areas remain in native grassland and are mowed for hay or are grazed, primarily by beef cattle. Most of the cultivated land is irrigated, mainly by gravity irrigation. The principal limitations are wetness in spring and the saline-alkali condition of the soils.

Two associations are in this group.

14. Lamo-Caruso-Gayville association

Deep, nearly level, somewhat poorly drained, loamy and silty soils formed in alkaline alluvium; on bottom lands

This association consists mainly of nearly level areas on bottom lands. Some areas have small microdepressions. Most areas have a moderately deep water table that subirrigates the vegetation.

This association occupies about 38,000 acres or about 12 percent of the county. Lamo soils make up about 23 percent of this association, Caruso soils 17 percent, and Gayville soils 15 percent. The remaining 45 percent is soils of minor extent.

The Lamo soils are on bottom lands. They are nearly level and somewhat poorly drained. Typically, the surface layer is dark gray and gray clay loam. Beneath this is a transitional layer of gray silty clay loam about 9 inches thick. The underlying material is gray sandy clay loam to a depth of 42 inches. Below that it is light brownish gray gravelly sand to a depth of 60 inches or more.

The Caruso soils are in association with the microdepressions generally at a slightly higher elevation than the Gayville soils. The Caruso soils are nearly level and somewhat poorly drained. Typically, the surface layer is about 14 inches thick. The upper part of the surface layer is gray loam, and the lower part is dark gray clay loam. Beneath this is a transitional layer of gray loam about 10 inches thick. The underlying material is stratified light gray clay loam, brown sandy clay loam, grayish brown loam and sandy clay loam, and light brownish gray loamy sand to a depth of 60 inches or more.

The Gayville soils occupy the microdepressions in association with Caruso soils. The Gayville soils are nearly level, somewhat poorly drained, and strongly alkali. Surface water ponds in the microdepressions during and after rains. Typically, the surface layer is gray silt loam about 2 inches thick. The subsoil is dark gray and gray clay loam and silty clay about 26 inches thick. The underlying material is olive, pale olive, and light olive gray sandy loam and sandy clay loam to a depth of 60 inches or more.

Of minor extent in this association are mainly the Alda, Gibbon, Gothenburg, Leshara, Lex, Platte, and Wann soils. The Alda, Lex, Leshara, Wann, and Gibbon soils are at a slightly higher elevation than the major soils. The Gothenburg and Platte soils are on low bottom lands along Silver Creek and are at a lower elevation than the major soils.

Farming in this association is diversified. It is mainly a combination of cash-grain and livestock enterprises. About 65 percent of the areas is cultivated. Nearly 70 percent of the cultivated acreage is irrigated. Irrigation is primarily by gravity. Wheat, grain sorghum, and alfalfa are the main dryland cultivated crops. Corn and grain sorghum are the principal irrigated crops. Land grading has improved surface drainage and increased the efficiency of irrigation in many areas. The saline-alkali areas are difficult to improve, and crop growth is generally poor. The remaining 35 percent of this association is in native grasses and alkali-tolerant grasses. These areas are used primarily for haying and grazing. The native grasses are mainly mid and tall species.

Flooding is a common hazard in this association. The main concerns of management are wetness from the

water table in spring, salinity and alkalinity, maintaining high fertility, and conserving soil moisture. Good range management practices, such as proper grazing use, deferred grazing, a planned grazing system of use and rest, and obtaining a good stand of alkali-tolerant grasses, help keep the range in good condition.

Farms in this association average about 240 acres. Nearly all farms have access to good gravel roads or hard surface roads. Some section lines do not have roads or trails.

15. Lamo-Gayville Variant association

Deep, nearly level, poorly drained and somewhat poorly drained, silty soils formed in alkaline alluvium; on bottom lands

This association consists mainly of nearly level, smooth areas on bottom lands. See figure 4. These areas are transected by shallow, meandering drainageways. The soils have a fluctuating water table that influences plant growth.

This association occupies about 6,000 acres or about 2 percent of the county. Lamo soils make up 75 percent of this association and Gayville Variant soils about 18 percent. The remaining 7 percent is soils of minor extent.

The Lamo soils are in smooth areas on bottom lands. They are nearly level and poorly drained. Typically, the surface layer is dark gray silt loam about 19 inches thick. Beneath this is a transitional layer of gray silty clay loam about 6 inches thick. The underlying material to a depth of 35 inches is gray, mottled silty clay loam. Below that, it is light gray loam to a depth of 60 inches or more.

The Gayville Variant soils are on bottom lands at a slightly higher elevation than the Lamo soils. They are nearly level and somewhat poorly drained. Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is very dark grayish brown clay loam about 7 inches thick and is very strongly alkaline. The underlying material is pale olive silt loam and is very strongly alkaline to a depth of 60 inches or more.

Of minor extent in this association are mainly the Caruso and Novina soils. These soils are at a slightly higher elevation than the major Lamo and Gayville Variant soils.

Farming in this association is diversified but is mainly a combination of cash grain, hay, and livestock enterprises. Nearly all the areas of this association are in native grassland and are used for haying or for grazing by beef cattle. These areas support native mid and tall grasses. Many areas support alkali-tolerant grasses. A small acreage is cultivated and generally irrigated by gravity irrigation. Corn and grain sorghum are the principal irrigated crops.

The main concerns of management are excessive wetness in spring, the strong alkalinity of some soils, and proper haying and grazing practices for maintaining the native grasses.

Most farmsteads and headquarters are on land in other associations that is more suitable for cultivation. That part of the farm operating unit in this association ranges from 10 acres to 320 acres but averages about 120 acres. Gravel roads are few, but trails or improved dirt roads are on most section lines.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Crofton silt loam, 15 to 30 percent slopes, is one of several phases in the Crofton series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Caruso-Gayville complex, 0 to 1 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and Dumps is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Some soil boundaries and soil names in this survey do not match those in surveys of adjacent counties. Differences result from changes in mapping guidelines, slope groupings, correlation procedures, or concepts of soil classification.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Ac—Alda sandy loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands in the Platte River Valley. It is occasionally flooded. This soil is moderately deep over coarse sand or gravelly sand. It formed in alluvial materials. Areas range from 10 to 125 acres.

Typically, the surface layer is very friable, calcareous sandy loam about 12 inches thick. The upper part of the surface layer is dark gray, and the lower part is gray. Beneath this is a transitional layer of grayish brown, friable, calcareous fine sandy loam about 6 inches thick. The upper part of the underlying material is light brownish gray, calcareous fine sandy loam to a depth of 25 inches. The lower part is coarse sand and gravelly sand to a depth of 60 inches or more. In places, the depth to coarse sand or gravelly sand is less than 20 inches because of extensive land grading for gravity irrigation. In some small areas, carbonates are leached to below a depth of 15 inches. In some depressions the surface layer is loam.

Included with this soil in mapping are small areas of Wann fine sandy loam soils in swales or shallow depressions. Small areas of saline and alkali soils are in lower positions where the water table is near the surface. The included soils make up about 10 to 20 percent of this map unit.

Permeability is moderately rapid in the upper part of the underlying material and very rapid in the lower part.

The seasonal high water table ranges from a depth of about 2 feet in wet years to about 3 feet in dry years. The available water capacity is low. Content of organic matter is moderately low, and natural fertility is medium. Runoff is slow. Moisture is released readily to plants. The root zone for most cultivated crops is generally limited to the material above the coarse sand and gravelly sand. The surface layer is very friable and easily tilled through a wide range of soil moisture. The water intake rate is moderately high.

Most areas of this soil are used for farming. Many areas are irrigated. The rest is in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. The principal limitation is soil wetness, generally in spring when tillage is commonly delayed. The fluctuating water table, however, provides moisture for crops, mainly in summer when rainfall is commonly inadequate. Conservation tillage practices that keep crop residue on the surface help improve tilth and prevent soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and pasture. Gravity or sprinkler irrigation is suited. Generally some leveling is needed for gravity irrigation. Perforated tile or ditches improve drainage if a suitable outlet is available. The coarse textured underlying material and the low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Conservation tillage practices help control soil blowing and improve tilth.

The use of this soil for rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plant community. Grazing the soil when it is wet can cause surface compaction and mounding of the surface, making grazing or haying difficult. Proper grazing use, timely deferment from grazing or haying, and restricted use during very wet periods help maintain the plant community.

This soil is suited to trees and shrubs in windbreaks if species that tolerate occasional wetness are selected. Seedlings survive and grow well if competing vegetation is controlled. This can be accomplished by good site preparation and by timely cultivation between the rows. Weeds in the row can be controlled by hand hoeing, rototilling, or spraying with appropriate herbicides.

This soil is not suitable for building sites or septic tank absorption fields because of the hazards of flooding and wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-6 dryland and capability unit IIIw-9 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Ag—Alda loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. This soil is moderately deep over coarse sand or gravelly sand. It formed in alluvial materials. Areas are irregular in shape and range from 10 to 120 acres in size.

Typically, the surface layer is dark gray, very friable, calcareous loam about 10 inches thick. Beneath this is a transitional layer of light brownish gray, friable, calcareous very fine sandy loam about 4 inches thick. The upper part of the underlying material, to a depth of 26 inches, is light gray fine sandy loam. The lower part is white coarse sand and gravelly sand to a depth of 60 inches or more. In places, the depth to coarse gravel or gravelly sand is less than 20 inches because of extensive land grading for gravity irrigation. In some areas carbonates are leached to below a depth of 15 inches. In a few areas the loam material extends to the coarse sand or gravelly sand.

Included with this soil in mapping are small areas of Platte and Wann soils. The Platte soils are shallower to the very coarse material than this Alda soil and are along the narrow, shallow drainageways that cross areas of this unit. The Wann soils are deep and at a slightly higher elevation. Small areas of strongly alkaline soils are in some low positions. The included soils make up less than 13 percent of this map unit.

Permeability is moderately rapid above the coarse underlying material and very rapid in the gravelly sand or coarse sand. The available water capacity is low. Runoff is slow. Moisture is released readily to plants. The root zone for plants is generally limited to the soil material above the coarse sand or gravelly sand. The content of organic matter is moderately low, and natural fertility is medium. The seasonal high water table ranges from a depth of about 2 feet in wet years to about 3 feet in dry years.

Most areas of this soil are used for dryland crops. The rest is mainly in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and oats. Grasses and alfalfa can be grown for hay or pasture. The principal limitation is soil wetness, and because of this tillage is generally delayed early in spring. Conservation tillage practices that keep crop residue on the surface help prevent soil blowing and maintain tilth. Perforated tile or V-ditches help lower the water table if a suitable outlet is available.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and pasture. Gravity or sprinkler irrigation is suited. Generally some land leveling is needed for gravity irrigation, and deep cuts should be avoided to prevent exposing the coarse textured underlying material. Tillage is generally delayed in spring in most years. Light, frequent applications of water and fertilizer are necessary because of the coarse textured underlying material and the low available water capacity of this soil. Returning crop residue to the soil helps maintain and improve the organic matter content and reduces soil blowing during periods of low rainfall.

This soil is suited to use as rangeland. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and deterioration of the range plants. Proper grazing use and a planned grazing system of use and rest help keep the grasses in good condition.

This soil is suited to trees and shrubs in windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between rows. The careful use of appropriate herbicides or hand hoeing is effective in controlling weeds within the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-7 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Bb—Barney loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom lands mainly in shallow drainageways that were former channels of the Platte River. This soil is shallow over gravelly sand or coarse sand. The areas are frequently flooded. They are generally long and narrow and commonly several hundred feet in width and several miles in length. Areas range from 10 to several hundred acres.

Typically, the surface layer is gray, friable, calcareous loam about 9 inches thick. The upper part of the underlying material, to a depth of about 18 inches, is calcareous, light brownish gray, mottled sandy loam, and the lower part is light gray, mottled gravelly sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Platte-Alda loams, channeled, on low positions in old drainageways. The Alda soils are deeper to sand and gravel than the Barney soil. These soils make up 5 to 15 percent of this map unit.

Permeability is moderately rapid above the coarse underlying material and very rapid in the gravelly sand or coarse sand. The available water capacity is very low. Runoff is very slow or ponded. The natural fertility is low, and content of organic matter is moderate. The root zone is restricted mainly to the surface layer and upper part of the underlying material and has only limited penetration into the gravelly sand. The seasonal high water table ranges from about 1 foot above the surface in wet years to a depth of about 2 feet in dry years.

Most areas of this soil are in rangeland. Many areas are mowed for hay, and the rest are used for grazing.

This soil is not suited to the common cultivated crops because the water table is too high in spring and flooding is frequent.

This soil is suitable for use as rangeland. Grazing during very wet periods needs to be restricted to help reduce surface compaction and formation of bogs or small mounds. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the range grasses healthy.

Trees or shrubs in windbreaks are not suited to this soil because of the frequent flooding and very high water table.

This soil is not suitable for building sites, septic tank absorption fields, or sewage lagoons because of the hazard of frequent flooding and the fluctuating high water table. Lowering the water table is generally not practical. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit Vw-7. It is in Wet Land range site and windbreak suitability group 10.

Bd—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on stream terraces. Areas range from 10 to 250 acres.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 16 inches thick. The subsoil is dark grayish brown, very friable, and about 14 inches thick. The upper part of the subsoil is fine sandy loam, and the lower part is sandy loam. The underlying material is pale brown, sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blendon Variant fine sandy loam in microdepressions and shallow swales. Also included are areas of moderately deep O'Neill soils at a slightly lower elevation

than this Blendon soil. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow. The content of organic matter is moderately low, and natural fertility is medium. The surface layer is very friable and easily tilled through a fairly wide range of soil moisture. The water intake rate is moderately high.

Most areas of this soil are used for farming. Many areas are irrigated. A small acreage is in range.

If this soil is used for dryland farming, it is suited to corn, sorghum, small grain, and alfalfa. The principal hazard is soil blowing. Conservation tillage practices that keep crop residue on the surface help prevent soil blowing and conserve moisture. Returning crop residue to the soil, including green manure crops in the cropping system, and application of barnyard manure help maintain or improve the organic matter content, fertility, and tilth.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Irrigation by sprinklers or gravity is suitable, but some land leveling is generally needed for gravity irrigation. This soil requires short runs because of the moderately high water intake rate. Leaving crop residue on the surface as a mulch and keeping tillage to a minimum help control soil blowing.

The use of this soil for rangeland is effective in controlling soil blowing. Overgrazing can reduce the plant cover and decrease the desirable range plants. The grasses can be kept healthy and vigorous by proper grazing use, deferred grazing, and a planned grazing system of use and rest.

If this soil is used for windbreaks, it is suited to those species of trees and shrubs that tolerate droughty conditions. The ability of adapted species to survive and grow is fair. Soil blowing can be controlled by maintaining strips of sod or other vegetative cover between tree rows. Careful application of appropriate herbicides, hand hoeing, or rototilling help control weeds in the row and reduce competition for moisture.

This soil is suited to building sites and sanitary facilities; however, seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing the septic tank absorption fields in raised fill helps provide for the adequate absorption of effluent, and lining or sealing the sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit IIe-3 dryland and capability unit IIe-8 irrigated. It is in Sandy range site and windbreak suitability group 5.

BdC—Blendon fine sandy loam, 2 to 6 percent slopes. This deep, undulating, well drained soil is on breaks of stream terraces. Areas are generally elongated and range from 25 to 250 acres.

Typically, the surface layer is dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is very friable fine sandy loam about 12 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is pale brown loamy fine sand to a depth of 60 inches or more. In a few small areas, the underlying material is silt loam below a depth of 40 inches.

Included with this soil in mapping are small areas of the moderately deep, gently sloping O'Neill soils. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is moderate. Runoff is medium. Content of organic matter is moderately low, and natural fertility is medium. The surface layer is friable and easily tilled through a fairly wide range of soil moisture. Moisture is released readily to plants. The water intake rate is moderately high.

Most areas of this soil are used for farming, and many areas are irrigated. A small acreage is in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, and alfalfa. This soil is subject to blowing and water erosion. Conservation tillage practices that keep crop residue on the surface help prevent soil blowing, reduce water erosion, and conserve moisture. Returning crop residue to the soil also helps maintain and improve the organic matter content and fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. This soil is especially suited to sprinkler irrigation. If bench leveling is used for gravity irrigation, deep cuts that expose the coarse textured material should be avoided. The moderately high water intake rate of this soil makes short runs and frequent irrigation desirable. Leaving crop residue on the surface as a mulch and keeping tillage to a minimum help control soil blowing, increase the intake of moisture, and improve fertility.

The use of this soil as rangeland is effective in controlling soil blowing and water erosion. Overgrazing can reduce the protective cover and cause deterioration of the plant community. It can also cause severe losses by soil blowing. Proper grazing use, timely deferment from grazing, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks, if those species of trees and shrubs that tolerate droughty conditions are selected. Seedlings generally grow well if competing vegetation is controlled. Soil blowing can be controlled by maintaining strips of sod or a cover crop between the tree rows. Good site preparation with careful application of appropriate herbicides in the row can be used to control weeds and reduce competition for moisture.

This soil is suited to building sites and sanitary facilities; however, seepage from septic tank absorption

fields and sewage lagoons can contaminate the underground water supply. Placing the septic tank absorption fields in raised fill helps provide adequate absorption of effluent, and lining or sealing the sewage lagoons helps prevent seepage. For sewage lagoon areas, grading is required to modify the slope and shape the lagoon. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit IIIe-3 dryland and capability unit IIIe-8 irrigated. It is in Sandy range site and windbreak suitability group 5.

Bf—Blendon Variant fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces. Areas range from 10 to 125 acres.

Typically, the surface soil is dark grayish brown, very friable fine sandy loam about 22 inches thick. The subsoil is grayish brown, very friable fine sandy loam about 11 inches thick. The underlying material is brown silt loam to a depth of 60 inches. Depth to the silt loam ranges from 26 to 40 inches. In areas, coarser textured material is below the silty layer at a depth of 40 to 60 inches. In small areas, loamy fine sand is above the silty layer, and in places, the fine sandy loam material is thicker than 40 inches.

Included with this soil in mapping are small areas of Blendon fine sandy loam that are at a slightly higher elevation and do not have underlying material of silt loam. Also included are small areas of O'Neill soils that are moderately deep over mixed sand and gravel and at a lower elevation. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderately rapid in the upper part of the profile and moderate in the lower silty part. The available water capacity is moderate. The content of organic matter is moderately low, and natural fertility is medium. Runoff is slow. The surface layer is very friable and easily tilled through a wide range of soil moisture. Moisture is released readily to plants. The water intake rate is moderately high.

Most areas of this soil are used for farming. Many areas are irrigated. Only a small acreage is in range.

If this soil is used for dryland farming, it is suited to corn, sorghum, and small grain and to grasses and alfalfa for hay or pasture. It is better suited to dryland crops than other Blendon soils because the silty substratum holds more available water within the root zone. The principle hazard is soil blowing. This can be minimized by stripcropping, stubble-mulch tillage, and a cropping system that keeps the soil covered with grasses or crop residue most of the time. Row crops can be alternated with small grain and legumes to replenish the content of organic matter.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Sprinklers or gravity irrigation is suited. Generally, some land leveling is needed for gravity irrigation. Leaving crop residue on the surface as a mulch, keeping tillage to a minimum, and planting field windbreaks help control soil blowing. Runs for gravity irrigation should be relatively short.

The use of this soil for rangeland is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native grasses and moderate losses by soil blowing. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is suited to trees and shrubs in windbreaks. Seedling mortality generally is slight. Soil blowing can be controlled by maintaining strips of sod or a cover crop between the tree rows. Weeds and grasses can be controlled by cultivating between the rows and by careful use of appropriate herbicides or by hand hoeing in the row.

This soil is suited to building sites. The moderate permeability of this soil is a limitation for septic tank absorption fields, but this can generally be overcome by increasing the size of the absorption area. Lining or sealing sewage lagoons helps prevent seepage. The moderate shrink-swell potential in the underlying material is a limitation to building sites. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of this soil. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit IIe-3 dryland and capability unit IIe-8 irrigated. It is in Sandy range site and windbreak suitability group 5.

Bk—Boel loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 10 to 150 acres.

Typically, the surface layer is dark gray, very friable, calcareous loam about 8 inches thick. The underlying material is light gray, calcareous very fine sandy loam to a depth of 17 inches. Below that is white, mottled fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the somewhat excessively drained Inavale soils at a higher elevation. The included soils make up about 5 to 10 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The water intake rate is moderately high. The seasonal high water table is at a depth of about 1.5 feet in wet years and about 3.5 feet in dry years. The content of organic matter is moderately low, and natural fertility is low. The surface layer is very friable and easily tilled through a wide range of soil moisture. Moisture is readily released to plants. Tilth is good.

Most areas of this soil are used for range. A few areas are farmed.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, winter wheat, and alfalfa. The principal limitation is soil wetness. Tillage is generally delayed early in spring. The fluctuating water table provides water for subirrigation. Conservation tillage methods that keep crop residue on the surface help prevent soil blowing and conserve moisture during periods of low rainfall. Tile or V-ditches can be used to lower the water table if drainage is needed.

If this soil is irrigated, it is suited to corn, grain sorghum, and alfalfa. Gravity or sprinkler irrigation is suited. Generally, some land leveling is needed for gravity irrigation, but deep cuts that expose the coarse textured underlying material should be avoided. Tillage is generally delayed in spring in most years. Tiles or V-ditches can be installed if a suitable outlet is available. The coarse textured underlying material and low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Conservation tillage practices help prevent soil blowing and conserve moisture.

This soil is suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plant community. Overgrazing when wet can result in the formation of small mounds, which make grazing or haying difficult. Proper grazing use and timely deferment of grazing or haying, along with restricted use during very wet periods, help maintain the plant community in good condition.

This soil is suited to trees and shrubs for windbreaks, if those species that tolerate wetness and occasional flooding are selected. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and timely cultivation between the rows. Careful use of appropriate herbicides or hand hoeing are effective in controlling weeds in the row.

This soil is not suited to septic tank absorption fields and sewage lagoons because of flooding and wetness. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-8 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Br—Brocksburg loam, 0 to 1 percent slopes. This nearly level, well drained soil is on stream terraces. It is moderately deep over gravelly sand or coarse sand. Areas range from 10 to 250 acres.

Typically, the surface soil is dark grayish brown, very friable loam about 20 inches thick. The subsoil is grayish brown, friable clay loam and about 7 inches thick. The underlying material is pale brown gravelly sand to a depth of 60 inches or more. In places, land grading for irrigation has altered the thickness of the surface soil and consequently, depth to the underlying gravelly sand varies considerably within short distances. In small areas, the subsoil is silt loam, loam, or fine sandy loam.

Included with this soil in mapping are small areas of Hall, Hord, and O'Neill soils. Hall and Hord soils do not have sand and gravel above a depth of 40 inches and are at a slightly lower elevation than this Brocksburg soil. O'Neill soils have more sand in the subsoil and are in long narrow areas that are relatively at a slightly higher elevation. The included soils make up 5 to 15 percent of this map unit.

Permeability is moderate in the subsoil and very rapid in the underlying gravelly sand. Runoff is slow. The available water capacity and content of organic matter are moderate. Natural fertility is medium. Tilth is generally good, and the soil is easily tilled through a fairly wide range of soil moisture. The root zone is restricted to the soil material above the gravelly sand.

Most areas of this soil are used for farming, and many of these are irrigated. The rest of the areas is mainly in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. The principal hazards are soil blowing and droughtiness late in the growing season. Conservation practices that keep crop residue on the surface help prevent soil blowing and conserve moisture. Incorporation of crop residue and barnyard manure to this soil provides organic matter, increases fertility, and improves tilth.

If this soil is irrigated, it is well suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suited. Generally, some land leveling is needed for gravity irrigation, but deep cuts should be avoided to prevent exposing the gravelly sand. This soil requires frequent, light applications of water and fertilizer to avoid leaching and contamination of the water table. Leaving crop residue on the surface as a mulch and keeping tillage to a minimum help control soil blowing and prevent excessive loss of moisture by evaporation. The optimum use of commercial fertilizer and barnyard manure is needed for sustained production.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing reduces the protective plant cover and causes deterioration of the range. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

If used for windbreaks, this soil is suited to those species of trees and shrubs that tolerate droughty conditions. Seedling mortality generally is slight, but irrigation may be needed for the survival of plants. Moisture competition from grasses and weeds is a hazard to the establishment of seedlings. Good site preparation and timely cultivation between tree rows

helps conserve available moisture. Weeds can be hoed by hand or rototilled within the row.

This soil is suitable for building sites. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide adequate absorption of the effluent. Lining or sealing sewage lagoons helps to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The low strength of the subsoil is a limitation for roads and streets. This limitation can be overcome by excavating the subsoil layer and, if necessary, replacing it with coarse grained material.

This soil is in capability unit IIs-5 dryland and capability unit IIs-7 irrigated. It is in Silty range site and windbreak suitability group 6G.

Cg—Caruso-Gayville complex, 0 to 1 percent slopes. This complex consists of deep, nearly level, somewhat poorly drained soils on bottom lands. These soils are occasionally flooded. Areas range from 5 to 200 acres. Areas of the Gayville soil are strongly affected by salinity and alkalinity.

This complex contains 50 to 70 percent Caruso soils and 30 to 50 percent Gayville soils. The Caruso soils are at a slightly higher elevation than the Gayville soils, which are in irregular-shaped microdepressions.

Typically, the Caruso soil has a friable surface layer about 14 inches thick. The surface layer is about 6 inches of gray loam over about 8 inches of dark gray clay loam. Beneath this is a transition layer of friable, calcareous clay loam 10 inches thick. The underlying material, to a depth of 60 inches or more, is stratified, calcareous, mottled, light gray clay loam, grayish brown loam and sandy clay loam, and light brownish gray loamy sand.

Typically, the Gayville soil has a surface layer of gray, very friable, calcareous silt loam about 2 inches thick. The subsoil is calcareous and 18 inches thick. The upper part of the subsoil is dark gray and gray, very firm silty clay, and the lower part is grayish brown, firm silty clay loam. The underlying material is mottled. The upper part of the underlying material is grayish brown, calcareous loam and sandy loam, the middle part is light gray, calcareous sandy clay loam, and the lower part is pale olive sand, to a depth of 60 inches. Soft masses of lime are in the upper and middle parts of the underlying material. The subsoil and upper part of the underlying material are strongly alkaline and very strongly alkaline.

Included with these soils in mapping are small areas of Gibbon, Leshara, and Lamo soils at an elevation similar to that of the Caruso soil and areas of Saltine soils at an elevation similar to that of the Gayville soil. The included soils make up about 10 to 15 percent of this map unit.

Permeability is moderately slow in the Caruso soils and very slow in the Gayville soils. The available water capacity is high in the Caruso soils and moderate in the Gayville soils. The seasonal high water table in both soils ranges from a depth of 2 feet in most wet years to 3 feet in most dry years. Caruso soils release moisture readily to plants, whereas Gayville soils release moisture slowly. The content of organic matter is moderate in both soils. The natural fertility is medium in Caruso soils but is low in Gayville soils because they lack available nutrients. The water intake rate is moderately low in Caruso soils and low in Gayville soils. Shrink-swell potential is moderate in Caruso soils and high in the Gayville soils. If cultivated, the surface layer of the Gayville soils tends to become hard and form a crust when dry and to become badly puddled when wet. Runoff is slow from areas of Caruso soils and very slow from areas of Gayville soils. Reaction generally ranges from neutral through moderately alkaline throughout the Caruso soils, but is strongly alkaline or very strongly alkaline in the Gayville soils above a depth of 40 inches.

Most areas of this complex are farmed. Some areas are in native grassland and are used for grazing or mowed for hay.

If these soils are used for dryland farming, they are well suited to small grain and to grasses for hay and pasture. They are suited to corn, grain sorghum, wheat, and alfalfa. A high level of management is needed on these soils because of the alkali condition, poor structure, and ponding of water in the low areas. Adequate surface drainage can be provided by grading or by ditches. Application of sulfur or gypsum helps reduce the effects of the alkali. Addition of crop residue or barnyard manure to the soil helps improve tilth and increase infiltration of water.

If these soils are irrigated, they are suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suitable. Land grading for gravity irrigation provides for surface drainage and an even distribution of water. Principal management concerns are the high alkalinity of the Gayville soils (fig. 6) and soil wetness in spring. Chemical amendments help reduce the effects of alkalinity in areas of the Gayville soils. Incorporation of barnyard manure and other forms of organic matter into the soil makes the surface layer more friable and improves the infiltration of water. Nitrogen and phosphorus fertilizers are generally needed. Application of large quantities of irrigation water helps leach the soluble salts and alkali to lower levels in the profile.

These soils are suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Overgrazing when these soils are wet causes surface compaction and poor tilth, making grazing or mowing difficult. Proper range use along with restricted use during wet periods and a planned grazing system of use and rest helps maintain the desirable native plants.

These soils are poorly suited to trees and shrubs in windbreaks. Onsite investigations are needed before planting. The species selected must tolerate occasional wetness and alkali conditions. Establishment of trees

Figure 6.—Typical pattern of corn in an area of Caruso-Gayville complex. The barren areas are the strongly alkaline and very strongly alkaline Gayville soils.

can be difficult in wet years, particularly in the areas of Gayville soils. Good site preparation and timely cultivation between the rows help control undesirable grasses and weeds.

These soils are not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. If alternate sites are not available, onsite studies should be made. Special installation procedures are needed for sewage lagoons and septic tank absorption fields. Areas of Caruso soils are better suited to septic tank absorption fields than areas of Gayville soils. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Low strength of the Gayville soil is a limitation for roads and streets. This can be overcome by using coarse grained material for subgrade or base material.

These soils are in capability unit IIIs-1 dryland and capability unit IIIs-4 irrigated. The Caruso soils are in Subirrigated range site, and the Gayville soils are in Saline Subirrigated range site. The Caruso soils are in windbreak suitability group 2S, and the Gayville soils are in windbreak suitability group 10.

Co—Cozad loam, wet substratum, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on bottom lands adjacent to major drainageways. It is rarely flooded. Areas range from 10 to 1,500 acres.

Typically, the surface layer is grayish brown, very friable loam about 7 inches thick. The subsoil is light

brownish gray, very friable very fine sandy loam about 15 inches thick. The underlying material is light brownish gray, calcareous silt loam to a depth of 36 inches. Next is an older, buried soil of gray, calcareous loam to a depth of 52 inches. Below that, the underlying material is very pale brown fine sandy loam to a depth of 60 inches or more. In a few areas, the surface layer is fine sandy loam. Thin strata of silty clay loam are in the underlying material. In places, the surface layer has been altered by land leveling.

Included with this soil in mapping are small areas of Leshara and Lex soils. The somewhat poorly drained Leshara soils are at a lower elevation than this Cozad soil. The Lex soils are somewhat poorly drained, generally at a lower elevation along intermittent drains, and have sand and gravel at a depth of 20 to 40 inches. The included soils make up less than 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is good, and the soil is easily tilled through a fairly wide range of soil moisture. The content of organic matter is moderate, and natural fertility is medium. A perched seasonal high water table is at a depth of about 4 feet in wet years and about 6 feet in dry years. The water intake rate is moderate.

Most areas of this soil are used for farming and most are irrigated. A small acreage is in grassland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, alfalfa, and grasses. In cultivated areas, soil blowing and the maintenance of the organic matter content are principal concerns. A conservation cropping system that keeps crop residue on the surface helps control soil blowing and conserve moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, introduced grass, soybeans, and alfalfa. Gravity or sprinkler irrigation is suited. Land leveling improves surface drainage and increases efficiency of gravity irrigation. Sustained production can be obtained by using commercial fertilizers, high plant populations, and efficient irrigation management that controls the amount and time of water application.

The use of this soil for rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the range. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil generally provides a good site for planting trees and shrubs in windbreaks. Seedlings survive and grow well if competing vegetation is controlled. The principal concern is the competition for moisture from weeds and grasses. This can be controlled by cultivation between the rows with conventional equipment, such as a disc. Hand hoeing, rototilling, or appropriate herbicides can be used within the row.

The hazard of rare flooding should be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material help protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Septic tank absorption fields need to be constructed on raised fill to a sufficient height above the seasonal high water table to provide adequate absorption of effluent. Lining or sealing sewage lagoons helps to prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage and by use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is in capability unit I-1 dryland and capability unit I-6 irrigated. It is in Silty Lowland range site and windbreak suitability group 1.

CrF—Crofton silt loam, 15 to 30 percent slopes. This deep, somewhat excessively drained, steep soil is on side slopes on loess uplands. Areas range from 5 to 125 acres.

Typically, the surface layer is grayish brown, friable silt loam about 4 inches thick. Beneath this is a transitional layer of light brownish gray, friable silt loam about 4 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of moderately steep Nora soils and moderately steep Crofton soils. The included soils make up 10 to 25 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is very rapid. The content of organic matter is moderately low, and natural fertility is low. Moisture is readily released to plants.

Nearly all areas of this soil are used for range. Some isolated areas are cultivated and are used as cropland.

This soil is not suited to dryland or irrigated farming because it is too steep and erodible. A good grass cover helps reduce the runoff and erosion. A few small cultivated areas are severely eroded. Planting these areas to native grasses and using them for grazing would help control the erosion. The bottom of some drainageways are suited to dams for livestock water, erosion control, and flood detention.

The use of this soil as rangeland is effective in controlling water erosion. Overgrazing reduces the plant cover, causes deterioration of the desired grasses, and results in severe soil loss by water erosion. Proper grazing use, timely deferments from grazing, and a

planned grazing system of use and rest help maintain or improve the range condition.

Most areas of this soil are too steep and erodible for planting of trees and shrubs in windbreaks. In a few places trees can be hand planted but need special tending.

This soil generally is not suitable for sanitary facilities because of the steep slope; therefore, alternate sites on other soils that are suited to these uses should be considered. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the site needs to be adequately graded to accommodate the structure. Roads and streets can be designed to complement the slope, or the slope can be modified by cuts and fills to provide a suitable grade. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets should be thick enough to compensate for the low strength. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit VIe-9 dryland. It is in Limy Upland range site and windbreak suitability group 10.

CsD2—Crofton-Nora silt loams, 6 to 11 percent slopes, eroded. These deep, strongly sloping, well drained soils are on loess uplands. Rills and small gullies are common after heavy rains, but these are generally filled in by successive tillage operations. Areas range from 5 to 160 acres.

This map unit is made up of about 50 to 65 percent Crofton soils and about 35 to 50 percent Nora soils. The Crofton soils are at a lower elevation on the more sloping parts of the landscape. The Nora soils are at a higher elevation and are less sloping.

Typically, the Crofton soil has a surface layer of brown, very friable silt loam about 5 inches thick. Beneath this is a transitional layer of pale brown, friable silt loam about 3 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of 60 inches or more. In some areas, the surface layer is very pale brown silt loam because the upper part of the underlying material has been mixed with the surface soil by tillage.

Typically, the Nora soil has a surface layer of dark grayish brown, friable silt loam about 5 inches thick. The upper part of the subsoil is grayish brown, friable silt loam about 14 inches thick, and the lower part is brown, friable silt loam about 11 inches thick. The underlying material is pale brown, calcareous silt loam to a depth of 60 inches or more. In places, the surface layer is not so thick as in the typical profile, and lime is nearer the surface.

Included with these soils in mapping are small areas of the steeper, eroded Crofton and Nora soils. The included soils make up about 5 to 10 percent of this map unit.

In both soils permeability is moderate, and the available water capacity is high. The water intake rate is moderate. Moisture is readily released to plants. The content of organic matter is low in Crofton soils and moderately low in Nora soils. Natural fertility is low in Crofton soils and medium in Nora soils. The surface layer is friable and easily tilled through a fairly wide range of soil moisture. Tilth is generally good.

Most areas of these soils are farmed. Some areas are in native grassland and are used for range.

If these soils are used for dryland farming, they are suited to corn, sorghum, small grain, and alfalfa. In a hot, dry summer, crops can be damaged from the lack of moisture. The principal hazard is water erosion. Runoff and water erosion can be controlled by terraces, grassed waterways, and contour farming. A cropping system that keeps the soil covered with crops or crop residue most of the time is effective in conjunction with water control structures. Consecutive row crops can be limited and a close-growing crop can be included in the rotation. Conservation tillage practices are effective in controlling erosion. Gullies can be shaped and seeded to grass. Grassed field borders help control runoff and can be used as turnrows, roadways, and wildlife habitat.

If these soils are irrigated, alfalfa and introduced grasses are suited. Row crops are poorly suited because water management is difficult and the hazard of erosion is severe. Terraces, grassed waterways, and the maximum use of crop residue as a mulch help control water erosion. Sprinkler irrigation is the only method suited to these soils. Controlling erosion is difficult because of the combined effects of rainfall and irrigation water. The rate at which water is applied needs to be adjusted so it does not exceed the intake rate of the soil.

The use of these soils for rangeland is effective in controlling soil blowing and water erosion. Overgrazing by livestock or untimely haying reduces the protective cover, causes deterioration of the desirable native plants, and results in severe soil loss by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help maintain or improve the range condition.

These soils are suited to windbreak plantings. Good survival and fair growth of adapted species can be expected if competing vegetation is controlled. This can be accomplished by rototilling or careful use of an appropriate herbicide in the row and by cultivation between the rows. Planting of trees and shrubs on the contour and the use of terraces help prevent runoff and water erosion.

Slope limits the use of these soils for building sites and sanitary facilities. Septic tank absorption fields can be constructed on the contour after the site is graded. For sewage lagoon areas, grading is required to modify the slope and shape the lagoon. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the site needs to be adequately graded to accommodate the structure. The moderate shrink-swell potential of the Nora soil is a limitation for building sites. Foundations for buildings

need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling. The low strength of these soils need to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

These soils are in capability unit IIIe-8 dryland and capability unit IVe-6 irrigated. The Crofton soils are in Limy Upland range site and windbreak suitability group 8. The Nora soils are in Silty range site and windbreak suitability group 4.

CsE2—Crofton-Nora silt loams, 11 to 15 percent slopes, eroded. These deep, well drained, moderately steep soils are on loess uplands. Rills and small gulleys are common after heavy rains. Areas range from 5 to 200 acres.

This map unit is made up of about 70 percent Crofton soils and 30 percent Nora soils. The Crofton soils are at a lower elevation in more sloping parts of the landscape, and the Nora soils are at a higher elevation in the less sloping parts.

Typically, the Crofton soil has a surface layer of brown, very friable silt loam about 5 inches thick. Beneath this is a transitional layer of pale brown, friable, calcareous silt loam about 7 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of 60 inches or more. In some areas, the surface layer is very pale brown because material from the upper part of the underlying material has been mixed with the surface layer by plowing.

Typically, the Nora soil has a surface layer of dark grayish brown, very friable silt loam about 5 inches thick. The upper part of the subsoil is brown, friable heavy silt loam about 9 inches thick, and the lower part is very pale brown, friable, calcareous silt loam about 16 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of 60 inches or more. In some areas, the surface layer is not so thick as typical, and the depth is shallower to lime.

Included with these soils in mapping are small areas of the strongly sloping, steep Crofton soils and the strongly sloping Nora soils. The included soils make up 5 to 12 percent of this map unit.

Permeability is moderate, and available water capacity is high in both soils. The water intake rate is moderate. Runoff is rapid. Moisture is readily released to plants. Content of organic matter is low in Crofton soils and moderately low in Nora soils. Natural fertility is low in the Crofton soils and medium in the Nora soils. The surface layer can be tilled through a fairly wide range of soil moisture. Nora soils have moderate shrink-swell potential. Tilth is generally good.

Most areas of these soils are used for range, but a few areas are farmed.

If these soils are used for dryland farming, they are poorly suited to corn and sorghum. They are better suited to small grain and alfalfa than to row crops. Alfalfa and small grain grow and develop in spring and early in summer when rainfall is heaviest. They also help control water erosion and conserve moisture because a permanent plant cover is established. The principal hazard is water erosion. Contour farming, terraces, and grassed waterways help conserve soil moisture and control runoff. Grassed field boundaries help control runoff and can be used as turnrows, roadways, and wildlife habitat. Alfalfa in the cropping system helps improve fertility and increase the content of organic matter. Row crops can be grown infrequently in the rotation.

The soils in this unit are not suited to irrigated cultivated crops because they are too steep and erodible and the irrigation water is too difficult to control.

Using these soils for rangeland is effective in controlling soil blowing and water erosion. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. Overgrazing also results in severe soil losses by water erosion. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is suited to trees and shrubs in windbreaks, but care is needed to control erosion. Installing terraces and planting trees on the contour help control erosion. The ability of adapted species to survive and grow is fair.

Slope limits the use of these soils for sanitary facilities. Septic tank absorption fields can be constructed on the contour after the site is graded. Sewage lagoons generally are not suited because of the slope; therefore, alternate sites on other soils that are suited to this use should be considered. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the site needs to be adequately graded to accommodate the structure. The moderate shrink-swell potential of the Nora soil is a limitation for building sites. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of the soil. Cuts and fills generally are needed to provide a suitable grade for roads. The low strength of these soils needs to be considered in the design of roads and streets. The pavement of roads and streets should be thick enough to compensate for the low strength. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

These soils are in capability unit IVe-8 dryland. The Crofton soil is in Limy Upland range site, and the Nora soil is in Silty range site. The Crofton soil is in windbreak

suitability group 8, and the Nora soil is in windbreak suitability group 3.

Eb—Els loamy fine sand, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in sandhill valleys and on stream terraces adjacent to the sandhills. This soil is rarely flooded. Areas range from 5 to 200 acres.

Typically, the surface layer is dark gray, very friable loamy fine sand about 8 inches thick. Beneath this is a transitional layer of pale brown, very friable, mottled loamy fine sand about 3 inches thick. The underlying material is mottled, pale brown loamy fine sand to a depth of 20 inches. Below that, it is light gray loamy sand to a depth of 60 inches or more. In a few areas, carbonates are above a depth of 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Ipage soils at a slightly higher elevation than this Els soil and the very poorly drained Marlake soils in depressions or swales. The included soils make up about 10 to 20 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. The seasonal high water table ranges from a depth of about 1.5 feet in wet years to about 3.5 feet in dry years. In this soil, a heavy layer below a depth of 5 feet tends to increase the wetness. The content of organic matter is moderately low, and natural fertility is low. The surface layer is very friable and easily tilled through a wide range of soil moisture. Moisture is readily released to plants. Tilth is fair.

Most areas of this soil are used for range. Some areas are farmed, and some of these are irrigated.

If this soil is used for dryland farming, it is poorly suited to cultivated crops. Corn and grain sorghum are the principal crops. Alfalfa can be grown but is generally short lived. The principal limitation to crops is wetness. Tillage is generally delayed early in spring. The water table provides supplemental water for most crops, and this is beneficial during dry seasons. Conservation tillage practices that keep crop residue on the surface can be used to prevent soil blowing. Returning crop residue to the soil helps maintain and improve tilth and fertility.

If this soil is irrigated, it is poorly suited to cultivated crops. Corn, grain sorghum, and alfalfa are the principal crops. Sprinklers are the only method of irrigation that is adapted to this soil. Tillage is generally delayed in spring in most years because of soil wetness. Perforated tile drains or V-ditches can be installed if a suitable outlet is available. The rapid permeability and low available water capacity of this soil makes light, frequent applications of irrigation water necessary. Minimum tillage and stubble mulching help prevent soil blowing.

This soil is suited to rangeland for grazing or haying. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the range plants. Overgrazing when wet results in the formation of small mounds, which make grazing or the harvesting of hay difficult. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods, help maintain the grasses in good range condition.

This soil is suited to those species of trees and shrubs in windbreaks that tolerate a high water table. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between the rows. Areas within the row can be hoed by hand or rototilled.

The hazard of rare flooding needs to be considered if this soil is used for building sites. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding and from wetness caused by the high water table. Dikes are needed to protect septic tank absorption fields and sewage lagoons. Septic tank absorption fields can be constructed on fill material so that the absorption field is a sufficient distance above the seasonal high water table. Lining or sealing sewage lagoons help prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IVw-5 dryland and capability unit IVw-11 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Fn—Fonner sandy loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on bottom lands. It is moderately deep over coarse sand and gravelly sand. This soil is rarely flooded. Areas are generally elongated and range from 10 to 360 acres.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 20 inches thick. Beneath this is a transitional layer of gray, very friable loamy sand about 6 inches thick. The underlying material is light brownish gray and light gray gravelly sand and coarse sand to a depth of 60 inches or more. In a few places, depth to the gravelly sand or coarse sand is less than 20 inches or is more than 40 inches because of extensive land grading for gravity irrigation.

Included with this soil in mapping are small areas of the noncalcareous Janude soils at a slightly higher elevation than this Fonner soil and Fonner loam in low areas. The included soils make up as much as 12 percent of this map unit.

Permeability is rapid in the loamy sand transitional layer and very rapid in the gravelly sand and coarse sand underlying material. The water intake rate is moderately high. Runoff is slow, and the available water capacity is low. Reaction ranges from strongly acid to

neutral throughout the profile. The natural fertility is medium, and content of organic matter is moderately low. The surface layer is very friable and easily tilled through a fairly wide range of soil moisture. This soil is subject to blowing if the surface is not protected with some type of cover. Tilth is good. The root zone is mostly in the soil material above the coarse sand and gravelly sand. The seasonal high water table ranges from a depth of about 3 feet in most wet years to about 6 feet in most dry years.

Most areas of this soil are farmed, and most of these are irrigated. A small acreage is dryfarmed.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. This soil is droughty during years of normal or below normal rainfall. The water table is highest in spring and provides supplemental moisture for crops at this time of year. The principal hazards are soil blowing and droughtiness late in the growing season. Conservation tillage practices that keep crop residue on the surface, such as minimum tillage and no-till planting, help prevent serious soil blowing and help conserve soil moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Either gravity or sprinkler irrigation is suited, but sprinkler irrigation is better suited than gravity irrigation. The coarse textured underlying material and the low available water capacity of this soil make light, frequent applications of water and fertilizer necessary. Returning crop residue to the soil surface and keeping tillage to a minimum help reduce soil blowing, conserve moisture, and maintain the organic matter content.

This soil is suited to rangeland. This use is effective in reducing the hazard of soil blowing. The water table provides moisture for subirrigation during spring. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses in good condition. Good management practices for pasture are rotation grazing, proper stocking, and application of fertilizer.

This soil is suited to trees and shrubs in windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between rows. Hand hoeing, rototilling, or appropriate herbicides can be used in the tree row.

The hazard of rare flooding should be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding and from wetness caused by the high water table. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-6 dryland and capability unit IIIw-9 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Fp—Fonner loam, 0 to 1 percent slopes. This nearly level, moderately well drained soil is on bottom lands. It is moderately deep over coarse sand and gravelly sand. This soil is rarely flooded. Areas range from 10 to 250 acres.

Typically, the surface layer is friable loam about 10 inches thick. The upper part of the surface layer is dark grayish brown, and the lower part is very dark grayish brown. Beneath this is a transitional layer of dark grayish brown, very friable sandy loam about 8 inches thick. The underlying material is grayish brown loamy sand to a depth of 24 inches, brown coarse sand to a depth of 30 inches, and pale brown gravelly sand to a depth of 60 inches. In places, the gravelly sand or coarse sand is at a depth of less than 20 inches or more than 40 inches. In a few small areas, carbonates are in the upper part of the underlying material.

Included with this soil in mapping are small areas of the moderately well drained Janude soils at a slightly higher elevation than this Fonner soil and Lockton loam at a slightly lower elevation. Also included are areas where the surface layer is sandy loam. The included soils make up 5 to 15 percent of this map unit.

Permeability is rapid in the loamy sand upper part of the underlying material and very rapid in the coarse sand and gravelly sand below. Runoff is slow, and available water capacity is low. The content of organic matter is moderately low, and natural fertility is medium. The surface layer is friable and easily tilled through a fairly wide range of soil moisture. The root zone of the common crops is mainly in the soil material above the coarse sand and gravelly sand. The seasonal high water table ranges from a depth of about 3 feet in most wet years to about 5 feet in most dry years. Water intake rate is moderately rapid. Tilth is good.

Most areas of this soil are used for farming. Most areas are irrigated, but some are used for dryland farming.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. The water table is highest in spring and provides supplemental moisture for crops. This soil tends to be droughty late in summer

because the water table recedes to below a depth of 5 feet. Conservation tillage practices that keep crop residue on the surface, such as disc and no-till planting, help conserve moisture and improve tilth.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Sprinkler or gravity irrigation is suitable. Some land leveling is generally needed for gravity irrigation. Light, frequent applications of irrigation water and fertilizer are desirable because of the low available water capacity. The high water table in spring provides supplemental moisture for crops. Keeping crop residue on the surface helps maintain good tilth and conserve moisture.

This soil is suited to rangeland. Overgrazing, untimely haying, or grazing when the soil is wet causes poor tilth and deterioration of the desirable range plants. Proper grazing use and timely deferment from grazing and haying, along with restricted use during wet periods, help maintain the grasses and keep the range in good condition.

This soil is suited to trees and shrubs in windbreaks. The species selected should tolerate occasional periods of wetness. Seedlings generally survive and grow well. Weeds and grasses that compete for moisture can be destroyed by good site preparation and by timely cultivation between the rows. Areas in the row and near trees can be hoed by hand or rototilled.

The hazard of rare flooding should be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent, and lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-7 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Fv—Fonner Variant loamy sand, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on bottom lands. It is shallow over gravelly sand or coarse sand. This soil is rarely flooded. Areas range from 10 to 750 acres.

Typically, the surface layer is grayish brown, very friable loamy sand about 9 inches thick. Beneath this is a transitional layer of light brownish gray, loose loamy sand 9 inches thick. The underlying material is pale brown and very pale brown gravelly sand to a depth of 60 inches or more. Small areas in some swales and microdepressions have a surface layer of loam.

Included with this soil in mapping are small areas of Inavale loamy sand at a slightly higher elevation than this Fonner Variant soil. Also included are the thicker Fonner soils that are 20 to 40 inches deep over gravelly sand or coarse sand and are at a slightly higher elevation. The included soils make up less than 10 percent of this map unit.

Permeability is rapid in the loamy sand surface layer and transitional layer and very rapid in the gravelly sand or coarse sand underlying material. The available water capacity is very low. The organic matter content and natural fertility are low. The root zone is restricted to the soil material above the gravelly sand or coarse sand. The seasonal high water table generally ranges from a depth of 3 feet in wet years to 5 feet in dry years. In some areas, mainly near channels of the Platte River, however, the seasonal high water table is closer to the surface. In the middle of summer, the water table can recede to a depth of 6 to 12 feet.

Most areas of this soil are used for cultivated crops. Some areas are in rangeland.

If this soil is used for dryland farming, it is poorly suited to cultivated crops. It is better suited to wheat and grain sorghum than to most other crops, because they mature before hot weather in summer. The principal limitations are droughtiness and the low moisture supply late in summer. Conservation tillage practices that keep crop residue on the surface, such as minimum tillage and stubble mulch tillage, conserve moisture and reduce soil blowing.

If this soil is irrigated, it is poorly suited to cultivated crops. Crops such as corn, sorghum, and alfalfa can be grown. Sprinkler irrigation is the only method of irrigation suited to this soil. Light, frequent applications of water and fertilizer are needed because of the coarse textured underlying material and the very low available water capacity. Soil blowing is a hazard on unprotected fields. Cultivation with a disc or chisel, no-till planting, and stubble mulching keep crop residue on the surface and help control soil blowing and conserve moisture. Returning crop residue to the soil and applying commercial fertilizers and barnyard manure help maintain fertility and increase the content of organic matter.

Use of this soil as rangeland is effective in controlling soil blowing. Overgrazing reduces the protective cover and causes deterioration of the range plants. Proper grazing use and timely deferments from grazing help maintain the range in good condition.

This soil provides a poor site for planting of trees and shrubs in windbreaks. The ability of adapted species to

survive and grow is only fair. Species should be selected that tolerate droughtiness late in summer. Supplemental water is needed during times when rainfall is insufficient.

The hazard of rare flooding should be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent, and sealing or lining sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit IVs-4 dryland and capability unit IVs-14 irrigated. It is in Sandy Lowland range site and windbreak suitability group 6G.

Gc—Gayville-Caruso complex, 0 to 1 percent slopes. This complex consists of deep, nearly level, somewhat poorly drained soils on bottom lands. These soils are flooded occasionally. Areas range from 5 to 150 acres.

This complex contains 50 to 70 percent Gayville soils and 30 to 50 percent Caruso soils. The Gayville soils are in irregularly shaped microdepressions in which water ponds after rains. The Caruso soils are between the microdepressions and at a slightly higher elevation than the Gayville soils.

Typically, the Gayville soil has a surface layer of gray, very friable silt loam about 2 inches thick. The subsoil is 26 inches thick. The upper part of the subsoil is dark gray, firm clay loam; the middle part is dark gray, very firm, calcareous clay; and the lower part is dark gray and gray, very firm, calcareous clay loam and sandy clay loam. The upper part of the mottled underlying material is calcareous, olive sandy loam; the middle part is pale olive, calcareous sandy clay loam; and the lower part is light olive gray sandy loam to a depth of 60 inches. The subsoil and upper part of the underlying material are strongly alkali.

Typically, the Caruso soil has a surface layer of friable loam 18 inches thick. The upper part of the surface layer is dark grayish brown, and the lower part is dark gray. Beneath this is a transitional layer of grayish brown, friable clay loam about 8 inches thick. The upper part of the underlying material is brown loam; the middle part is pale brown sandy clay loam; and the lower part is grayish brown and light brownish gray, mottled silty clay loam to a depth of 60 inches or more. Soft masses of lime occur throughout the underlying material.

Included with these soils in mapping are small areas of Lamo silt loam and Gibbon silt loam at an elevation similar to that of the Caruso soil. Also included are small areas of Saltine soils at an elevation similar to that of the Gayville soil. The included soils make up 8 to 15 percent of this map unit.

Permeability is very slow in the Gayville soils and moderately slow in the Caruso soils. The available water capacity is moderate in the Gayville soils and high in the Caruso soils. Both soils have a seasonal high water table that ranges from a depth of 2 feet in most years to about 3 feet in most dry years. Gayville soils release moisture slowly to plants, and Caruso soils release moisture readily. Natural fertility is medium in the Caruso soils and low in the Gayville soils. The content of organic matter is moderate in both soils. Runoff is slow in Caruso soils and very slow in Gayville soils. The water intake rate is low in Gayville soils and moderately low in Caruso soils. The surface layer of the Gayville soils is hard and crusty when dry and becomes puddled when wet. Shrink-swell potential is high in the Gayville soils and moderate in the Caruso soils. Reaction is strongly alkaline and very strongly alkaline in most horizons of the Gayville soils. The Caruso soils range from neutral through moderately alkaline in most horizons.

Most areas of these soils are in rangeland and are used for grazing. A few small areas are cultivated, but crop production is generally low.

If these soils are used for dryland farming, they are poorly suited to small grain and to alkali-tolerant grasses for hay and pasture. Other cultivated crops are generally not suited because of the accumulation of excess salts, poor soil structure, and ponding of water in areas of Gayville soils. Applications of sulfur or gypsum help reduce the effects of the alkali. Installation of V-shaped ditches improve surface drainage and help lower the water table. Crop residue and green manure crops can be turned under to help improve tilth and increase infiltration of water.

If these soils are irrigated, they are poorly suited to cultivated crops; however, corn, sorghum, and alfalfa can be grown. Gravity or sprinkler irrigation is suited. Land leveling is needed to improve surface drainage and provide for a more even distribution of water. Leveling also fills the microdepressions with more fertile soil material. The principal management concern is high alkalinity in areas of the Gayville soils. Frequent irrigation is needed, but the rate of water application must be slow because of the slow permeability in the Gayville soils. Barnyard manure, green manure crops, and other forms of organic matter can be incorporated into the soil to make it more friable and receptive to water. Large quantities of irrigation water leach the alkali to lower levels. Nitrogen and phosphorus fertilizers are generally needed.

These soils are suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the range. In addition, overgrazing when

these soils are wet causes surface compaction and poor tilth. This makes grazing and cultivation difficult. Proper grazing use, deferred grazing, restricted grazing during wet periods, and a planned grazing system of use and rest help maintain the desirable native plants.

These soils are poorly suited to trees and shrubs in windbreaks. Careful, onsite investigation is needed before planting. The species selected must tolerate the occasional wetness and strong alkalinity. Establishment of trees is difficult, particularly in wet years and in the alkali areas of Gayville soils. Good site preparation and timely cultivation between the rows help control undesirable grasses and weeds.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of the Caruso soil needs to be considered in the design of roads and streets. The pavement of roads and streets should be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. The high shrink-swell potential in the subsoil of the Gayville soil is a limitation for roads and streets. This limitation can be overcome by excavating the subsoil layer and replacing it, if necessary, with coarse grained material. Also, mixing the subsoil material with additives, such as hydrated lime, helps prevent excessive shrinking and swelling.

These soils are in capability unit IVs-1 dryland and capability unit IVs-2 irrigated. The Gayville soils are in Saline Subirrigated range site, and the Caruso soils are in Subirrigated range site. The Gayville soils are in windbreak suitability group 10, and the Caruso soils are in windbreak suitability group 2S.

Gf—Gayville Variant silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on natural levees of streams that cross bottom lands. This soil is rarely flooded. Areas range from 5 to 300 acres.

Typically, the upper part of the surface layer is dark grayish brown, friable silt loam about 4 inches thick, and the lower part is gray, friable silt loam about 2 inches thick. The subsoil is dark grayish brown, firm, calcareous silty clay loam about 7 inches thick and is very strongly alkaline. The underlying material is pale olive, calcareous silt loam to a depth of 60 inches and is very strongly alkaline. In places, the surface layer has been altered by land leveling and is very strongly alkaline.

Included with this soil in mapping are small areas of Caruso, Leshara, and Cozad soils. The Caruso and Leshara soils are at a lower elevation than this Gayville Variant soil, and Cozad soils are slightly higher. The included soils do not have very strong alkalinity below the surface layer. They make up about 5 to 15 percent of this map unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. Tilth is fair. The content of organic matter is moderately low, and natural fertility is low. The seasonal high water table ranges from a depth of about 3 feet in most wet years to about 5 feet in most dry years. The water intake rate is low.

Most areas of this soil are used for range. A few areas are used for cultivated crops, but crop production is generally poor unless a high level of management is used.

If this soil is used for dryland farming, it is poorly suited to grain sorghum, small grain, and introduced grasses. The principal limitation is the very strong alkaline condition in the root zone. The sodium salts are toxic to roots, and they slow plant growth and substantially lower productivity. Wetness is also a concern because it delays tillage and retards the growth of crops in some years. This soil is droughty in summer for dryland crops. The production of wheat and the first cutting of alfalfa are the most dependable because these crops grow and mature in spring when rainfall is highest. A high level of management is needed on this soil. Chemicals, such as sulfur and gypsum, are applied to improve this soil, but the result is commonly disappointing. Better production can be obtained from alkali-tolerant crops than most other crops. Water absorption can be improved by adding barnyard manure and crop residue.

If this soil is irrigated, it is poorly suited to grain sorghum and grasses. Corn and alfalfa are grown in a few areas. The principal limitation is the very strongly alkaline subsoil and underlying material. In places, the alkaline material is exposed on the surface as a result of land leveling. Leveling is necessary to obtain uniform distribution of irrigation water and provide adequate surface drainage. Improving this soil is possible by adding chemicals, such as sulfur and gypsum to decrease the alkalinity, and by applying large amounts of irrigation water to help leach salts out of the root zone. The use of these chemicals is expensive and results are commonly disappointing. Alfalfa or a grass-legume mixture in the cropping system tends to open the soil and permit deeper water penetration. Nitrogen and phosphorus fertilizers are needed to produce good crop response. Good results can be obtained by growing alkali-tolerant crops.

This soil is suited to rangeland. Salt-tolerant grasses can be grown in the plant community. Overgrazing causes deterioration of the desirable grasses and increases growth of annual weeds. In addition, overgrazing causes surface compaction which reduces moisture intake of the soil. Proper grazing use and timely deferment from grazing, along with restricted use during very wet periods, help maintain the most desirable native plants.

This soil is not suited to trees or shrubs in windbreaks. Selected plantings of species that tolerate the very strongly alkaline condition can be made in small areas.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding and from wetness caused by the high water table. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Septic tank absorption fields need to be constructed on fill material so that the absorption field can be placed a sufficient distance above the seasonal high water table. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets should be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit IVs-1 dryland and capability unit IVs-2 irrigated. It is in Saline Lowland range site and windbreak suitability group 10.

Gg—Gibbon loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 5 to 175 acres.

Typically, the surface layer is dark gray, friable loam about 14 inches thick. Beneath this is a transitional layer of gray, mottled, friable clay loam about 8 inches thick. The underlying material is gray and light gray, mottled clay loam, and silt loam to a depth of 60 inches or more. In some areas, the underlying material has thin strata of coarser and finer textured material. In a few small areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Lamo clay loam, Leshara silt loam, and Saltine soils. The Lamo soils have a thicker surface layer and are at about the same elevation as this Gibbon soil. The Leshara soils are deeper to free calcium carbonates and are at a slightly higher elevation. The Saltine soils are at a lower elevation. The included soils make up 8 to 12 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, and natural fertility is medium. Tilth is generally good. A seasonal high water table is at a depth of about 1.5 feet in wet years and 3 feet in dry years. It is generally highest in spring.

Most areas of this soil are farmed, and many of these are irrigated. A few areas are in rangeland and are used for grazing or are mowed for hay.

If this soil is used for dryland farming, it is suited to corn, sorghum, wheat, and alfalfa (fig. 7). It is poorly suited to small grain because of the high water table in spring. Wetness generally delays tillage early in spring, but the water table provides supplemental moisture late in the growing season. Conservation tillage practices that keep crop residue on the surface help prevent excessive loss of moisture by evaporation, improve tilth, and maintain fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, introduced grasses, alfalfa, and soybeans. Tillage is commonly delayed in spring in most years. Land grading for irrigation helps improve surface drainage and increase the efficiency of irrigation. A tailwater recovery system at the end of the field helps conserve the supply of underground water.

This soil is suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. In addition, overgrazing if the soil is wet can result in surface compaction and the formation of small mounds, thus making grazing and haying difficult. Proper grazing use and timely deferment of grazing or haying, along with restricted use during very wet periods, help maintain or improve the range condition.

If this soil is used for windbreaks, it is suited to trees and shrubs that tolerate occasional wetness. Competition for moisture from weeds and grasses occurs late in summer when the water table is lowest. Good site preparation and timely cultivation between the rows help control undesirable grasses and weeds. Weeds in the row can be hoed by hand, rototilled, or carefully sprayed with an appropriate herbicide.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Constructing sewage lagoons on fill material raises the bottom of the lagoon to a sufficient height above the seasonal high water table, and lining or sealing the lagoons helps prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-4 dryland and capability unit IIw-6 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Gt—Gothenburg soils, 0 to 3 percent slopes. These soils are nearly level and very gently sloping, poorly

Figure 7.—Alfalfa hay and corn are excellent uses for Gibbon loam, 0 to 2 percent slopes.

drained, and on bottom lands. They are very shallow over coarse sand or gravelly sand. The texture of the surface layer is variable. It ranges from gravelly sand to loam. Areas are dissected by shallow stream channels and are frequently flooded by excess stream flow of the Platte River. Areas are generally elongated and range from 20 to 1,000 acres.

Typically, the surface layer is dark gray, very friable loamy sand about 3 inches thick. The upper part of the underlying material is light gray coarse sand about 8 inches thick, and the lower part is very pale brown gravelly sand to a depth of 60 inches or more and has common, strong brown mottles.

Included with these soils in mapping are small areas of the poorly drained Barney loam and the somewhat poorly drained Platte soils. The included soils are at a slightly higher elevation than the Gothenburg soils. The included soils make up 10 to 25 percent of this map unit.

Permeability is very rapid, and the available water capacity is very low. Runoff is very slow. The natural fertility is low, and content of organic matter is very low. The root zone is restricted to the soil material above the gravelly sand or coarse sand. The seasonal high water table ranges from the surface in wet years to a depth of 2 feet in dry years.

Most areas of these soils are used as habitat for woodland and wetland wildlife. The areas are also commonly grazed.

These soils are not suited to cultivated crops because of the very shallow depth to gravelly sand, low available water capacity, and frequent flooding.

Use of these soils for rangeland is very limited. Common vegetation is annual grasses, sedges, weeds, shrubs, and cedar trees. An adequate supply of water is available in the river channels during most seasons.

These soils are not suited to planted trees or shrubs in windbreaks. The principal native trees are eastern cottonwood and eastern redcedar. They are shallow rooted and subject to abuse during storms.

These soils are not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Because of the rapid permeability of the underlying material, these soils do not adequately filter effluent from a waste disposal system. Seepage from

septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Areas of these soils can be investigated as a source of sand and gravel. They also provide suitable sites for excavated ponds for livestock watering facilities.

These soils are in capability unit VIIs-3 dryland. They are in windbreak suitability group 10.

Ha—Hall silt loam, sandy substratum, 0 to 1 percent slopes. This deep, well drained, nearly level soil is on stream terraces. Areas range from 25 to 500 acres.

Typically, the surface soil is dark gray, very friable silt loam about 16 inches thick. The upper part of the subsoil is dark grayish brown, firm silty clay loam about 16 inches thick, and the lower part is grayish brown, friable silty clay loam about 8 inches thick. The upper part of the underlying material is pale brown silt loam to a depth of 46 inches, and the lower part is pale brown fine sand to a depth of 60 inches. In places, the underlying material is silt loam to a depth of 60 inches. In places, free carbonates are at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of Brocksburg and Hord soils. The deep Hord soils are at a slightly higher elevation than this Hall soil. The Brocksburg soils are moderately deep. The included soils make up about 5 to 15 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The surface layer is very friable and easily tilled through a wide range of soil moisture. Water is absorbed and released readily by plants. Natural fertility is high, and the content of organic matter is moderate.

Most areas of this soil are used for cultivated crops and are irrigated.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, and alfalfa. The principal concerns of management are maintaining the fertility and content of organic matter. Conservation tillage practices that leave crop residue on the surface, such as no-till planting and stubble mulching, help protect the surface from soil blowing and help prevent the loss of soil moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, and soybeans. Gravity or sprinkler irrigation is suited. Some land leveling is generally needed for gravity irrigation. Crop residue should be left on the surface in winter to help control soil blowing. Irrigation water should be applied in sufficient amounts to serve the needs of the crops and at a rate that permits maximum absorption and minimum runoff.

Only a small acreage of this soil is in rangeland. If this soil is used for range, overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable range plants. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil provides a good site for trees and shrubs in windbreaks. Survival and growth of adapted species is generally good. Moisture competition from weeds and grasses is the main limitation. Good site preparation and timely cultivation between tree rows can increase available moisture for the trees and shrubs. Careful use of appropriate herbicides and rototilling can be used to help control weeds and grasses in the row.

This soil is suitable for building sites. The moderately slow permeability of this soil is a limitation for septic tank absorption fields, but this can generally be overcome by increasing the size of the absorption area. Seepage from sewage lagoons can contaminate the underground water supply. Lining or sealing sewage lagoons helps prevent seepage. The moderate shrink-swell potential of this soil is a limitation for building sites. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of the soil. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving of the sandy underlying material. The low strength of the subsoil needs to be considered in the design of roads and streets. The surface pavement of roads and streets needs to be designed so that it is thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit I-1 dryland and capability unit I-4 irrigated. It is in Silty Lowland range site and windbreak suitability group 1.

Hb—Hobbs silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on bottom lands of intermittent drainageways. It is occasionally flooded. Areas range from 5 to 25 acres.

Typically, the surface layer is gray, friable silt loam about 6 inches thick. The underlying material is stratified grayish brown, dark grayish brown, dark gray, brown, and pale brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Hord soils at a slightly higher elevation than this Hobbs soil. The included soils make up less than 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Flooding is occasional, but floodwater generally recedes within a few hours. Moisture is released readily to plants. The content of organic matter is moderate, and natural fertility is high. The surface layer is friable and easily tilled. Tilth is good.

Most areas of this soil are used for cultivated crops. A few areas are in rangeland and are used for grazing.

If this soil is used for dryland farming, it is suited to corn, sorghum, small grain, and alfalfa. The principal

hazard is occasional flooding. Small grain and alfalfa production can be reduced by flooding, but during dry periods the additional moisture is beneficial to crops because it adds to the needed supply of moisture. Diversion terraces and drainage ditches help to reduce flooding by intercepting the runoff and keeping it from spreading over a wide area. Minimum tillage and stubble mulch tillage keep crop residue on the surface and thus prevent soil blowing and excessive loss of moisture.

If this soil is irrigated, it is suited to corn, sorghum, alfalfa, and soybeans. Gravity or sprinkler irrigation is suitable. Land leveling is generally needed for gravity irrigation. Diversion terraces are needed to intercept the floodwater from higher soil areas. Managing crop residue and using conservation tillage practices that keep crop residue on the surface help to prevent soil blowing and excessive loss of moisture.

This soil is suitable as rangeland. Overgrazing by livestock and deposition of silt reduce the protective cover and cause deterioration of desirable range plants. Proper grazing use and a planned grazing system of use and rest help maintain or improve the range condition.

If this soil is used for windbreaks, it is fairly well suited to trees and shrubs. Survival of seedlings is fair. Moisture competition from weeds and grasses can be controlled by good site preparation and timely cultivation between the rows. Careful use of appropriate herbicides and hoeing by hand help control weeds and grasses within the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding; therefore, alternate sites on other soils that are suited to these uses should be considered. Sewage lagoons need to be diked as protection from flooding. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit IIw-3 dryland and capability unit IIw-6 irrigated. It is in Silty Overflow range site and windbreak suitability group 1.

HcB—Hobbs silt loam, channeled, 0 to 3 percent slopes. This deep, well drained, channeled soil is on bottom lands of intermittent drainageways. It is flooded frequently after heavy rains by overflow from the stream channel. Areas are 200 to 500 feet wide and 2 to 5 miles or more long. Many areas are bordered by short, steep streambanks or breaks to the bottoms.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches or more is gray silt loam that has thin strata of slightly coarser textured material. In small areas, the soil is loamy and sandy.

Included with this soil in mapping are small areas of silty soils that are occasionally flooded and at a slightly higher elevation than the Hobbs soil. The included soils make up about 10 to 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is medium. The content of organic matter is moderate, and natural fertility is high. The water intake rate is moderate.

Nearly all areas of this soil are in native grassland and are used for range.

This Hobbs soil is not suited to cultivated crops because it is frequently flooded and the long narrow areas are traversed by deep meandering channels.

This soil is suited to rangeland. Overgrazing by livestock and deposition of silt reduces the protective cover and causes deterioration of the native plants. Proper grazing use and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is not suited to planting of trees or shrubs in windbreaks. The principal hazard is the frequent flooding and the deep meandering channels. Some areas have a good growth of volunteer, native trees and shrubs, mainly eastern cottonwood.

This soil is not suitable for building sites, septic tank absorption fields, or sewage lagoons because of the hazard of frequent flooding. Because of this hazard, alternate sites on other soils that are suited to these uses should be considered. Bridges and culverts are generally used where local roads cross areas of this soil.

This soil is in capability unit VIw-7 dryland. It is in Silty Overflow range site and windbreak suitability group 10.

Hg—Holder silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on narrow divides on the loess uplands. Areas range from 5 to 75 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 18 inches thick. The subsoil is about 22 inches thick. The upper part of the subsoil is grayish brown, friable silty clay loam, and the lower part is light grayish brown, friable silt loam. The underlying material is pale brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Nora soils at a lower elevation than the Holder soils. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderate, and natural fertility is high. Runoff is slow. Tilth is generally good, and the soil is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are used for farming. Some small areas are in rangeland and are used for grazing.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. Grasses and alfalfa can be grown for hay or pasture. The principal limitation is the limited rainfall. The production of small grain and the first cutting of alfalfa are generally more

dependable because these crops grow and mature in spring when rainfall is highest. No-till planting and mulching permit the planting of crops without excessive cultivation or loss of soil moisture. They also keep crop residue on the surface, help maintain the content of organic matter, and improve fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suited. Most areas need some land leveling for efficient gravity irrigation. Sustained production can be obtained by using fertilizers and high plant populations and by efficient irrigation that controls the amount and time of water application. Keeping crop residue on the surface prevents excessive loss of soil moisture.

This soil is suited to use as rangeland. Overgrazing the range reduces the protective plant cover and causes deterioration of the range plants. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

If this soil is used for windbreaks, it provides a good planting site. The survival and growth of adapted species is good. Limited rainfall is the principal hazard. Irrigation water is needed during periods before seedlings are established or during periods of prolonged drought. Competition for moisture from grasses and weeds is a hazard to the establishment of seedlings. Good site preparation and timely cultivation between the rows help reduce the competition for moisture.

This soil is suitable for building sites. The moderate permeability of this soil is a limitation for septic tank absorption fields, but this can generally be overcome by increasing the size of the absorption area. Lining or sealing sewage lagoons helps prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of the soil. The low strength of this soil should be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit I-1 dryland and capability unit I-4 irrigated. It is in Silty range site and windbreak suitability group 3.

HrB—Hord silt loam, 1 to 3 percent slopes. This deep, well drained, very gently sloping soil is on stream terraces. Areas range from 10 to 75 acres.

Typically, the surface soil is dark gray, friable silt loam about 21 inches thick. The subsoil is friable, heavy silt loam about 21 inches thick. The upper part of the subsoil is dark grayish brown, and the lower part is brown. The underlying material is light yellowish brown silt loam to a depth of 60 inches or more. In a few areas the underlying material is gravelly sand below a depth of 40 inches.

Included with this soil in mapping are small areas of the very gently sloping Kenesaw soil at a slightly higher elevation. The included soils make up less than 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, and natural fertility is high. The surface layer is friable and easily tilled.

Nearly all areas of this soil are used for cultivated crops and are irrigated. A few small areas are in rangeland or various uses, such as farmsteads and windbreaks.

If this soil is used for dryland farming, it is suited to corn, sorghum, wheat, and alfalfa. The principal hazard is soil blowing on unprotected fields. Conservation tillage practices that keep crop residue on the surface, such as minimum tillage and stubble mulching, help reduce soil blowing and conserve moisture. Water erosion can occur following heavy rains if the soil is bare. Stripcropping and stubble mulching help prevent erosion from forming rills and gulleys.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suitable. Generally some leveling is needed for gravity irrigation. Keeping crop residue on the surface increases the intake rate of water and helps prevent erosion. Reducing and controlling the runoff of irrigation water helps conserve the supply of underground water and increases efficiency of irrigation.

The use of this soil as rangeland is effective in controlling soil blowing and water erosion. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Overgrazing can result in severe soil loss by water erosion. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is well suited to trees and shrubs in windbreaks. Seedlings generally survive and grow well if competing grasses and weeds are controlled. This can be accomplished by timely cultivation between the rows and by careful use of appropriate herbicides or rototilling in the row. Supplemental water is needed during drought.

This soil is well suited to building sites and septic tank absorption fields. In places, grading is required for sewage lagoon areas to modify the slope and shape the lagoon. Sealing or lining the lagoons helps prevent seepage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit IIe-1 dryland and capability unit IIe-6 irrigated. It is in Silty range site and windbreak suitability group 1.

Hs—Hord silt loam, sandy substratum, 0 to 1 percent slopes. This deep, well drained, nearly level soil is on stream terraces. Areas range from 10 to 1,000 acres.

Typically, the surface soil is very friable silt loam about 21 inches thick. The upper part of the surface soil is dark gray, and the lower part is dark grayish brown. The subsoil is friable silt loam about 21 inches thick. The upper part of the subsoil is dark grayish brown, and the lower part is brown. The underlying material is very pale brown gravelly sand to a depth of 60 inches or more. In areas near Palmer the underlying material to a depth of 60 inches is silt loam. In some areas the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Brocksburg soils at a slightly lower elevation. The included soils make up about 3 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. The surface layer is very friable, and tilth is good. Moisture is readily released to plants. The content of organic matter is moderate, and natural fertility is high.

Most areas of this soil are used for cultivated crops and are irrigated. A few small areas are used for rangeland, farmsteads, or windbreaks.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, and soybeans and to grasses and alfalfa for hay or pasture. The principal management problems are related to keeping an adequate supply of moisture in the soil and maintaining fertility. Conservation tillage practices that keep crop residue on the surface, such as cultivation with a disc or chisel, no-till planting, and stubble mulching, protect the surface from soil blowing and prevent excessive evaporation of soil moisture. Crop diseases and insects can be controlled if row crops are alternated with small grain or hay and pasture crops in the crop sequence.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, and soybeans. Sprinkler or gravity irrigation is suitable. Some land leveling is generally required for gravity irrigation. Crop residue should be left on the surface to help control soil blowing. Irrigation water should be applied in sufficient amounts to serve the needs of the crops and at a rate that permits maximum absorption and minimum runoff.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition. Proper use, rotation grazing, and application of commercial fertilizers are good management practices if this soil is used for introduced grasses for pasture.

This soil provides a good site for trees and shrubs in windbreaks. Survival and growth of adapted species is generally good. Moisture competition from weeds and grasses is the main limitation. Good site preparation and timely cultivation between the tree rows conserve available moisture. Careful use of appropriate herbicides and rototilling help control weeds and grasses in the row.

This soil is well suited to building sites and septic tank absorption fields. Seepage from sewage lagoons can contaminate the underground water supply. Lining or sealing sewage lagoons helps prevent seepage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit I-1 dryland and capability unit I-6 irrigated. It is in Silty Lowland range site and windbreak suitability group 1.

IfD—Inavale loamy sand, 3 to 9 percent slopes. This deep, somewhat excessively drained, gently sloping and strongly sloping soil is on bottom lands. This soil is rarely flooded. Areas are generally hummocky and long and narrow. They range from 5 to 50 acres.

Typically, the surface layer is dark grayish brown, very friable loamy sand about 3 inches thick. Beneath this is a transitional layer of grayish brown, very friable loamy sand about 4 inches thick. The underlying material is pale brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of nearly level Inavale soils. In places, somewhat poorly drained Platte soils are at a lower elevation. The included soils make up less than 5 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The natural fertility and content of organic matter are low. This soil releases moisture readily to plants but tends to lose much of it through deep percolation. The surface layer is loose.

Most areas of this soil are in native grasses and are used for range or cut for hay.

This soil is not suited to dryland cultivated crops because it is sandy, droughty, and subject to severe soil blowing. It is better suited to grasses, trees, and wildlife habitat than to cultivated crops. Unless water for irrigation is available, areas that are presently cultivated need to be returned to native vegetation.

If this soil is irrigated, it is poorly suited to corn, grain sorghum, introduced grasses, and legumes. Sprinkler irrigation is better suited to this soil than most other methods of irrigation. The main hazard is soil blowing. Frequent, light applications of water are needed to avoid excessive leaching of nutrients. Maintaining a large

amount of crop residue on the surface and use of a conservation tillage system and stripcropping help control soil blowing.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the potential plant community. This causes severe losses by soil blowing and the formation of small blowouts. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system help maintain or improve the range condition.

If trees and shrubs are used for windbreaks, this soil provides a fair planting site. The survival and growth of adapted species is fair. Disturbed areas of this soil are subject to blowing, and this is the principal hazard. Seedlings need to be planted in shallow furrows and should not be cultivated. During high winds, seedlings can be damaged or covered by blowing sand. Supplemental water is needed during times of insufficient moisture.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them against flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect them from flood damage.

This soil is in capability unit VIe-5 dryland and capability unit IVe-5 irrigated. It is in Sands range site and windbreak suitability group 7.

In—Inavale loamy fine sand, 0 to 3 percent slopes. This deep, somewhat excessively drained, nearly level and very gently sloping soil is on bottom lands. It is rarely flooded. Areas are generally long and narrow and range from 5 to 75 acres.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 7 inches thick. Beneath this is a transitional layer of light brownish gray, very friable loamy sand about 13 inches thick. The underlying material is light brownish gray loamy sand that contains thin strata of finer textured sediment to a depth of 60 inches or more. In a few small areas, the surface layer is fine sandy loam or loamy sand.

Included with this soil in mapping are small areas of Platte, Alda, and Janude soils. Platte and Alda soils are somewhat poorly drained and at a lower elevation than this Inavale soil. Janude soils are moderately well drained and at a lower elevation. The included soils make up 5 to 10 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. The natural fertility and content of organic matter are low. This soil releases moisture readily to plants but tends to lose much of it through deep percolation. The surface layer is very friable and easily tilled through a wide range of soil moisture.

Most areas of this soil are in native grassland and are used for range. A few areas are used for cultivated crops.

If this soil is used for dryland farming, it is poorly suited to corn, sorghum, small grain, introduced grasses, and alfalfa. The production of small grain and the first cutting of alfalfa are generally more dependable than most other crops because they grow in spring when rainfall is highest. The main hazards are soil blowing and the droughtiness of the soil. Soil blowing can be reduced, the moisture conserved, and fertility maintained if the crop residue covers the soil most of the time. Soil blowing can also be reduced by stripcropping, conservation tillage, grassed field borders, and narrow windbreaks.

If this soil is irrigated, it is suited to corn, alfalfa, small grain, grasses, and legumes. Sprinkler irrigation is the only method of application that is suitable. The principle hazard is soil blowing. Frequent, light applications of water are needed to avoid excessive leaching of plant nutrients and because the available water capacity is low. Maintaining a high amount of crop residue on the surface, stripcropping, using field windbreaks, and keeping tillage to a minimum help control soil blowing.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the natural vegetation. Proper grazing use and timely deferment from grazing and haying help maintain or improve the range condition.

If trees and shrubs are used for windbreaks, this soil provides a good planting site. The growth and survival of adapted species is fair. Lack of adequate moisture and soil blowing are the main limitations. Soil blowing can be prevented by maintaining strips of sod or other cover crops between the rows. Undesirable weeds and grasses that compete for moisture can be controlled by careful use of appropriate herbicides. Irrigation is needed to provide supplemental moisture during periods of low rainfall. Cultivation generally needs to be restricted to the tree rows.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them against flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the

rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage.

This soil is in capability unit IVe-5 dryland and capability unit IIIe-11 irrigated. It is in Sandy Lowland range site and windbreak suitability group 5.

Iv—Ipage loamy fine sand, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is in sandhill valleys and on stream terraces. Areas range from 10 to 200 acres.

Typically, the surface layer is gray, very friable loamy fine sand about 9 inches thick. The underlying material is brown fine sand to a depth of 32 inches. Below this, it is light gray fine sand that has yellowish brown mottles to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the somewhat poorly drained Els soils in low places. Also included are areas of Libory soils at a slightly higher elevation than this Ipage soil. The included soils make up 10 to 20 percent of this map unit.

Permeability is rapid, and the available water capacity is low. The natural fertility and content of organic matter are low. Runoff is very slow. The surface layer is very friable and easily tilled through a wide range of soil moisture. The seasonal high water table ranges from a depth of about 3 feet in the most wet years to about 5 feet in most dry years.

Most areas of this soil are in native grassland and are used for range. A few areas are farmed and are commonly irrigated.

If this soil is used for dryland farming, it is suited to corn, wheat, and grain sorghum and to grasses and legumes for hay and pasture. The principal hazards are soil blowing and droughtiness. Conservation tillage practices such as no-till planting and stubble mulch tillage help prevent serious soil blowing and conserve soil moisture. Use of a cover crop is also beneficial.

If this soil is irrigated, it is suited to corn, grain sorghum, and alfalfa. Sprinkler irrigation is suited. Gravity irrigation is not suited because of the high rate of water intake and rapid permeability. The principal hazard is soil blowing. Frequent, light applications of water and fertilizer are needed because the available water capacity is low and to avoid excessive leaching of plant nutrients. Keeping crop residue on the surface and using conservation tillage practices help control soil blowing.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods reduces the protective cover, causes deterioration of the range plants, and results in soil blowing. Proper range use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

This soil is suited to trees and shrubs in windbreaks. The principal problems are droughtiness and competition for moisture from weeds and grasses. Weeds and grasses can be controlled by timely cultivation between rows and by careful use of appropriate herbicides and rototilling in the rows.

This soil is suitable for building sites. Installing perimeter drains, such as perforated tile, around buildings with basements helps prevent wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Placing septic tank absorption fields in raised fill helps provide adequate absorption of effluent. Lining or sealing sewage lagoons helps prevent seepage. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIe-5 dryland and capability unit IIIe-11 irrigated. It is in Sandy Lowland range site and windbreak suitability group 5.

Iw—Ipage-Els loamy fine sands, 0 to 3 percent slopes. These soils are deep, nearly level and very gently sloping, moderately well drained and somewhat poorly drained. They are on stream terraces and in sandhill valleys. The Els soil is occasionally flooded. Areas range from 25 to 1,000 acres.

This map unit is made up of about 50 to 65 percent Ipage soils and about 35 to 50 percent Els soils. The Ipage soils are on the high, very gently sloping part of the landscape, and the Els soils are on the low, nearly level parts.

Typically, the Ipage soil has a surface layer of dark grayish brown, very friable loamy fine sand about 5 inches thick. Beneath this is a transitional layer of grayish brown, very friable loamy fine sand about 8 inches thick. The underlying material is pale brown, mottled fine sand to a depth of 60 inches or more.

Typically, the Els soil has a surface layer of very friable loamy fine sand about 12 inches thick. The upper part of the surface layer is dark gray, and the lower part is mottled dark grayish brown. Beneath this is a transitional layer of light brownish gray, mottled, very friable loamy fine sand about 6 inches thick. The underlying material is light gray loamy sand to a depth of 60 inches or more.

Included with these soils in mapping are small areas of the very poorly drained Marlake soils in depressions and the excessively drained Valentine soils at the highest elevation. The included soils make up about 8 to 10 percent of this map unit.

Permeability is rapid, the available water capacity is low, and the water intake rate is very high in these soils. The content of organic matter is low in Ipage soils and moderately low in Els soils. The natural fertility is low in both soils. The surface soil is very friable and easily tilled through a wide range of soil moisture. In Ipage soils the seasonal high water table ranges from a depth of about 3 feet in most wet years to about 5 feet in most dry years. In Els soils it ranges from about 1.5 feet in most wet years to about 3.5 feet in most dry years.

Most areas of these soils are in native grassland and used for range. Some areas are used for cultivated crops.

If these soils are used for dryland farming, they are suited to corn, sorghum, wheat, and alfalfa. The principal limitations are soil blowing and soil wetness. The Ipage soils are especially subject to soil blowing and to droughtiness late in the growing season. The Els soils have a moderately high water table, and tillage is generally delayed early in spring because of the wetness. The water table, however, provides supplemental water during dry periods. Soil blowing is a hazard on unprotected fields. Conservation tillage practices that keep crop residue on the surface, such as disc- or chisel-plant and stubble mulching, help prevent serious soil blowing and conserve moisture.

If these soils are irrigated, they are suited to corn, sorghum, and alfalfa. These soils are generally better suited to sprinkler irrigation than to other kinds of irrigation. Tillage is generally delayed in spring of most years because of wetness from the high water table on the Els part of this unit. Frequent, light applications of water help to avoid excessive leaching of the plant nutrients and are necessary because of the rapid permeability and low available water capacity of these soils. Maintaining crop residue on the surface by using conservation tillage practices is effective in controlling soil blowing.

The native grasses on these soils are suitable for rangeland grazing or haying. Overgrazing or improper haying methods reduce the protective cover and cause deterioration of the desirable plants. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help maintain or improve the range condition.

These soils are suited to trees and shrubs in windbreaks. An onsite check of the area is needed before selecting the species to be planted. The species selected should tolerate the occasional wetness, especially in the areas of Els soils. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by timely cultivation between the rows. Areas within the rows can be hoed by hand or rototilled.

The Els soil is not suitable as a site for septic tank absorption fields or dwellings and other buildings because of occasional flooding and wetness. The Ipage soil is suitable for building sites, although the seasonal high water table somewhat limits its use for buildings with basements. Because of the rapid permeability in the underlying material, these soils do not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons on the Ipage soil can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

These soils are in capability unit IIIw-5 dryland and capability unit IIIw-11 irrigated. The Ipage soil is in Sandy Lowland range site, and the Els soil is in Subirrigated range site. The Ipage soil is in windbreak suitability group 5, and the Els soil is in windbreak suitability group 2S.

Jm—Janude sandy loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on bottom lands. It is rarely flooded. Areas range from 25 to 500 acres.

Typically, the surface soil is very friable sandy loam about 30 inches thick. The upper part of the surface soil is grayish brown, and the lower part is gray. Beneath this is a transitional layer of light brownish gray, very friable fine sandy loam about 8 inches thick. The underlying material is faintly mottled, light gray loamy sand to a depth of 60 inches or more. In small areas, the lower part of the profile is calcareous.

Included with this soil in mapping are small areas of Fonner sandy loam, Inavale loamy fine sand, and Wann sandy loam. The Fonner soils are moderately deep to sand and gravel and at a slightly lower elevation than this Janude soil. The Inavale soils are at a slightly higher elevation and are better drained. The Wann soils are calcareous and somewhat poorly drained. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow. The water intake rate is moderately high. The content of organic matter is moderately low, and natural fertility is medium. The seasonal high water table ranges from a depth of 4 feet in most wet years to 6 feet in most dry years. The surface soil is very friable and can be tilled through a wide range of soil moisture. Tilth is good.

Most areas of this soil are used for cultivated crops. Only a few small areas are in rangeland.

If this soil is used for dryland farming, it is suited to corn, sorghum, wheat, and alfalfa. The water table is highest in spring and provides supplemental moisture for deep-rooted crops at this time. The principal hazards are soil blowing and droughtiness late in the growing season. Practices that keep crop residue on the surface, such as conservation tillage, help prevent soil blowing and conserve soil moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suited. Generally, a small amount of land leveling is needed for gravity irrigation. Light, frequent applications of water and fertilizer are needed. Returning crop residue to the soil and keeping tillage to a minimum help reduce soil blowing, conserve moisture, and maintain the organic matter content.

Use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferment from grazing or haying help maintain the plants in good condition.

This soil is suited to trees and shrubs in windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between the rows.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them against flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Septic tank absorption fields can be constructed on fill material so that the absorption field can be placed a sufficient distance above the seasonal high water table. Lining or sealing sewage lagoons helps prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect the roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIe-3 dryland and capability unit IIe-8 irrigated. It is in Sandy Lowland range site and windbreak suitabiity group 1.

Ks—Kenesaw silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on high stream terraces. Typically, the drainage pattern is weakly formed. Areas range from 5 to 200 acres.

Typically, the surface layer is grayish brown, very friable silt loam about 8 inches thick. The subsoil is brown, friable silt loam about 7 inches thick. The underlying material to a depth of about 37 inches is pale brown, calcareous silt loam. Below that, it is pale brown, calcareous, very fine sandy loam to a depth of 60 inches or more. In small areas, the surface layer and subsoil are fine sandy loam. Also, in areas the surface layer has been thinned or thickened by land leveling.

Included with this soil in mapping are small areas of Hord, Loretto, and Rusco soils. The dark colored Hord soils are along drainageways. The loamy Loretto soils are at a slightly higher elevation than this Kenesaw soil. The moderately well drained Rusco soils are at a lower elevation. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is generally good, and the soil is easily tilled. The content of organic matter is moderately low, and natural fertility is medium. The water intake rate is moderate.

Most areas of this soil are used for cultivated crops. A few small areas are in rangeland and various land uses.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, grasses, and alfalfa. The principal concern in management is maintenance of the organic matter content and high fertility. Preventing soil blowing in winter is also a concern. A conservation cropping system that includes keeping crop residue on the surface helps reduce soil blowing, conserves moisture, and maintains the content of organic matter.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Gravity or sprinkler irrigation is suited to this soil. Irrigation water needs to be supplied in sufficient amounts to serve the needs of the crop and at a rate that permits maximum absorption and minimum runoff. Land leveling helps improve surface drainage and increases efficiency of gravity irrigation. Row crops can be grown continuously if a high level of management is used and fertility is maintained.

This soil is suited to rangeland. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferment from grazing or haying help maintain or improve the range condition.

This soil generally provides a good site for planting trees and shrubs in windbreaks. Survival of adapted species is generally good. The principal concern is the competition for moisture from weeds and grasses. This can be controlled by cultivation between the rows with conventional equipment, such as a disc or harrow. Appropriate herbicides and rototilling can be used to control weeds and grasses in the row.

This soil is well suited to building sites and septic tank absorption fields. Lining or sealing sewage lagoons helps prevent seepage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to

roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit I-1 dryland and capability unit I-6 irrigated. It is in Silty Lowland range site and windbreak suitability group 3.

KsC—Kenesaw silt loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on high stream terraces. It is on the side slopes of drainageways or on the slope break between the upper and lower terrace levels. Typically, the areas are hummocky and range from 25 to 100 acres.

Typically, the surface layer is grayish brown, very friable silt loam about 7 inches thick. The subsoil is light brownish gray, very friable silt loam about 13 inches thick. The underlying material is light gray, calcareous silt loam to a depth of 60 inches or more. In places, the surface layer is lighter colored than typical as a result of erosion.

Included with this soil in mapping are smaller areas of the strongly sloping Loretto and Valentine soils at a higher elevation than this Kenesaw soil. The included soils make up less than 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The intake rate is moderate. Runoff is medium. The content of organic matter is moderately low, and natural fertility is medium. The surface layer is very friable and easily tilled through a fairly wide range of soil moisture. Tilth is good.

Most areas of this soil are farmed. A few areas are in rangeland or in various land uses, such as windbreaks and farmsteads.

If this soil is used for dryland farming, it is suited to corn, sorghum, small grain, and alfalfa. The principal hazard is water erosion. Drought is a problem in hot periods in summer when rainfall is below normal. Conservation tillage practices that keep crop residue on the surface, such as minimum tillage, no-till planting, and stubble mulching, help reduce water erosion and conserve moisture. Terraces, grassed waterways, and contour farming reduce the rate of runoff and the hazard of erosion.

If this soil is irrigated, it is suited to corn, sorghum, alfalfa, soybeans, and introduced grasses. Close-sown crops are better suited than row crops. The principal hazards are water erosion and soil blowing. Maintaining fertility and proper distribution of water are concerns of management. This soil is better suited to sprinkler irrigation than to gravity irrigation. Terraces, contour irrigation, grassed waterways, and keeping crop residue on the surface help reduce water erosion and soil blowing. The rate at which water is applied should not exceed the intake rate.

This soil is suited to rangeland. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Overgrazing also results in severe soil losses by water erosion. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

If trees and shrubs are used in windbreaks, this soil provides a good site. Survival and growth of seedlings of adapted species is generally good. The principal hazards are droughtiness and water erosion. Irrigation water is needed during droughty periods. Using terraces and planting trees on the contour help prevent erosion. Appropriate herbicides and rototilling can be used in the row to control undesirable grasses and weeds which compete for moisture. Areas between the row can be disced or harrowed.

This soil is suited to building sites and septic tank absorption fields. For sewage lagoon areas, grading is required to modify the slope and shape the lagoon. Lining or sealing sewage lagoons helps prevent seepage. Small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches provide the needed surface drainage.

This soil is in capability unit IIIe-1 dryland and capability unit IIIe-6 irrigated. It is in Silty range site and windbreak suitability group 3.

La—Lamo silt loam, wet, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 10 to 500 acres.

Typically, the surface soil is dark gray, friable silt loam about 19 inches thick. Beneath this is a transitional layer of gray, friable silty clay loam about 6 inches thick. The underlying material, to a depth of 35 inches, is gray, mottled silty clay loam. Below that, it is light gray, mottled loam to a depth of 60 inches or more. The profile is calcareous throughout. In the Loup Valley, this soil is sandier in the lower part of the underlying material than it is in the Platte Valley.

Included with this soil in mapping are small areas of Leshara, Ovina, and Wann soils that are better drained and at a slightly higher elevation than this Lamo soil. The included soils make up 8 to 12 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. The water intake rate is moderately low. The content of organic matter is moderate, and natural fertility is medium. The seasonal high water table ranges from the surface in most wet years to a depth of 2 feet in most dry years.

Most areas of this soil are in rangeland and are used for hay and grazing.

This soil is not suited to the common cultivated crops because of the high water table and occasional flooding.

Rangeland, either grazing or haying, is an excellent use for this soil (fig. 8). Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. Overgrazing when the soil is wet causes surface compaction and formation of small bogs and mounds. These make grazing or harvesting for hay difficult. Proper grazing use and timely deferment of grazing or haying, along with restricted use during wet periods, help maintain the native plants in good condition.

This soil is poorly suited to trees and shrubs in windbreaks because of the high water table. The species selected should tolerate prolonged periods of wetness. Planting needs to be done when the water table is lowest. Weeds and grasses can be controlled by cultivation between the rows.

This soil is not suited to building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit Vw-7 dryland. It is in Wet Subirrigated range site and windbreak suitability group 10.

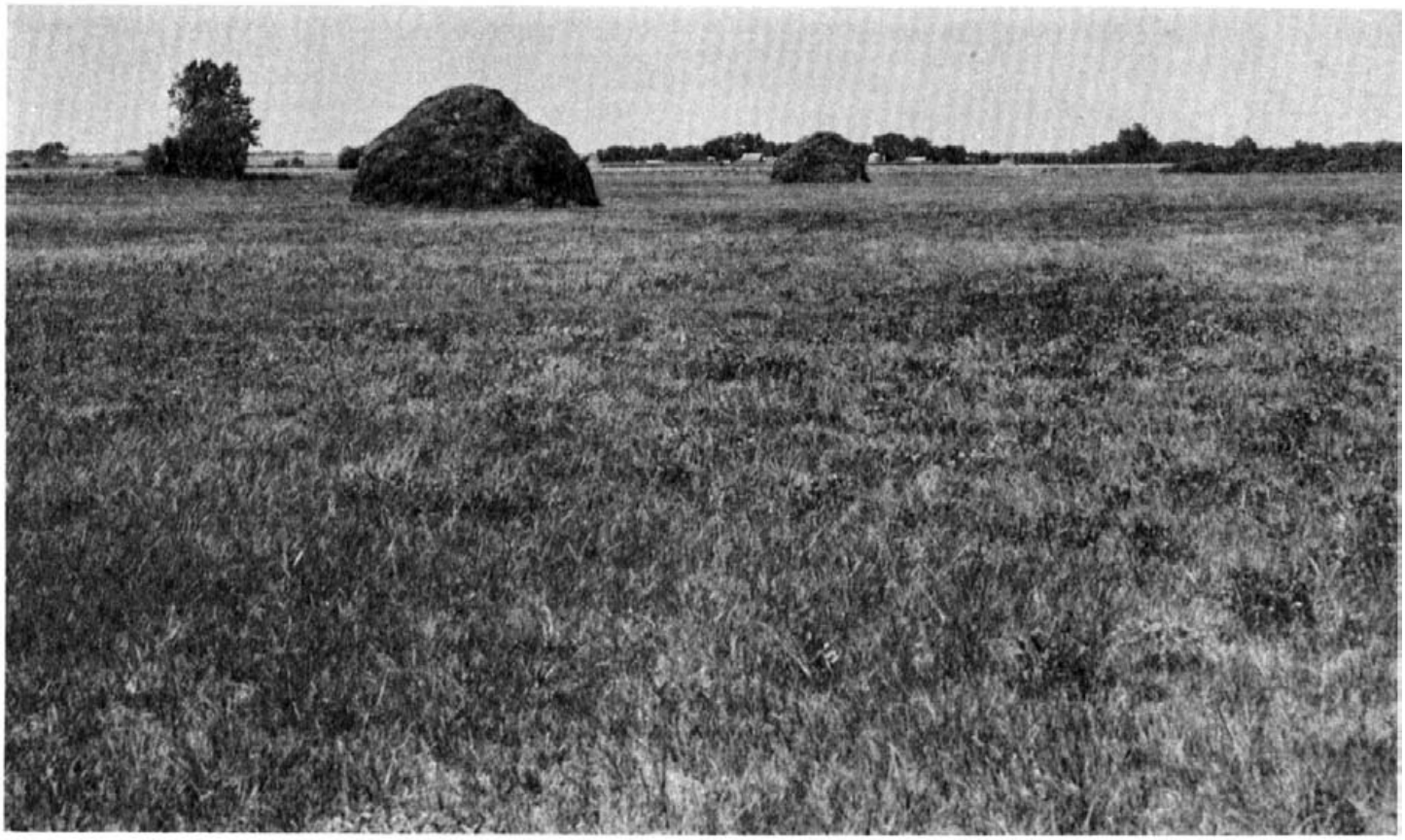

Figure 8.—Native hay is a good use for the poorly drained Lamo silt loam, wet. The seasonal high water table is at or near the surface in spring.

Lb—Lamo clay loam, sandy substratum, 0 to percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 20 to 500 acres.

Typically, the surface layer is friable, calcareous clay loam about 21 inches thick. The upper part of the surface layer is dark gray, and the lower part is gray. Beneath this is a transitional layer of gray, firm, calcareous silty clay loam about 9 inches thick. The underlying material to a depth of 42 inches is gray, mottled, calcareous sandy clay loam. Below that, it is light brownish gray gravelly sand to a depth of 60 inches or more. In some places, gravelly sand is above a depth of 40 inches because of land leveling for gravity irrigation.

Included with this soil in mapping are small areas of Gibbon, Lex, and Saltine soils. The Gibbon soils have a thinner surface layer and are at a higher elevation than this Lamo soil. The Lex soils are moderately deep to mixed sand and gravel and are at a slightly higher elevation. The saline-alkali Saltine soils are at a lower elevation. The included soils make up 10 to 15 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The water intake rate is low. The content of organic matter is moderate, and natural fertility is medium. The seasonal high water table ranges from a depth of about 2 feet in most wet years to about 4 feet in most dry years.

Most areas of this soil are used for farming. The rest is in native grasses and is used for hay or range.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, alfalfa, and small grain. The principal limitation is soil wetness which delays tillage in spring. Returning crop residue to the soil helps maintain and improve tilth and fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Tillage is commonly delayed in spring of most years. Land leveling generally is needed for gravity irrigation. Irrigation runs on this soil can be somewhat longer than on most soils because the water intake rate is low. Reducing and controlling runoff of irrigation water at the end of the field conserves the supply of underground water and improves efficiency of irrigation.

This soil is suited to use as rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. In addition, overgrazing when the soil is wet causes surface compaction. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods, help maintain the native plants in good condition.

This soil is suited to those species of trees and shrubs in windbreaks that tolerate a moderately high water table. Competition for moisture from weeds and grasses can be controlled by good site preparation and timely cultivation between the rows. Appropriate herbicides or rototilling can be used in the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Lining or sealing sewage lagoons helps to prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-4 dryland and capability unit IIw-3 irrigated. It is in Subirrigated range site and windbreak suitability group 2W.

Lc—Lamo-Saltine complex, 0 to 1 percent slopes. This complex consists of deep, nearly level, somewhat poorly drained soils on bottom lands. These soils are occasionally flooded. Small areas of alkali soils are common and appear as light gray irregular spots in cultivated fields. Areas range from 5 to 150 acres.

This complex contains 55 to 65 percent Lamo soils and 35 to 45 percent Saltine soils. The Lamo soils are in the lower positions, and the Saltine soils are generally in the higher positions.

Typically, the Lamo soil has a surface layer of dark gray, calcareous, friable clay loam about 10 inches thick. Below this is a transitional layer of dark gray, calcareous clay loam about 8 inches thick. The underlying material is dark gray and grayish brown, calcareous clay loam in the upper part, light brownish gray silty clay loam in the middle part, and light gray loam in the lower part to a depth of 60 inches or more. In places, the underlying material is noncalcareous.

Typically, the Saltine soil has a surface layer of dark gray and gray, friable calcareous silt loam about 12 inches thick. The subsoil is firm, calcareous silty clay loam about 30 inches thick and is strongly alkaline. The upper part of the subsoil is grayish brown, the middle part is light brownish gray, and the lower part is gray. The upper part of the underlying material is gray, calcareous silty clay loam, and the lower part is light brownish gray very fine sandy loam to a depth of 60 inches.

Included with these soils in mapping are small areas of Gayville soils in microdepressions and Caruso soils on slightly higher positions than the major soils. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderately slow, and the water intake rate is low. The available water capacity is high in the Lamo soils and moderate in the Saltine soils. Natural fertility is medium in the Lamo soils and low in the Saltine soils. The content of organic matter is moderate in the Lamo soils and moderately low in Saltine soils. In both soils the water table ranges from a depth of about 2 feet in most wet years to about 3 feet in most dry years. The Lamo soils have a limited range in soil moisture for good tillage, but the surface layer of the Saltine soils is friable and can be tilled through a wider range of soil moisture. Tilth is fair in the Lamo soils and poor in the Saltine soils.

Most areas of these soils are used for cultivated crops and are irrigated. The rest is in rangeland and used for haying or grazing.

If these soils are used for dryland farming, they are suited to corn, grain sorghum, wheat, and alfalfa. The main limitations are soil wetness and strong alkalinity. Tillage is generally delayed in spring of most years because of wetness from the water table and rains. In areas where outlets are adequate, the water table can be lowered by V-shaped ditches or perforated tile drains. The fluctuating water table provides supplemental moisture during periods of prolonged dry weather. Crop production is lower in areas that have strong alkalinity. These areas can be specially treated with barnyard manure to improve fertility and tilth. The principal concerns of management are maintaining the fertility and content of organic matter. Cultivation with a disc or chisel and no-till planting help keep crop residue on the surface, improve tilth, and conserve moisture.

If these soils are irrigated, they are suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler irrigation is suitable. Generally, some land leveling is necessary for gravity irrigation. Leveling also provides better surface drainage. Tillage is generally delayed in spring of most years because of wetness from the water table and rains. Excessive application of irrigation water should be avoided. Crop production is lower in areas that have strong alkalinity. These areas can be treated with barnyard manure to improve fertility and soil tilth. Conservation tillage practices that keep crop residue on the surface help improve soil tilth and conserve moisture.

The use of these soils as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferments from grazing or haying, along with restricted use during very wet periods, help maintain the native plants in good condition.

These soils are suited to trees and shrubs in windbreaks. Species that tolerate occasional wetness and moderate alkalinity should be planted. Seedlings generally survive and grow well if competing weeds and grasses are controlled. This can be accomplished by timely cultivation between the rows. Careful use of appropriate herbicides or rototilling helps control weeds in the row.

These soils are not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

These soils are assigned to capability unit IIIw-4 dryland and capability unit IIIw-4 irrigated. The Lamo soil is in Subirrigated range site, and the Saltine soil is in Saline Subirrigated range site. The Lamo soil is in windbreak suitability group 2W, and the Saltine soil is in windbreak suitability group 9S.

Ld—Lawet Variant fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands. It is frequently flooded. Areas range from 10 to 400 acres.

Typically, the surface layer is fine sandy loam. The upper 10 inches of the surface layer is dark gray, very friable, and moderately saline, and the lower 9 inches is very friable, gray, and mottled. Beneath this is a buried soil. It is very dark gray silty clay loam about 10 inches thick. The underlying material is light gray, mottled silt loam to a depth of 40 inches, gray very fine sandy loam to a depth of 46 inches, and gray, mottled gravelly sand to a depth of 60 inches or more. The profile is calcareous to a depth of 46 inches. Thin strata of silty clay loam are common in the underlying material.

Included with this soil in mapping are small areas of the moderately well drained Ipage soils on low knolls. Also included are areas of the somewhat poorly drained Ovina soils at a slightly higher elevation than this Lawet soil. The included soils make up 3 to 5 percent of this map unit.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is very slow. The content of organic matter is moderate, and natural fertility is low. The seasonal high water table is at the surface in wet years and ranges to a depth of about 2 feet. A large amount of carbonates are in this soil. An accumulation of soluble salts is on the surface over much of the area. The water intake rate is moderate.

Most areas of this soil are in rangeland and are used for grazing. A few small areas are cultivated, and the rest is in various land uses.

This soil is not suitable for cultivated crops because it is flooded too frequently, the water table is too high, and drainage is generally not practical. Also, the alkalinity and salinity of this soil are high.

This soil is suited to use as rangeland. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help increase vigor and growth of the grasses. Alkali-tolerant species of grass should be seeded. Restricted use during very wet periods help maintain the range in good condition and prevent the range from becoming boggy.

Trees and shrubs in windbreaks are not suited to this soil because of the excess salinity and alkalinity. Some areas are suitable for planting alkali-tolerant species in wildlife habitat areas, if the trees and shrubs are hand planted and carefully tended.

This soil is not suitable for building sites or for septic tank absorption fields and sewage lagoons because of the hazard of frequent flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit VIs-1 dryland. It is in Saline Subirrigated range site and windbreak suitability group 10.

Le—Leshara silt loam, 0 to 2 percent slopes. This deep, somewhat poorly drained, nearly level soil is on bottom lands. It is occasionally flooded. Areas range from 5 to 75 acres.

Typically, the surface layer is very friable silt loam about 12 inches thick. The upper part of the surface layer is grayish brown, and the lower part is dark grayish brown. Beneath this is a transitional layer of gray, very friable, calcareous silt loam about 8 inches thick. The upper part of the underlying material is light brownish gray, mottled, calcareous silt loam; the middle part is light gray, mottled, calcareous silt loam; and the lower part is very pale brown coarse sand to a depth of 60 inches. In places, the middle part of the underlying material is silty clay loam.

Included with this soil in mapping are small areas of Gibbon and Lex soils at a slightly lower elevation than this Leshara soil. The Gibbon soils have carbonates above a depth of 10 inches, and the Lex soils have gravelly sand at a depth of 20 to 40 inches. Also included are small areas of Ovina loam that are sandier between depths of 10 and 40 inches. The included soils make up 12 to 18 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, and natural fertility is medium. The surface layer is very friable and easily tilled. The seasonal water table ranges from a depth of about 2 feet in most wet years to about 3 feet in most dry years.

Most areas of this soil are used for farming and are irrigated.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, alfalfa, and small grain. The principal limitation is soil wetness, and because of this tillage is generally delayed in spring. If adequate outlets are available, the water table can be lowered by V-shaped ditches or perforated tile drains. The fluctuating water table provides supplemental moisture during periods of prolonged dry weather. Cultivation with a disc or chisel and no-till planting help prevent soil compaction.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Gravity (fig. 9) or sprinkler irrigation is suitable. Generally, some land leveling is necessary for gravity irrigation. Leveling also provides better surface drainage. Tillage is generally delayed in spring in most years because of wetness from the water table and spring rains. Excessive application of irrigation water should be avoided. Conservation tillage methods that keep crop residue on the surface help to prevent soil compaction and improve tilth.

The use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods, help maintain the plant community in good condition.

This soil is suited to trees and shrubs in windbreaks. Species that tolerate occasional wetness should be planted. Seedlings generally survive and grow well if competing weeds and grasses are controlled. Grasses and weeds can be controlled by timely cultivation between the rows and careful use of appropriate herbicides or rototilling in the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Lining or sealing sewage lagoons helps prevent seepage. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage. The low strength of this soil needs to be considered in the design of roads and

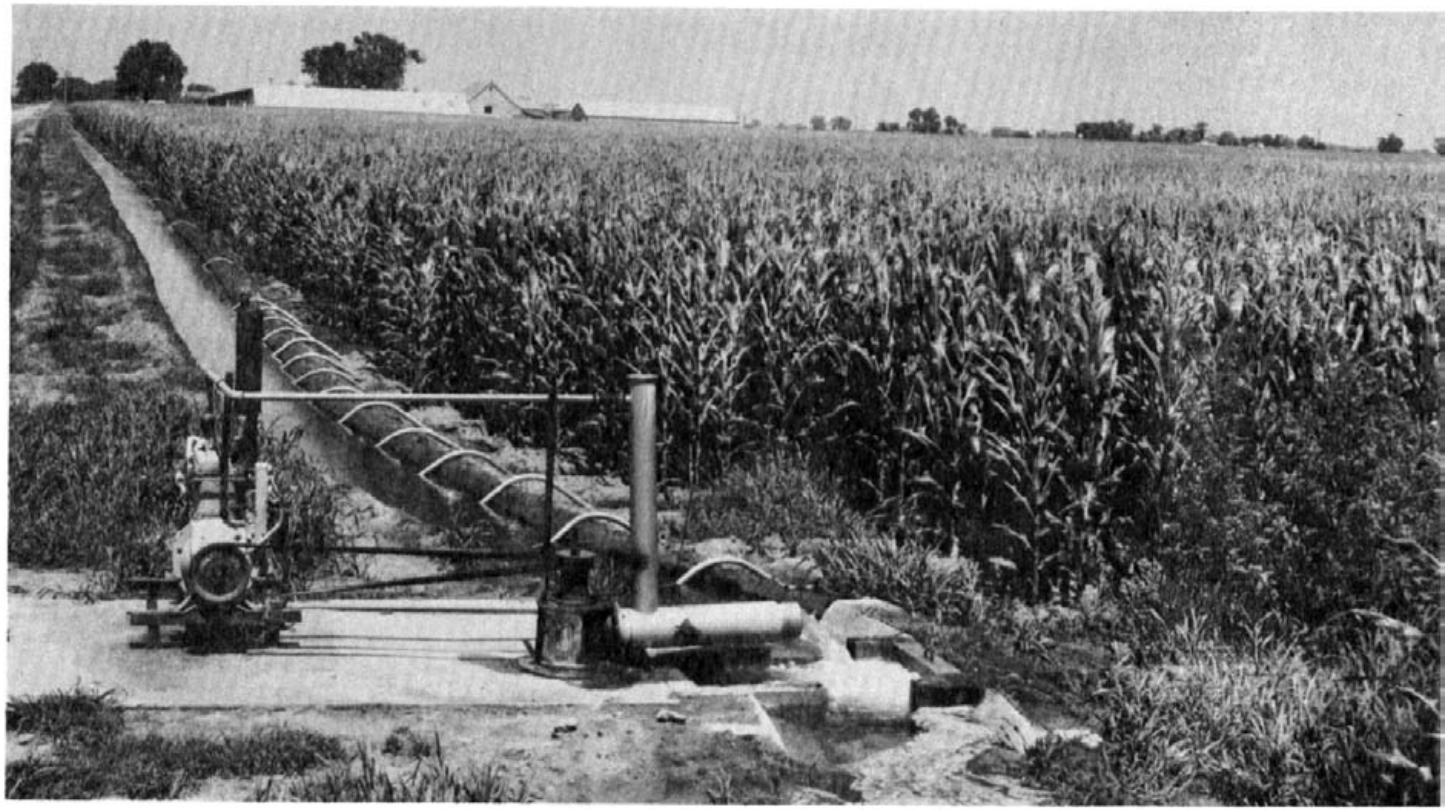

Figure 9.—An open-ditch lateral with syphon tubes is used to irrigate corn on Leshara silt loam.

streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit IIw-4 dryland and capability unit IIw-6 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Lg—Lex loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded and is moderately deep over coarse sand and gravelly sand. Areas range from 10 to 160 acres.

Typically, the surface layer is very friable loam about 17 inches thick. The upper 7 inches of the surface layer is dark gray, and the lower 10 inches is grayish brown and gray and is calcareous. The underlying material is light gray, calcareous loam to a depth of 24 inches. Below that it is stratified coarse sand and gravelly sand to a depth of 60 inches or more. In places, depth to the coarse sand and gravelly sand is less than 20 inches because of extensive land grading for gravity irrigation. In a few small areas, the profile does not have calcium carbonate.

Included with this soil in mapping are small areas of Alda, Leshara, and Wann soils. The Alda soils are coarser textured in the upper part of the underlying material than this Lex soil and are at about the same elevation. The Leshara and Wann soils are deeper to gravelly sand and are at a slightly lower elevation. The included soils make up 5 to 12 percent of this map unit.

Permeability is moderate in the upper part of the profile and is very rapid in the lower part of the underlying material. The available water capacity is low. Runoff is slow. The water intake rate is moderate. The seasonal high water table is at a depth of about 2 feet in most wet years and about 3 feet in most dry years. It is generally highest in spring. The content of organic matter is moderate, and natural fertility is medium. The surface layer is very friable and easily tilled through a wide range of soil moisture. Moisture is readily released to plants. Tilth is good.

Most areas of this soil are used for cultivated crops. A few areas are in rangeland and are used for grazing or are mowed for hay. A few areas are seeded to introduced grasses and are used for pasture.

If this soil is used for dryland farming, it is suited to corn, sorghum, and small grain and to grasses and alfalfa for hay and pasture. The principal limitation is soil

wetness. Because of wetness, tillage generally is delayed early in spring. The water table provides supplemental water for dryland crops. Returning crop residue to the soil helps maintain and improve the organic matter content and helps reduce the hazard of soil blowing during periods of low rainfall. It also conserves moisture for use by crops when the water table is lowest, generally late in summer.

If this soil is irrigated, it is suited to corn, grain sorghum, introduced grasses, soybeans, and alfalfa. The coarse textured underlying material and the low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Tillage is commonly delayed in spring in most years. Land grading is generally needed and helps improve surface drainage and increase efficiency of irrigation. Returning crop residue to the soil helps keep the soil friable, prevents soil blowing, and conserves soil moisture.

The use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Overgrazing when the soil is wet causes surface compaction in places. Proper grazing use, timely deferment for grazing or haying, and a planned grazing system of use and rest help maintain the range in good condition.

For windbreaks, this soil is suited to those trees and shrubs that tolerate a high water table and occasional flooding. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between the rows. The careful use of appropriate herbicides and rototilling help control annual grasses and weeds in the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-7 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Lk—Lex clay loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded and is moderately deep over coarse sand and gravelly sand. Areas range from 25 to 500 acres.

Typically, the upper part of the surface layer is very dark gray, friable, calcareous clay loam about 10 inches thick, and the lower part is dark gray, firm, calcareous silty clay loam about 9 inches thick. The underlying material to a depth of 27 inches is gray, mottled sandy clay loam. To a depth of 60 inches or more, it is light gray, stratified coarse sand and gravelly sand. In a few places, depth to the coarse sand and gravelly sand is more than 40 inches because of extensive land grading for gravity irrigation.

Included with this soil in mapping are small areas of the deep Lamo soils and the alkaline Saltine soils. Both soils are at a lower elevation than this Lex soil. The included soils make up 8 to 14 percent of this map unit.

Permeability is moderately slow in the upper part of the profile and very rapid in the underlying coarse sand and gravelly sand. The available water capacity and the water intake rate are low. Runoff from cultivated areas is slow. Natural fertility is medium, and content of organic matter is moderate. The root zone is restricted to the soil material above the sand and gravelly sand. The seasonal high water table ranges from a depth of about 2 feet in wet years to about 3 feet in most dry years. It is generally highest in spring. Tilth is fair.

Most areas of this soil are used for cultivated crops. Most of the rest is in rangeland and is used for native hay and grazing. A few areas are seeded to introduced grasses and are used for haying.

If this soil is used for dryland farming, it is suited to corn, sorghum, alfalfa, and small grain. The principal limitation is soil wetness, which commonly delays tillage and harvesting operations in spring. The water table provides supplemental water for dryland crops. Returning crop residue to the soil helps improve tilth and conserve moisture for use by crops when the water table is lowest. This soil is droughty late in summer when rainfall is low and the water table recedes to a depth within the gravelly sand.

If this soil is irrigated, it is suited to corn, sorghum, soybeans, and alfalfa. Tillage is commonly delayed in spring in most years. Generally, land leveling is needed for gravity irrigation. Leveling helps improve surface drainage and increases the efficiency of irrigation. The low available water capacity and coarse textured underlying material make light, frequent applications of water necessary. Returning crop residue to the soil helps maintain tilth and conserves moisture.

This soil is suited to use as rangeland. Overgrazing or untimely haying reduces the protective cover and causes

deterioration of the native plants. Overgrazing when the soil is wet causes surface compaction. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain the native plants.

For windbreaks, this soil is suited to those species of trees or shrubs that tolerate a moderately high water table. Good site preparation and timely cultivation between the rows help control undesirable grasses and weeds which compete for moisture. Rototilling, hand hoeing, and careful use of appropriate herbicides help control weeds within the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-3 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Lm—Lex Variant loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands. This soil is occasionally flooded. It is moderately deep over coarse sand or gravelly sand and is moderately affected by salinity and alkalinity. Areas range from 25 to 150 acres.

Typically, the upper part of the surface layer is grayish brown, very friable loam about 10 inches thick. The underlying material is strongly alkaline and very strongly alkaline, light brownish gray and light gray silt loam to a depth of 26 inches. Below that, the underlying material is very pale brown coarse sand and gravelly sand to a depth or 60 inches or more. In some areas, the surface layer is silt loam or silty clay loam.

Included with this soil in mapping are small areas of Gibbon, Gayville, Lamo, and Saltine soils. These soils do not have coarse sand or gravelly sand above a depth of 40 inches. In addition, the Gayville soils are more clayey between depths of 10 and 40 inches than this Lex Variant soil. The included soils make up 10 to 20 percent of this map unit.

Permeability is moderate in the upper part of the profile and very rapid in the underlying coarse sand and gravelly sand. The available water capacity is moderate. The root zone is generally restricted to the soil material above the coarse sand or gravelly sand. The content of organic matter is moderate, and natural fertility is low. The seasonal high water table ranges from a depth of 1 foot in wet years to about 3 feet in dry years. Moisture is released slowly to plants because of the effect of sodium on moisture absorption by plants. Below the surface layer, the profile is strongly alkaline and very strongly alkaline. This soil is hard to work because it is sticky when wet and hard when dry. The areas that are strongly alkaline crust on the surface when drying. The water intake rate is moderate. Tilth is poor.

Most areas of this soil are in native grassland and are used for range. Some areas are used for cultivated crops.

If this soil is used for dryland farming, it is poorly suited to corn, sorghum, small grain, and alfalfa. Cultivated crops commonly do poorly because of the accumulation of excess salts, poor structure, and ponding of water on the surface. A high level of management is needed for successful production. The excess salts also cause poor tilth and slow permeability that increases the rate of runoff. Adequate surface drainage is needed. Chemicals, such as gypsum and sulfur, can be used to reduce the effects of the salts. Generally, crops that are alkali tolerant do better than crops that do not tolerate alkali. Crop residue should be returned to the soil to help improve tilth and increase the intake of moisture.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Generally, gravity irrigation is better suited than sprinkler irrigation. Land leveling for gravity irrigation provides good surface drainage and an even distribution of water. The principal management concern is reducing the high alkalinity. Sulfur or gypsum can be used to reduce the effects of the alkali. Barnyard manure and other forms of organic matter can be incorporated into the soil to make it more friable and absorbent to water. Nitrogen and phosphorus fertilizers are generally needed. Large quantities of irrigation water can be applied to leach the alkali to a lower depth.

This soil is suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. Grazing when the soil is wet causes surface compaction and poor tilth. Proper grazing use and deferred grazing, along with restricted use during wet periods, help maintain the desirable native plants.

Trees and shrubs in windbreaks are suited to this soil, if species are selected that tolerate the high water table and the very strongly alkaline condition of the underlying material. Establishment of trees is difficult in wet years. Timely cultivation between the rows helps control undesirable weeds and grasses.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capabiity unit IVs-1 dryland and capability unit IIIs-7 irrigated. It is in Saline Subirrigated range site and windbreak suitability group 9S.

LoB—Libory loamy fine sand, 0 to 3 percent slopes. This deep, moderately well drained, nearly level and very gently sloping soil is on stream terraces. Areas range from 5 to 150 acres.

Typically, the surface layer is very friable loamy fine sand about 16 inches thick. The upper part of the surface layer is gray, and the lower part is grayish brown. Beneath this is a layer of loose, light brownish gray fine sand about 5 inches thick. Next is a subsoil layer of pale brown, friable, mottled silt loam about 14 inches thick. The underlying material is light gray, mottled silt loam to a depth of 60 inches or more. In areas, the subsoil and underlying material are strongly mottled silty clay loam. Also, in some areas north of Silver Creek, the underlying material is loam and begins below a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained Boelus soils at a higher elevation than this Libory soil, the sandy Ipage soils at a slightly lower elevation, and the somewhat poorly drained Ovina soils at a lower elevation. The included soils make up 10 to 18 percent of this map unit.

Permeability is rapid in the sandy upper part of the profile and moderate in the silty lower part. The available water capacity is moderate, and the water intake rate is high. The content of organic matter is moderately low, and natural fertility is low. The surface layer is very friable and easily tilled through a wide range of soil moisture. A perched high water table is at a depth of about 1.5 feet in wet years and about 3 feet in dry years.

Most areas of this soil are farmed, and many are irrigated. The rest is in rangeland and is used for grazing or haying.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, wheat, and alfalfa. The production of close-grown crops is more dependable than row crops because they grow better in spring when rainfail is greatest. The principal hazard is soil blowing. Other concerns in management are conserving moisture and maintaining organic matter content and fertility. Cultivation with a disc or chisel, no-till planting, and stubble mulching help control soil blowing and conserve moisture. Stripcropping also helps control soil blowing. The silty subsoil holds moisture and helps dryfarmed crops to withstand droughty conditions.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Gravity and sprinkler irrigation are suitable, but sprinkler irrigation is better. Generally, some leveling is needed for gravity irrigation. Conservation tillage practices that keep crop residue on the surface, such as cultivation with a disc or chisel and no-till planting, help control soil blowing and conserve moisture.

The use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system of use and rest help maintain the plants in good condition.

If trees and shrubs are used for windbreaks, this soil provides a fair planting site. Growth and survival of adapted trees and shrubs is fair. The main limitation is soil blowing. Soil blowing can be prevented by maintaining strips of sod or other cover crops between the rows. Undesirable weeds and grasses, which compete for moisture in the row, can be controlled by careful use of appropriate herbicides and by hand hoeing or rototilling.

Wetness caused by the perched seasonal high water table limits this soil for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps overcome wetness caused by the high water table. Installing perimeter drains, such as perforated tile, around buildings with basements helps prevent wetness. Septic tank absorption fields and sewage lagoons can be constructed on fill material so that the absorption field or bottom of the lagoon can be placed at sufficient height above the seasonal high water table. Constructing roads on suitable, compacted fill material and providing adequate side ditches and culverts help protect roads from wetness.

This soil is in capability unit IIIe-5 dryland and capability unit IIIe-10 irrigated. It is in Subirrigated range site and windbreak suitability group 5.

Lp—Lockton loam, 0 to 1 percent slopes. This nearly level, moderately well drained soil is on bottom lands. It is rarely flooded and is moderately deep over gravelly sand or coarse sand. Areas range from 25 to several thousand acres.

Typically, the surface layer is very friable loam about 13 inches thick. The upper part of the surface layer is dark grayish brown, and the lower part is dark gray. Beneath this is a transitional layer of grayish brown, friable loam about 10 inches thick. The underlying material is grayish brown loam to a depth of 27 inches. Below that, it is very pale brown, mottled gravelly coarse sand to a depth of 60 inches or more. In places, gravelly sand is at a depth of less than 20 inches or more than 40 inches. In a few areas, carbonates are in the upper part of the underlying material. In some areas, a clay loam or silty clay loam layer is above the coarse sand or gravelly sand.

Included with this soil in mapping are small areas of the deep Leshara soils at about the same elevation as this Lockton soil. The included soils make up 5 to 10 percent of this map unit.

Permeability is moderate in the loamy upper part of the profile and very rapid in the underlying gravelly sand or coarse sand. The available water capacity is low, and water intake rate is moderate. The root zone is restricted to the soil material above the gravelly sand. The content of organic matter is moderate, and natural fertility is medium. Tilth is good. The surface is very friable and easily tilled. The seasonal high water table ranges from a depth of about 3 feet in most wet years to about 5 feet in most dry years.

Most areas of this soil are used for irrigated cropland. A few small areas are in rangeland and various land uses, such as windbreaks and farmsteads.

If this soil is used for dryland farming, it is suited to corn, sorghum, and winter wheat. Alfalfa is suited, but the soil needs to be limed. The water table is highest in spring and provides supplemental moisture for crops at this time of the year. Conservation tillage practices that keep crop residue on the surface, such as cultivation with a disc or chisel or no-till planting, help conserve moisture.

If this soil is irrigated, it is suited to corn, sorghum, alfalfa, and soybeans. Sprinkler or gravity irrigation is suitable. Land grading is generally needed for irrigation development. It generally improves surface drainage and increases efficiency of the irrigation system. The low available water capacity of this soil requires light, frequent applications of water. Reducing and controlling the runoff of irrigation water at the end of the field helps conserve the supply of underground water. Keeping crop residue on the surface helps maintain tilth and conserve moisture.

This soil is well suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. In addition, overgrazing when the soil is wet can cause surface compaction. Proper grazing use and timely deferment from grazing or haying, along with restricted use during wet periods, help maintain the desirable native plants.

Trees and shrubs in windbreaks are suited to this soil. Seedlings generally survive and grow well if competing vegetation is controlled. This can be accomplished by good site preparation and timely cultivation between the rows. Grasses and weeds in the row can be hand hoed, rototilled, or sprayed with appropriate herbicides.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIIw-4 dryland and capability unit IIIw-7 irrigated. It is in Subirrigated range site and windbreak suitability group 2.

LrB—Loretto fine sandy loam, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on stream terraces. Areas range from 5 to 160 acres.

Typically, the surface layer is brown and grayish brown, very friable fine sandy loam about 19 inches thick. The subsoil is pale brown, friable silty clay loam about 25 inches thick. The underlying material is very pale brown clay loam to a depth of 60 inches or more. In places, it includes a thin layer of silty clay. In small areas, the surface layer is loamy fine sand or loam or has been altered by land leveling.

Included with this soil in mapping are small areas of Boelus, Kenesaw, Rusco, and Valentine soils. The Boelus soils have loamy fine sand and fine sand above a depth of 28 inches and are at a higher elevation than this Loretto soil. The Kenesaw soils formed in silty material and are at a lower elevation. The Rusco soils are moderately well drained and are at a lower elevation. The Valentine soils are sandy throughout the profile and are at a higher elevation. The included soils make up about 10 to 20 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is generally good.

The content of organic matter is low, and natural fertility is medium. The water intake rate is moderate.

Most areas of this soil are used for cultivated crops. A few areas are in native grassland and are used for grazing.

If this soil is used for dryland farming, it is better suited to grain sorghum, alfalfa, and small grain than to most other crops. Corn and introduced grasses can also be grown. Soil blowing is the principal hazard. Conserving moisture and improving the content of organic matter are concerns. A conservation cropping system that keeps the soil covered with crop residue most of the time helps reduce soil blowing, conserve moisture, and improve organic matter content. Cultivation with a disc or chisel and no-till planting also help conserve moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, introduced grasses, soybeans, and alfalfa. Sprinkler irrigation is well suited to this soil. Gravity irrigation can also be used. For efficient gravity irrigation, the soil needs to be leveled. Soil blowing is a hazard on this soil, especially in winter and early in spring. This can be controlled through use of a cropping system that leaves crop residue on the surface.

The use of this soil as rangeland is effective in controlling wind erosion. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil provides a good site for trees and shrubs in windbreaks. Survival and growth of adapted species is generally fair. The principal concerns are soil blowing and competition for moisture from weeds and grasses. Soil blowing can be controlled by maintaining strips of sod or a cover crop between the tree rows. Weeds and grasses can be controlled by cultivation between the rows with conventional equipment, such as a disc. Appropriate herbicides can be applied in the row or the areas can be hoed by hand or rototilled.

This soil is well suited to building sites and septic tank absorption fields. Lining or sealing sewage lagoons help to prevent seepage. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit IIe-3 dryland and capability unit IIe-5 irrigated. It is in Sandy range site and windbreak suitability group 5.

LvD—Loretto-Valentine complex, 3 to 9 percent slopes. This complex consists of deep, gently sloping and strongly sloping, well drained and excessively drained soils on stream terraces and uplands. Areas range from 5 to 100 acres.

This complex contains 45 to 70 percent Loretto soils and 30 to 55 percent Valentine soils. The Loretto soils are on the low part of the landscape, and the Valentine soils are on the high part.

Typically, the Loretto soil has a surface layer of very friable fine sandy loam about 14 inches thick. The upper part of the surface layer is grayish brown, and the lower part is brown. The subsoil is very pale brown, friable silt loam about 23 inches thick. The underlying material is very pale brown silt loam to a depth of 60 inches. In some areas, the surface layer is a loamy fine sand because of soil blowing.

Typically, the Valentine soil has a surface layer of grayish brown, very friable loamy fine sand about 5 inches thick. Beneath this is a transitional layer of brown, very friable loamy fine sand about 4 inches thick. The underlying material is pale brown and light yellowish brown fine sand to a depth of 60 inches or more.

Included with these soils in mapping are small areas of Boelus and Kenesaw soils. The Boelus soils are well drained and have contrasting sandy texture over loamy texture. The Kenesaw soils are silty throughout the profile and are in the lowest part of the landscape. The included soils make up 10 to 15 percent of this map unit.

Permeability and the available water capacity are moderate in the Loretto soils, and permeability is rapid in the Valentine soils. The available water capacity is low in the Valentine soils. The content of organic matter is low in both soils. Natural fertility is medium in the Loretto soils and low in the Valentine soils. The surface is very friable and easily tilled through a wide range of soil moisture.

Most areas of these soils are used for cultivated crops. A few areas are in rangeland and are used for grazing or mowing.

If these soils are used for dryland farming, they are poorly suited to corn, grain sorghum, small grain, and alfalfa. The production of small grain and alfalfa are generally more dependable because these crops grow and mature early in spring and summer when rainfall is highest. The principal hazards are water erosion and soil blowing. Stripcropping, stubble mulch tillage, and a tillage system that keeps the soil covered most of the time with grass or crop residue, help reduce water erosion and soil blowing. Row crops need to be alternated in the cropping system with small grain and legumes. If these soils are used mainly for row crops, terraces, contour farming, and grassed waterways are needed.

If these soils are irrigated, they are suited to corn, sorghum, soybeans, and alfalfa. Because of the slopes, only sprinkler irrigation is suited. Leaching of plant nutrients and the low available water capacity of the Valentine soils make light, frequent applications of irrigation water necessary. Maintaining a large amount of crop residue on the surface, keeping tillage to a minimum, and stripcropping help to control water erosion and soil blowing. The same conservation practices used for dryland farming are needed if these soils are irrigated.

The use of these soils as rangeland is effective in controlling soil blowing and water erosion. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. They can also cause severe losses by soil blowing and the formation of small blowouts. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

These soils provide a fair planting site for trees and shrubs in windbreaks. Survival and growth of adapted species is fair. These soils are subject to soil blowing if disturbed, and this is the principal hazard. Maintaining strips of sod or a cover crop between the tree rows helps control soil blowing. Undesirable weeds and grasses that compete for moisture in the row can be controlled by careful use of appropriate herbicides and by rototilling or hoeing by hand. Irrigation provides supplemental moisture during periods of low rainfall. The use of terraces and planting trees on the contour help prevent erosion by water.

The soils in this map unit are suited to building sites. Small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be graded to accommodate the structure. The Loretto soil is suited to septic tank absorption fields. Because of rapid permeability in the Valentine soil, this soil does not adequately filter effluent from a waste disposal system. Lining or sealing sewage lagoons help prevent seepage, and grading is required to modify the slope and to shape the lagoon. The walls or sides of shallow excavations in areas of the Valentine soil can be temporarily shored to prevent sloughing or caving. The low strength of the Loretto soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

These soils are in capability unit IVe-3 dryland and capability unit IIIe-5 irrigated. The Loretto soil is in Sandy range site, and the Valentine soil is in Sands range site. The Loretto soil is in windbreak suitability group 5, and the Valentine soil is in windbreak suitability group 7.

Ma—Marlake loamy sand, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in depressions on bottom lands and stream terraces. This soil is commonly adjacent to sandhills. It is frequently ponded. Areas range from 5 to 25 acres.

Typically, a layer of organic matter about 1 inch thick is on the surface. The surface layer is dark gray loamy sand about 8 inches thick. The upper part of the surface layer is very friable, and the lower part is loose. The underlying material is pale brown, mottled sand to a depth of 30 inches. Below that, it is light gray fine sand to a depth of 60 inches or more. In a few areas, the surface layer is loamy fine sand or fine sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Els soils at a slightly higher elevation than this Marlake soil. The included soils make up about 5 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Surface water is ponded. The content of organic matter is high, and natural fertility is low. The seasonal high water table fluctuates from about 2 feet above the surface in most wet years to about 1 foot beneath the surface in most dry years.

Nearly all areas of this soil are used as habitat for wildlife. This soil is not suited to cultivated crops because it is generally waterlogged during the growing season. The vegetation is not suitable for grazing. Cattails, tall sedges, rushes, and common reedgrass are the common kinds of vegetation. Windbreaks are not suited because the soil is too wet for trees or shrubs that are acceptable in windbreaks.

This soil is not suitable for building sites or for sanitary facilities because of the hazard of frequent ponding. Water ponds on the surface for long periods of time; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the high water level, and providing adequate side ditches and culverts help protect roads from ponding and wetness.

This soil is in capability unit VIIIw-7 dryland. It is in windbreak suitability group 10.

MdD—Meadin sandy loam, 2 to 9 percent slopes. This excessively drained, gently sloping and strongly sloping soil is on breaks of stream terraces. This soil is shallow over gravelly sand or very gravelly sand. Areas range from 5 to 50 acres.

Typically, the surface layer is very friable sandy loam about 11 inches thick. The upper part of the surface layer is dark grayish brown, and the lower part is grayish brown. The underlying material is very pale brown very gravelly sand to a depth of 60 inches or more. In areas, the surface layer is commonly loam, coarse sandy loam, and loamy sand.

Included with this soil in mapping are small areas of the gently sloping O'Neill soils. The O'Neill soils are better drained than this Meadin soil and have gravelly sand at a depth of 20 to 40 inches. The included soils make up less than 5 percent of this map unit.

Permeability is very rapid, and the available water capacity is very low. The organic matter content and natural fertility are low. The root zone is restricted to the soil material above the very gravelly sand.

Most areas of this soil are in rangeland and are used for grazing. A few small areas are irrigated.

This soil is not suited to cultivated crops. The main hazard is droughtiness. Soil blowing is a concern where the vegetation is damaged or destroyed.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock reduces

the productive cover and causes deterioration of the native plants. Proper grazing use, timely deferments, and planned grazing systems of use and rest help maintain or improve the range condition.

This soil is not suited to trees or shrubs in windbreaks because of the limited root zone and the low available water capacity. Droughtiness is a severe hazard in most years.

This soil is suitable for building sites. Small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. Because of the very rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Establishing vegetation on roadbanks is difficult unless the roadbank is topdressed with topsoil.

This soil is in capability unit VIs-4 dryland. It is in Shallow to Gravel range site and windbreak suitability group 10.

Me—Merrick loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on bottom lands in major stream valleys. This soil is rarely flooded. Areas range from 10 to 400 acres.

Typically, the surface layer is friable loam about 30 inches thick. The upper part of the surface layer is grayish brown, the middle part is dark gray, and the lower part is dark grayish brown. The underlying material is grayish brown loam to a depth of 42 inches, grayish brown, mottled silt loam to a depth of 48 inches, and pale brown, mottled loam to a depth of 60 inches or more. In a few small areas, the lower part of the underlying material is sandy loam or coarser textured. In many areas, the surface layer has been altered by land leveling.

Included with this soil in mapping are small areas of Leshara, Lex, and Ovina soils at a slightly lower elevation than this Merrick soil. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is good, and the soil is easily tilled through a fairly wide range of soil moisture. The content of organic matter is moderate, and natural fertility is high. The seasonal high water table is at a depth of about 4 feet in most wet years and about 6 feet in most dry years. The water intake rate is moderate.

Most areas of this soil are used for cultivated crops and are irrigated. A few small areas are in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, alfalfa, and grasses. The principal concern in management is maintenance of the organic matter content and high fertility. Preventing soil blowing in winter is also a concern. A cropping system that includes keeping crop residue on the surface helps conserve moisture for use by crops and prevents soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. All common types of irrigation are suited to this soil. Water management and maintenance of fertility are the principal concerns. Irrigation water needs to be supplied in sufficient amounts to serve the needs of the crop and at a rate that permits maximum absorption and minimum runoff. Land leveling helps improve surface drainage and increases efficiency of gravity irrigation. Keeping crop residue on the surface during winter aids in the control of soil blowing.

The use of this soil as rangeland is very effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferment from grazing or haying help maintain or improve the range condition.

This soil provides a good site for planting trees and shrubs in windbreaks. Survival of adapted species is generally good. The principal concern is the competition for moisture from weeds and grasses. The weeds and grasses can be controlled by cultivation between the rows with a disc or harrow. Appropriate herbicides or rototilling can be used in the tree rows to control weeds and grasses.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. The moderate permeability of this soil is a limitation for septic tank absorption fields, but this can generally be overcome by increasing the size of the absorption area. Septic tank absorption fields can be constructed on fill material so that the absorption field can be placed a sufficient distance above the seasonal high water table. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. The low strength of this soil needs to be considered in the design of roads and streets. The pavement of roads and streets needs to be thick enough to compensate for the low strength of the soil material. Coarse grained material for subgrade or base material can be used to ensure better performance.

This soil is in capability unit I-1 dryland and capability unit I-6 irrigated. It is in Subirrigated range site and windbreak suitability group 1.

Nv—Novina sandy loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on bottom lands in major stream valleys. This soil is rarely flooded. Areas range from 10 to 200 acres.

Typically, the surface layer is dark gray and gray, very friable sandy loam about 19 inches thick. Beneath this is a transitional layer of gray, friable sandy loam about 7 inches thick. The underlying material is light gray and light brownish gray, mottled loam to a depth of 42 inches. Below that, it is grayish brown and white sandy loam and loam to a depth of 60 inches or more. This soil is noncalcareous throughout. Land leveling has altered the surface layer in places. In a few small areas, the surface layer is fine sandy loam and loamy fine sand.

Included with this soil in mapping are small areas of Janude soils at a slightly higher elevation than this Novina soil. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is generally good, and the soil is easily tilled through a fairly wide range of soil moisture. The content of organic matter is moderately low, and natural fertility is medium. The seasonal high water table is at a depth of about 3 feet in most wet years and 6 feet in most dry years. The water intake rate is moderately high.

Most areas of this soil are used for cultivated crops. A few areas are in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, alfalfa, and small grain and to grasses for hay and pasture. Soil blowing is a hazard if the soil is left bare. Alfalfa benefits from the water table throughout the growing season, but other crops that are not so deep rooted can be damaged by drought in midsummer when the water table is low. Keeping crop residue on the surface helps control the soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, introduced grasses, and alfalfa. Gravity or sprinkler irrigation is suited. Land leveling is generally needed for efficient gravity irrigation. Soil blowing, maintenance of fertility, and proper distribution of irrigation water are the principal concerns of management. Keeping crop residue on the surface helps reduce soil blowing and conserves moisture for use by crops. A grass-legume mixture in the cropping system helps maintain organic matter content and tilth.

The use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use and timely deferment from grazing or haying help maintain the plants in good condition.

This soil provides a good site for planting of trees and shrubs in windbreaks. Survival and growth of adapted species is good if the species selected tolerate occasional wetness in spring. Weeds and grasses can be controlled by cultivation between the rows with a disc or harrow. Appropriate herbicides or rototilling in the tree rows help control weeds and grasses.

The hazard of rare flooding needs to be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material helps protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Septic tank absorption fields can be constructed on fill material so that the absorption field can be placed a sufficient distance above the seasonal high water table. Sewage lagoons can be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Lining and sealing sewage lagoons helps prevent seepage. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-6 dryland and capability unit IIw-8 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Om—O'Neill sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces. It is moderately deep over coarse sand or gravelly sand. Areas range from 10 to 500 acres.

Typically, the surface layer is dark gray, very friable sandy loam about 23 inches thick. The subsoil is grayish brown, very friable loamy sand about 7 inches thick. The underlying material is light brownish gray coarse sand to a depth of 39 inches. Below that, it is light brownish gray, light gray, and very pale brown gravelly sand to a depth of 60 inches or more. In areas, where this soil has been leveled for irrigation, the thickness of the surface layer varies widely.

Included with this soil in mapping are small areas of the deep Blendon fine sandy loam on slightly higher hummocks or low ridges and O'Neill loam in microdepresssions and shallow swales. The included soils make up about 5 to 10 percent of this map unit.

Permeability is rapid in the upper part of the profile and very rapid in the underlying material. The available water capacity is low, and water intake rate is moderately high. Runoff is slow. The natural fertility is low, and content of organic matter is moderately low. The surface layer is very friable and easily tilled through a fairly wide range of soil moisture. The root zone for common crops is restricted to the soil material above the coarse sand or gravelly sand.

Most areas of this soil are used for cultivated crops, and nearly all of these are irrigated.

If this soil is used for dryland farming, it is suited to grain sorghum, wheat, and introduced grasses. The principal hazards are soil blowing and droughtiness. Conservation practices that keep crop residue on the surface, such as minimum tillage and no-till planting, help prevent soil blowing and conserve moisture. The use of cover crops is helpful.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Gravity or sprinkler

irrigation is suited, but sprinkler irrigation is better suited. Generally, some leveling is needed for gravity irrigation. Deep cuts should be avoided because they may expose the coarse-textured underlying material. Frequent, light applications of water and fertilizer are necessary because of the low available water capacity of this soil and to avoid leaching. Conservation tillage practices, such as mulching and keeping tillage to a minimum, that leave crop residue on the surface help control soil blowing, conserve moisture, and maintain organic matter.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing the range reduces the protective plant cover and causes deterioration of the range plants. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses vigorous.

Where this soil is used for windbreaks, it provides a poor planting site. Survival and growth of adapted species is fair. This soil is droughty because the available water capacity is low, and this is the principal hazard. Good site preparation and timely cultivation between the rows help reduce competition for moisture. Careful application of appropriate herbicides and rototilling help control weeds in the row. Supplemental irrigation is needed during periods of insufficient moisture.

This soil is well suited to building sites and roads and streets. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage.

This soil is in capability unit IIIe-3 dryland and capability unit IIIe-9 irrigated. It is in Sandy range site and windbreak suitability group 6G.

OmC—O'Neill sandy loam, 2 to 6 percent slopes. This undulating, well drained soil is on breaks of stream terraces. It is moderately deep over coarse sand or gravelly sand. Areas are generally elongated, and in places are as long as 5 miles and as wide as 1/8 mile. The areas range from 25 to 500 acres.

Typically, the surface layer is dark grayish brown, very friable sandy loam about 12 inches thick. The subsoil is grayish brown, very friable, and 18 inches thick. The upper part of the subsoil is loamy sand, and the lower part is loamy coarse sand. The underlying material is pale brown and very pale brown coarse sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the deep, gently sloping Blendon soils. The included soils make up less than 5 percent of this map unit.

Permeability is rapid through the upper part of the profile and very rapid in the underlying material. The available water capacity is low. Natural fertility is low, and the content of organic matter is moderately low. The water intake rate is moderately high. The root zone is restricted to the soil material above the coarse sand and gravel. The surface layer is very friable and easily tilled through a wide range of soil moisture.

Most areas of this soil are used for cultivated crops. A few areas are in rangeland or in various land uses, such as farmsteads and windbreaks.

If this soil is used for dryland farming, it is poorly suited to grain sorghum and small grain. Generally, the production of small grain and the first cutting of alfalfa are the most dependable because these crops mature in spring when rainfall is most plentiful. This soil is subject to blowing and to erosion by water. Conservation tillage practices that leave crop residue on the surface help prevent serious soil blowing, conserve moisture, and reduce water erosion. Stripcropping and contour farming are suited to this soil.

If this soil is irrigated, it is suited to corn, grain sorghum, and alfalfa. Sprinkler irrigation is suitable. The coarse-textured underlying material and low available water capacity in this soil make frequent, light applications of water and fertilizer necessary to avoid leaching. Leaving crop residue on the surface as a mulch and keeping tillage to a minimum help control soil blowing and maintain organic matter content.

The use of this soil as rangeland is effective in controlling soil blowing and water erosion. Untimely haying or overgrazing by livestock reduces the protective cover, causes deterioration of the native plants, and causes losses by soil blowing. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil provides a poor planting site for trees and shrubs in windbreaks. Growth and survival of adapted species is fair. This soil is droughty because of the low available water capacity, and this is the principal hazard. Good site preparation and timely cultivation between rows help reduce competition for moisture. Careful application of appropriate herbicides and rototilling help control weeds in the row. Trees can be planted on the contour in combination with the use of terraces to conserve moisture. Supplemental water is needed during periods of insufficient rainfall.

This soil is well suited for building sites and roads and streets. Where cuts are made to stabilize the grade, roadbanks need to be topdressed with topsoil before the banks can be revegetated. In places, small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage

lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps to prevent seepage.

This soil is in capability unit IVe-3 dryland and capability unit IVe-9 irrigated. It is in Sandy range site and windbreak suitability group 6G.

On—O'Neill loam, 0 to 1 percent slopes. This nearly level, well drained soil is on stream terraces. It is moderately deep over coarse sand or gravelly sand. Areas range from 10 to 500 acres.

Typically, the surface layer is dark gray, very friable, and about 21 inches thick. The upper part of the surface layer is loam, and the lower part is fine sandy loam. The subsoil is grayish brown, very friable loamy sand about 6 inches thick. The underlying material is light brownish gray and very pale brown coarse sand to a depth of 60 inches or more. In places, coarse sand is at a depth of less than 20 inches because of extensive land grading for gravity irrigation.

Included with this soil in mapping are small areas of the Brocksburg silt loam in microdepressions and swales and the O'Neill sandy loam on low mounds or ridges. The included soils make up about 5 to 10 percent of this map unit.

Permeability is rapid through the upper part of the profile and very rapid in the underlying material. The available water capacity is low, and water intake rate is moderate. The surface layer is very friable and easily tilled through a wide range of soil moisture. The root zone is restricted to the soil material above the coarse sand and gravel. Tilth is good.

Most areas of this soil are used for cultivated crops, and nearly all of these areas are irrigated. A few areas are in rangeland or in various land uses, such as farmsteads and windbreaks.

If this soil is used for dryland farming, it is suited to grain sorghum, small grain, and alfalfa. The production of small grain and the first cutting of alfalfa are more dependable because these crops mature in spring when rainfall is more plentiful. The principal hazards are soil blowing and droughtiness. Conservation tillage practices, such as cultivation with a disc or chisel, keep crop residue on the surface and thus help prevent serious soil blowing and conserve needed moisture. Stripcropping also helps prevent soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, and soybeans. Gravity or sprinkler irrigation is suitable. Generally, some leveling is needed for gravity irrigation. Deep cuts should be avoided because they expose the coarse textured underlying material. The low available water capacity makes frequent, light applications of water and fertilizer necessary to avoid leaching. Leaving crop residue on the surface as a mulch and keeping tillage to a minimum help control soil blowing and conserve moisture.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

If used for trees and shrubs in windbreaks, this soil is only fairly well suited. Survival and growth of adapted species is fair. The principal hazard is droughtiness because of the low available water capacity. Good site preparation and timely cultivation between the tree rows helps reduce competition for moisture. Careful use of appropriate herbicides or rototilling helps control weeds in the row. Irrigation is comonly needed to provide supplemental moisture during periods of low rainfall.

This soil is well suited to building sites and roads and streets. Where cuts are made to stabilize the grade, roadbanks need to be topdressed with topsoil before the banks can be revegetated. In places, small commercial buildings need to be properly designed to accommodate the slope or the soil needs to be adequately graded to accommodate the structure. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage.

This soil is in capability unit IIs-5 dryland and capability unit IIs-7 irrigated. It is in Sandy range site and windbreak suitability group 6G.

Ow—Ovina loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands and stream terraces in major stream valleys. This soil is rarely flooded. Areas range from 10 to 150 acres.

Typically, the surface layer is very friable loam about 12 inches thick. It is dark grayish brown in the upper part and very dark gray in the lower part. The underlying material is grayish brown fine sandy loam to a depth of 22 inches, dark gray and gray loam to a depth of 42 inches, and grayish brown and very pale brown, mottled fine sandy foam to a depth of 60 inches or more. Because most areas of this soil have been leveled for irrigation, the present surface layer is variable in thickness and color. In a few small areas, the surface layer is silt loam or fine sandy loam.

Included with this soil in mapping are small areas of the Lamo silt loam, wet, 0 to 1 percent slopes, and small areas of Libory and Wann soils. The Lamo soil is in swales or pockets. The Libory soils are at a higher elevation than this Ovina soil, and the Wann soils are at a slightly higher elevation. The included soils make up about 10 to 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. Tilth is fair. The content

of organic matter is moderately low, and natural fertility is medium. The seasonal high water table fluctuates from a depth of about 2 feet in wet years to below 3 feet in dry years. The water intake rate is moderately high.

Most areas of this soil are used for farming. A few areas are in rangeland.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, alfalfa, small grain, and introduced grasses. The wetness early in spring and soil blowing are the principal concerns. A cropping system that keeps the soil covered with crop residue or a growing crop reduces soil blowing and conserves moisture. Excessive wetness from the fluctuating water table can be controlled by drainage ditches or tile drains, if adequate outlets are available. Alfalfa benefits from supplemental water from the fluctuating water table throughout the growing season.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, introduced grasses, and alfalfa. Gravity or sprinkler irrigation is suited. Wetness early in spring and proper distribution of irrigation water are the principal concerns. Land leveling helps improve surface drainage and increases efficiency of gravity irrigation. The water table can be lowered by using drainage ditches or tile drains.

The use of this soil as rangeland, either for grazing or haying, is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. In addition, grazing when the soil is wet can cause surface compaction. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods, help maintain the native plants in good condition.

This soil provides a good site for planting trees and shrubs in windbreaks. Survival and growth of adapted species is good if the species selected tolerate occasional wetness. Weeds and grasses can be controlled by cultivation between the rows with conventional equipment, such as a disc or harrow. Appropriate herbicides or rototilling in the tree rows help control weeds and grasses.

The hazard of rare flooding should be considered if this soil is used for building sites and sanitary facilities. Constructing dwellings and buildings on elevated, well compacted fill material help protect them from flooding. Dikes can be used to protect septic tank absorption fields and sewage lagoons. Sewage lagoons and septic tank absorption fields need to be constructed on fill material so that the bottom of the lagoon or the absorption field can be placed at a sufficient height above the seasonal high water table. Lining or sealing sewage lagoons helps to prevent seepage. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-4 dryland and capability unit IIw-8 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Pb—Pits and Dumps. This miscellaneous area consists mainly of mounds of gravel, sand, and overburden, together with adjacent pits that have water in them. It also consists of the land commonly occupied by pump equipment, roads, and loading docks. The sand and gravel are stockpiled for use in construction. Areas are in bottom lands and range from 5 to 80 acres. Flooding in most areas is rare.

Typically, material in this unit consists of a mixture of fine, medium, and coarse sand and gravel. The soil profile has not developed.

Included with this unit in mapping are small areas of the somewhat poorly drained Platte and Alda soils and areas of the shallow Gothenburg soils at a lower elevation in the landscape. The included soils make up 3 to 8 percent of this unit.

Permeability of the material is rapid or very rapid, and the available water capacity is very low. The content of organic matter is very low, and natural fertility is low. The level of the water in the pits generally is 2 to 8 feet lower than the land surface. The mounds of sand are generally devoid of vegetation, except where they are no longer being actively used for commercial purposes. Runoff is very slow.

Most areas of this unit are used for commercial mining of sand and gravel. A few areas are used as sites for cottages. The water-filled pits are used for recreation and as wetland wildlife habitat.

Areas of this unit are generally not suited to farming, range, windbreaks, or other agricultural uses. Vegetation gradually becomes established in areas no longer mined.

Cottonwood, willow, and pine trees can be planted by hand, in either individual or scattered plantings. They need special care after planting to survive. A native grass cover or wooden barriers can be used to protect the plantings from blowing sand. Newly planted trees may need supplemental watering. In landscaping around summer cottages, grasses, shrubs, and trees are generally difficult to establish.

This unit is suited to development of recreation areas. Roads can be built for accessibility to lakes and picnic areas. The waste material commonly consists of nearly white fine sand which makes ideal beaches for sun bathing and relaxation. Areas can be developed for swimming by grading part of the sand back into the pits. This reduces depth of the water, gives a gradual decrease in the depth of water, and makes the areas less hazardous. The depth of some pits is 35 to 55 feet. Activities available in areas of this map unit are fishing, boating, water skiing, rock hunting, swimming, hiking, and picnicking.

The hazard of flooding needs to be considered if this unit is used for building sites and sanitary facilities. In some areas, summer cottages have been built around the shoreline of the pits. Buildings need to be constructed on the highest parts of this unit. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Because of the rapid permeability, this material does not adequately filter effluent from waste disposal systems. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered.

This miscellaneous area is in capability unit VIIIs-8. It is in windbreak suitability group 10.

Pt—Platte loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands. It is commonly in shallow, flat abandoned stream channels but also on slightly higher positions above the channel. This soil is occasionally flooded. It is shallow over coarse sand or gravelly sand. Areas are generally elongated and range from 10 to 500 acres.

Typically, the surface layer is gray, very friable calcareous loam about 7 inches thick. Beneath this is a transitional layer of grayish brown, very friable, calcareous sandy loam about 5 inches thick. The upper 3 inches of the underlying material is light brownish gray, mottled loamy sand. Below that, the underlying material is very pale brown gravelly sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the poorly drained Barney soils in low swales and the somewhat poorly drained Alda and Wann soils at a slightly higher elevation than this Platte soil. The included soils make up 10 to 20 percent of this map unit.

Permeability is moderately rapid in the upper part of the underlying material and very rapid in the lower part. The available water capacity is very low. Capillary action brings soluble salts to the surface in winter, but spring rains tend to leach these salts away. Runoff is slow. The natural fertility is low, and content of organic matter is moderately low. Tilth is good. The root zone is almost entirely in the soil material above the coarse sand or gravelly sand. The seasonal high water table is at a depth of about 1 foot in most wet years and about 2.5 feet in most dry years.

Most areas of this soil are in native grassland. They are used for haying and grazing. A few areas are farmed, and most of these are irrigated.

If this soil is used for dryland farming, it is poorly suited to grain sorghum, close grown crops, and introduced grasses. The principal hazard is soil wetness and, as a result, tillage is generally delayed early in spring. The fluctuating water table provides supplemental water for dryland crops. This soil tends to be droughty late in summer when the water table is lowest. Cultivation with a disc or chisel helps prevent soil blowing and conserves moisture for crops.

If this soil is irrigated, it is poorly suited to corn, grain sorghum, and introduced grasses. This soil is better suited to sprinkler irrigation than to other kinds of irrigation. Land leveling is generally needed for gravity irrigation. Deep cuts should be avoided to prevent exposing the coarse textured underlying material. Tillage is generally delayed in spring of most years because of wetness from the high water table. The very rapid permeability of the underlying material and the low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Keeping crop residue on the surface helps maintain the organic matter content and reduces soil blowing during winter.

This soil is well suited for use as range. Grazing when the soil is too wet, however, causes surface compaction and poor tilth. The water table provides moisture for subirrigation of the grasses. Proper grazing use, deferred grazing, a planned grazing system of use and rest, and restricted use during very wet periods help keep the grasses healthy and vigorous.

This soil is poorly suited for windbreak plantings. The species of trees and shrubs selected should be those that tolerate wetness in spring. Establishing the trees and cultivating are difficult in wet years, and control of weeds and grasses can be a problem. Cultivating between the rows and rototilling within the row help control the weeds and grasses.

This soil is not suitable for building sites or sanitary facilities because of the hazard of flooding and wetness. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit IVw-4 dryland and capability unit IVw-13 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Pv—Platte loam, wet, 0 to 1 percent slopes. This nearly level, poorly drained soil is on bottom lands in the Platte River Valley. This soil commonly is in abandoned, flat-bottom channels and is occasionally flooded. It is shallow over coarse sand and gravelly sand. Areas range from 10 to 500 acres.

Typically, the surface layer is very dark gray, very friable, calcareous loam about 6 inches thick. Beneath this is a transitional layer of dark gray gravelly sandy loam about 4 inches thick. The underlying material is light brownish gray and pale brown coarse sand and gravelly sand to a depth of 60 inches or more. In some areas, the surface layer is fine sandy loam or loamy sand. In places, gravelly sand is at a depth of 20 to 30 inches.

Included with this soil in mapping are small areas of Alda sandy loam and Inavale and Lawet Variant soils.

The Alda soils are somewhat poorly drained and have gravelly sand at a depth of 20 to 40 inches. The Inavale soils are somewhat excessively drained and do not have gravelly sand. The Lawet Variant soils are deep and contain more silt and clay than this Platte soil. The included soils make up 10 to 15 percent of this map unit.

Permeability is very rapid in the coarse sand and gravelly sand underlying material. The available water capacity is very low. The root zone is restricted to the soil material above the coarse sand and gravelly sand. The content of organic matter is moderately low, and natural fertility is low. The seasonal high water table ranges from the surface in most wet years to a depth of 2 feet in most dry years.

Most areas of this soil are in rangeland. The rest is used for cultivated crops.

If this soil is used for dryland farming, it is poorly suited to cultivated crops; however, small amounts of corn, sorghum, and small grain are grown. The principal limitation is soil wetness. Tillage is generally delayed early in spring. The water table supplies supplemental water for use by crops. This soil is droughty late in summer. Conservation tillage practices that keep crop residue on the surface, such as minimum tillage and stubble mulching, conserve moisture.

If this soil is irrigated by sprinklers, it is suited to corn, grain sorghum, and introduced grasses. Furrow irrigation is not suitable because of the shallow depth to coarse materials. Tillage is generally delayed in spring in most years. The very rapid permeability in the sand and gravel and low available water capacity of this soil make light, frequent applications of irrigation water necessary. Keeping crop residue on the surface helps maintain and improve tilth and conserve moisture during dry periods.

This soil is suitable as rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Overgrazing when the soil is wet causes surface compaction. Bogs commonly form, making grazing and haying difficult. Proper grazing use and timely deferment from grazing or haying, along with restricted use during wet periods, help maintain the native plants in good condition.

This soil provides a poor site for trees and shrubs in windbreaks. Survival and growth of adapted species is fair. Selected species must tolerate the wetness. Undesirable grasses and weeds can be controlled by good site preparation and timely cultivation between the rows. Areas close to the trees can be hoed by hand or rototilled. Establishing the trees can be difficult in wet years and planting needs to be delayed.

This soil is not suitable for building sites or sanitary facilities because of the hazard of flooding and wetness. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit IVw-4 dryland and capability unit IVw-13 irrigated. It is in Wet Subirrigated range site and windbreak suitability group 10.

PwB—Platte-Alda loams, channeled, 0 to 3 percent slopes. These nearly level and very gently sloping, somewhat poorly drained soils are on bottom lands along the Wood River. These soils are shallow or moderately deep over coarse sand and gravelly sand. They are frequently flooded. Areas are elongated and several thousand acres in size.

This complex contains about 65 percent Platte soils, 25 percent Alda soils, and 10 percent soils of minor extent. The Platte soils are on the slightly lower positions, and the Alda soils are on the slightly higher positions.

Typically, the Platte soils have a surface layer of dark gray, very friable, calcareous loam about 5 inches thick. Beneath this is a transitional layer of gray, mottled, very friable sandy loam about 3 inches thick. The underlying material is light brownish gray, mottled loamy sand to a depth of 15 inches. Below that, it is light gray gravelly sand to a depth of 60 inches or more. In some areas, the surface layer is fine sandy loam.

Typically, the Alda soils have a surface layer of dark grayish brown, very friable loam about 7 inches thick. The underlying material is light brownish gray, mottled fine sandy loam to a depth of 25 inches. Below that, it is light gray coarse sand and gravelly sand to a depth of 60 inches or more.

Included with these soils in mapping are small areas of the very shallow and shallow Gothenburg soils. Also included are small areas of the deep, somewhat excessively drained Inavale soils at a higher elevation than the major soils. The included soils make up about 10 percent of this map unit.

Permeability is moderately rapid in the upper part of the profile and very rapid in the underlying coarse sand and gravelly sand in both soils. The available water capacity is very low in Platte soils and low in Alda soils. The Platte soils have a seasonal high water table that ranges from a depth of 1 foot in wet years to 2.5 feet in dry years. The Alda soils have a seasonal high water table that ranges from a depth of about 2 feet in wet years to 3 feet in dry years. The content of organic matter is moderately low in both soils. The Platte soils have low natural fertility, and the Alda soils have medium fertility. The root zone is restricted to the soil material above the coarse sand and gravelly sand.

Most areas of these soils are used for range. A few areas are used for cultivated crops.

These soils are not suited to cultivated crops because of the frequent flooding. The landscape consists of numerous channels and intervening low ridges.

These soils are suited to rangeland. Keeping these soils in rangeland is effective in controlling soil blowing. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the desirable native plants. Overgrazing when these soils are wet causes

surface compaction and the formation of small mounds or bogs and makes grazing and haying difficult. Proper grazing use and deferred grazing or haying, along with restricted use during very wet periods, help maintain the plants in good condition.

These soils are not suited to trees and shrubs in windbreaks because of frequent flooding. These soils are droughty in mid and late summer when the water table recedes. Native trees that are presently growing on these soils are shallow rooted and subject to abuse during storms.

These soils are not suitable for building sites or sanitary facilities because of the frequent flooding and wetness. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Areas of these soils are a potential source of sand and gravel for roadfill or for use in construction.

These soils are in capability unit VIw-7 dryland. They are in Subirrigated range site and windbreak suitability group 10.

PxB—Platte-Gothenburg complex, channeled, 0 to 3 percent slopes. This complex consists of nearly level and very gently sloping, somewhat poorly drained and poorly drained soils. These soils are shallow and very shallow over coarse sand or gravelly sand. They are on bottom lands along Prairie Creek and Warm Slough that are frequently flooded. The areas are entrenched at an elevation about 5 feet below the adjacent landscape. They are long and narrow and several hundred acres in size.

This complex contains about 45 percent Platte soils, 45 percent Gothenburg soils, and 10 percent other soils. The Platte soils are in the slightly higher parts of the landscape, and the Gothenburg soils are in the lower parts.

Typically, the Platte soil has a surface layer of dark grayish brown, very friable, calcareous fine sandy loam about 7 inches thick. Beneath this is a transitional layer of light brownish gray, mottled, calcareous sandy loam about 5 inches thick. The underlying material is light gray coarse sand and gravelly sand to a depth of 60 inches or more. Depth to the gravelly coarse sand or gravelly sand ranges from 10 to 20 inches. In some areas, Platte soils do not have carbonates because they have been leached.

Typically, the Gothenburg soil has a surface layer of grayish brown, very friable loamy sand about 3 inches thick. The upper 5 inches of the underlying material is light brownish gray, mottled fine sand. Below this, the underlying material is very pale brown gravelly sand to a depth of 60 inches or more.

Included with these soils in mapping are small areas of Alda soils that are moderately deep over gravelly sand and are slightly higher in elevation. The included soils make up about 10 percent of this map unit.

Permeability in the Platte soils is moderately rapid in the upper part of the profile and very rapid in the underlying material. It is very rapid in the Gothenburg soils. The available water capacity is very low in both soils. The seasonal high water table in the Platte soils ranges from a depth of 1 foot in most wet years to about 2.5 feet in most dry years; in the Gothenburg soils it ranges from the surface in most wet years to a depth of 2 feet in most dry years. The organic matter content and natural fertility are low in both soils. Root development is restricted to the soil material above the coarse sand and gravelly sand.

All areas of these soils are used for range. The areas also furnish good cover for openland wildlife because they have an abundance of trees and are adjacent to cultivated fields.

These soils are not suited to cultivated crops because of the shallow and very shallow depth to gravelly sand, low available water capacity, and frequent flooding.

Rangeland is the most effective use of these soils. Overgrazing, however, reduces the protective cover and causes deterioration of the plants. Proper grazing, deferred grazing, and a planned grazing system of use and rest, help maintain the plants in good condition.

These soils are not suited to trees or shrubs in windbreaks because they are frequently flooded in spring and are droughty later in the growing season when soil moisture is low. The trees on these soils are shallow rooted and subject to damage during storms.

The soils in this map unit are not suitable for building sites or sanitary facilities because of the hazard of frequent flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Bridges and culverts are generally used where local roads cross these soils. These soils are a potential source of sand and gravel for roadfill or for use in construction.

These soils are in capability unit VIIw-7 dryland. The Platte soil is in Subirrigated range site. The Gothenburg soil is not in a range site. These soils are in windbreak suitability group 10.

Ru—Rusco silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on stream terraces and in shallow basins and depressions. The basins are occasionally flooded. Areas range from 10 to 100 acres.

Typically, the surface layer is friable silt loam about 12 inches thick. The upper part of the surface layer is grayish brown, and the lower part is dark grayish brown. The subsoil is mottled, light brownish gray, firm silty clay loam about 12 inches thick. The underlying material is light gray, mottled, calcareous silt loam to a depth of 60 inches or more. In places, the thickness of the surface layer has been altered by land leveling.

Included with this soil in mapping are small areas of the well drained Kenesaw soils and the lighter colored Loretto soils at a slightly higher elevation than this Rusco soil. The included soils make up about 10 to 15 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. Tilth is generally good. The content of organic matter is moderate, and natural fertility is medium. The water intake rate is moderately low.

Most areas of this soil are used for cultivated crops. A few areas are irrigated. A small acreage is in rangeland and is used for grazing.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, alfalfa, and introduced grasses. Wetness in spring is the principal limitation. The soil is occasionally flooded for short periods following heavy rains. During dry periods, however, the additional moisture from flooding is beneficial to crops because it adds to the available moisture supply. Conservation tillage practices that keep crop residue on the surface help prevent loss of moisture and soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and introduced grasses. Gravity or sprinkler irrigation is suited. Most areas need some land leveling for gravity irrigation. They also need effective measures for diverting or intercepting floodwater. Tillage is occasionally delayed in spring because of the excess wetness. Sustained production can be obtained by using fertilizers, high density plant populations, and efficient irrigation that controls the amount and time of water application. The same conservation tillage practices suited to dryland farming are useful for irrigated farming.

This soil is suited to use as rangeland, either for grazing or haying. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. In addition, overgrazing when the soil is wet can result in surface compaction. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods, help maintain the native plants in good condition.

This soil provides a fair site for trees and shrubs in windbreaks. Survival and growth of adapted species is good if the species selected tolerate occasional wetness. The principal limitations and hazards are the occasional flooding in basin areas and the vigorous growth of weeds and grasses on this moderately wet soil. Weeds and grasses can be controlled by cultivation between the rows with conventional equipment, such as a disc or harrow. Careful application of appropriate herbicides or rototilling in the tree rows help control weeds and undesirable grasses.

This soil is not suitable for building sites or septic tank absorption fields because of the flooding. Sewage lagoons need to be diked as protection from flooding. Constructing roads on suitable compacted fill material, so that they are above the flood level, and providing adequate side ditches and culverts help protect roads from flood damage. Damage to roads by frost action can be reduced by good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-3 dryland and capability unit IIw-4 irrigated. It is in Silty Overflow range site and windbreak suitability group 1.

Sm—Simeon loamy sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on stream terraces. Areas range from 10 to 150 acres.

Typically, the surface layer is gray, very friable loamy sand about 9 inches thick. Beneath this is a transitional layer of grayish brown, loose loamy sand about 6 inches thick. The underlying material is mainly very pale brown coarse sand to a depth of 60 inches or more. It has 2 to 15 percent gravel.

Included with this soil in mapping are small areas of Thurman and Valentine soils. These soils do not have gravel in the underlying material and are at a slightly higher elevation than this Simeon soil. The included soils make up about 10 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. The natural fertility and content of organic matter are low. The root zone is mainly restricted to the soil material above the coarse sand. Moisture is released readily to plants, but much of it is lost through deep percolation.

Most areas of this soil are in rangeland and are used for grazing. A few small areas are used for cultivated crops, and most of these irrigated.

This soil is not suited to dryland farming because of the low available water capacity which results in droughtiness.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Sprinkler irrigation, especially the center-pivot system, is suited. Leaching of plant nutrients through the coarse textured underlying material and the low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Soil blowing is a hazard on unprotected fields. Conservation tillage practices that keep crop residue on the surface, such as cultivation with a disc or chisel and no-till planting, help control soil blowing and reduce the loss of moisture by evaporation.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferments of grazing and haying, and a planned grazing system of use and rest help maintain or improve the range condition.

This soil is not suited to windbreaks because of droughtiness, the coarse texture, and the limited zone for root growth.

This soil is well suited to building sites and local roads and streets. Because of the rapid permeability of the

underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Establishing vegetation on roadbanks is difficult unless the roadbank is topdressed with topsoil.

This soil is in capability unit VIe-4 dryland and capability unit IVe-14 irrigated. It is in Shallow to Gravel range site and windbreak suitability group 10.

ThB—Thurman loamy fine sand, 0 to 3 percent slopes. This deep, somewhat excessively drained, nearly level and very gently sloping soil is on high stream terraces. Areas range from 5 to 125 acres.

Typically, the surface layer is very friable loamy fine sand about 14 inches thick. The upper part of the surface layer is dark grayish brown, and the lower part is dark gray. Beneath this is a transitional layer of grayish brown, very friable loamy fine sand about 5 inches thick. The underlying material is brown and pale brown loamy fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the moderately well drained Ipage soils at a slightly lower elevation than this Thurman soil and the excessively drained Valentine soils at a slightly higher elevation. The included soils make up 7 to 14 percent of this map unit.

Permeability is rapid, and the available water capacity is low. The water intake rate is very high. The content of organic matter is moderately low, and natural fertility is low. The surface layer is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of this soil are used for cultivated crops, and some of these are irrigated. The rest is in rangeland and is used for grazing or haying.

If this soil is used for dryland farming, it is suited to corn, sorghum, small grain, and alfalfa. The production of small grain and the first cutting of alfalfa are generally dependable because these crops grow and mature in spring and early in summer when rainfall is highest. The principal hazard is soil blowing. This can be reduced and moisture can be conserved by use of stripcropping, field windbreaks, and a tillage system that keeps crop residue on the surface. Disc and no-till planting also conserve needed moisture.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Sprinkler irrigation is better suited than other types of irrigation. Frequent, light applications of water are needed because the available water capacity is low. These applications also help to avoid excessive leaching of plant nutrients. The principal hazard is soil blowing. This can be reduced by using a tillage system that keeps a crop or crop residue on the soil surface.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the range, losses by soil blowing, and the formation of small blowouts. Proper grazing use, timely deferments from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

If used for trees and shrubs in windbreaks, this soil is suited to those species that tolerate the somewhat droughty conditions. Soil blowing can be controlled by maintaining strips of sod or other cover crops between the tree rows. Careful application of appropriate herbicides or rototilling in the row help control weeds and reduce competition for moisture.

This soil is well suited to building sites and local roads and streets. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing.

This soil is in capability unit IIIe-5 dryland and capability unit IIIe-11 irrigated. It is in Sandy range site and windbreak suitability group 5.

ThC—Thurman loamy fine sand, 3 to 6 percent slopes. This deep, somewhat excessively drained, gently undulating soil is on high stream terraces. Areas range from 25 to 250 acres.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 12 inches thick. Beneath this is a transitional layer of brown, very friable loamy fine sand about 15 inches thick. The underlying material is pale brown loamy fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of nearly level Thurman soils at a lower elevation than this Thurman soil and strongly sloping Valentine soils at a higher elevation. Also included are small areas of moderately well drained Ipage soils in low positions. The included soils make up about 5 to 15 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The water intake rate is very high. The natural fertility is low, and content of organic matter is moderately low. The surface layer is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of this soil are used for cultivated crops, and a few of these are irrigated by sprinklers. A few areas are in native grassland and are used for grazings.

If this soil is used for dryland farming, it is poorly suited to corn, sorghum, small grain, and alfalfa. The

production of small grain and the first cutting of alfalfa are generally dependable because these crops grow and mature in spring and early in summer when rainfall is highest. The principal hazards are soil blowing and droughtiness. Other concerns in management are conserving moisture and maintaining fertility. Soil blowing can be reduced and moisture conserved by the use of stripcropping, field windbreaks, and a cover crop or residue on the soil most of the time. Cultivation with a disc or chisel and no-till planting also help conserve soil moisture.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Sprinkler irrigation is better suited than other methods of irrigation. Frequent, light applications of water are needed because of the low available water capacity. These applications also help to avoid excessive leaching of plant nutrients. Soil blowing is the principal hazard. Maintaining a large amount of crop residue on the surface, stripcropping, field windbreaks, and keeping tillage to a minimum help reduce soil blowing.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing reduces the protective plant cover and causes deterioration of the range. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

This soil is suited to those species of trees and shrubs that tolerate droughtiness. Planting a cover crop between the rows of trees helps control soil blowing. Undesirable grasses and weeds that compete for moisture can be controlled by careful use of appropriate herbicides, rototilling, or hand hoeing in the row.

This soil is suited to building sites and local roads and streets. In places, small commercial buildings need to be properly designed to accommodate the slope or the soil needs to be adequately graded to accommodate the structure. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons help prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing and water erosion.

This soil is in capability unit IVe-5 dryland and capability unit IVe-11 irrigated. It is in Sandy range site and windbreak suitability group 5.

VbD—Valentine fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, excessively drained soil is on uplands and stream terraces. Areas range from 10 to 1,000 acres.

Typically, the surface layer is grayish brown, very friable fine sand about 4 inches thick. Beneath this is a transitional layer of pale brown, loose fine sand about 4 inches thick. The underlying material is very pale brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Boelus soils on side slopes or in swales and Thurman soils that are generally at a lower elevation than this Valentine soil. Also included are a few areas of Valentine soils that have slopes of 9 to 20 percent. The included soils make up about 5 to 15 percent of this map unit.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The natural fertility and content of organic matter are low. Tilth is only fair because of the loose consistency.

Most areas of this soil are in rangeland and are used for grazing. A few areas are irrigated by center-pivot sprinklers.

This soil is generally not suited to dryland cultivated crops because it is sandy, droughty, and subject to severe soil blowing. This soil is better suited to grasses, trees, and wildlife habitat than to cultivated crops. Areas that are presently cultivated for dryland crops need to be irrigated or returned to native vegetation.

If this soil is irrigated, it is poorly suited to corn, grain sorghum, and alfalfa. Only sprinkler irrigation is used. The principle hazard is soil blowing. Low fertility is a concern of management. Leaching of plant nutrients and the low available water capacity of this soil make light, frequent applications of irrigation water and fertilizer necessary. Maintaining a large amount of crop residue on the surface, stripcropping, field windbreaks, and keeping tillage to a minimum help control soil blowing. Conservation tillage systems that keep crop residue on the surface are particularly well suited to this soil.

Use of this soil as rangeland is effective in controlling soil blowing. Overgrazing reduces plant cover and causes deterioration of the desirable range plants. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

If this soil is used for windbreaks, it provides a fair planting site. Survival and growth of adapted species is fair. This soil is subject to blowing if disturbed, and this is the principal hazard. Seedlings should be planted in shallow furrows, and areas between the rows should not be cultivated. Hand hoeing or rototilling helps control weeds and undesirable grasses in the row. Unless protected, seedlings can be damaged during high winds or covered by blowing sand.

This soil is suited to building sites and local roads and streets. Small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate

absorption of the effluent. Lining or sealing sewage lagoons help prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. In places, cuts and fills are needed to provide a suitable grade for roads. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing.

This soil is in capability unit VIe-5 dryland and capability unit IVe-12 irrigated. It is in Sands range site and windbreak suitability group 7.

VbE—Valentine fine sand, 9 to 20 percent slopes. This deep, moderately steep, excessively drained soil is on uplands. Areas range from 25 to several thousand acres.

Typically, the surface layer is grayish brown, very friable fine sand about 3 inches thick. Beneath this is a transitional layer of pale brown, loose fine sand. The underlying material is very pale brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of strongly sloping Valentine soils. The included soils make up less than 5 percent of this map unit.

Permeability is rapid. Runoff is slow because most of the moisture is readily absorbed into the soil. The available water capacity, natural fertility, and content of organic matter are low.

Most areas of this soil are in rangeland and are used for grazing.

This soil is not suited to dryland or irrigated cultivated crops because it is sandy, droughty, and subject to soil blowing if disturbed. It is suited to grasses and to use as habitat for wildlife. Areas that are cultivated need to be returned to native vegetation.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing the range causes deterioration of desirable range plants. It can also cause severe losses by soil blowing and the formation of small blowouts. The desirable grasses can be kept healthy and vigorous by proper grazing use, deferred grazing, and a planned grazing system of use and rest.

If used for windbreaks, this soil provides a poor planting site. Survival and growth of adapted species is poor. This soil is subject to blowing if disturbed, and this is the major hazard. Sod should be maintained between the rows. Seedlings should be planted in shallow furrows and should not be cultivated. Young seedlings can be damaged or covered with drifting sand during high winds. Irrigation is needed to provide supplemental water during times of insufficient moisture.

Slope limits the use of this soil for building sites and sanitary facilities. The steeper areas are not suitable for sanitary facilities; therefore, alternate sites on other soils that are suited to these uses should be considered. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. In places, septic tank absorption fields can be constructed on the contour after the site is graded. For sewage lagoon areas, grading is required to modify the slope and shape the lagoon. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Cuts and fills are generally needed to provide a suitable grade for roads. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing.

This soil is in capability unit VIe-5 dryland. It is in Sands range site and windbreak suitability group 7.

VcB—Valentine loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on stream terraces and uplands. Areas range from 10 to 50 acres.

Typically, the surface layer is very friable loamy fine sand about 6 inches thick. The upper part of the surface layer is grayish brown, and the lower part is brown. Beneath this is a transitional layer of pale brown, very friable loamy fine sand about 8 inches thick. The underlying material is light brownish gray and light yellowish brown loamy fine sand to a depth of 60 inches or more. In places, the underlying material is loamy fine sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Blendon, Boelus, Ipage, Loretto, and Thurman soils. The Blendon, Ipage, Loretto, and Thurman soils are at a lower elevation than this Valentine soil. The Blendon soils are not so sandy. The Boelus soils have loamy fine sand over silt loam and are generally on side slopes. The Ipage soils are moderately well drained. The Loretto soils have more silt and clay in the profile. The Thurman soils have a darker surface layer. The included soils make up 8 to 15 percent of this map unit.

Permeability is rapid, and the available water capacity is low. The water intake rate is very high. The organic matter content and natural fertility are low. The surface layer is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of this soil are used for cultivated crops. The rest is in native grassland and is used for grazing.

If this soil is used for dryland farming, it is poorly suited to cultivated crops. The production of wheat and alfalfa is generally more dependable because these crops grow and mature in spring and early in summer when rainfall is the highest. The principal hazard is soil blowing. This soil is droughty late in the growing season. Limiting the consecutive years of row crops and including close-growing crops in the cropping system conserve soil moisture and reduce soil blowing. Conservation tillage systems that leave crop residue on

the surface, such as no-till and chisel planting, help conserve soil moisture and reduce soil blowing.

If this soil is irrigated, it is suited to corn, sorghum, and alfalfa. Sprinkler irrigation is the only method of irrigation that is suitable. The principal hazard is soil blowing. Low fertility and proper distribution or irrigation water are concerns of management. The possible leaching of plant nutrients and the low available water capacity make light, frequent applications of water necessary. Maintaining a large amount of crop residue on the surface, stripcropping, field windbreaks, and keeping tillage to a minimum help control soil blowing.

The use of this soil for rangeland is effective in controlling soil blowing. Overgrazing or untimely haying reduces the plant cover and causes severe losses by soil blowing and the formation of small blowouts. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

If used for windbreaks, this soil provides a fair planting site. Survival and growth of adapted species is fair. The principal hazard is soil blowing, and this can be controlled by maintaining strips of sod or other cover crops between the tree rows. Cultivation should be restricted to the tree rows. Seedlings should be hoed by hand. Careful use of an appropriate herbicide in the row helps control the undesirable grasses and weeds that compete for moisture.

This soil is well suited to building sites and local roads and streets. Because of the rapid permeability of the underlying material, this soil does not adequately filter effluent from a waste disposal system. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing.

This soil is in capability unit IVe-5 dryland and capability unit IVe-11 irrigated. It is in Sandy range site and windbreak suitability group 5.

VcD—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, strongly sloping, somewhat excessively drained soil is on uplands and stream terraces. Areas range from 10 to 500 acres.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 6 inches thick. Beneath this is a transitional layer of grayish brown, very friable loamy fine sand about 6 inches thick. The underlying material is pale brown loamy fine sand to a depth of 60 inches or more. In many places, the underlying material has common thin strata that has 2 to 5 percent more clay than is typical.

Included with this soil in mapping are small areas of Loretto and Boelus soils, generally on side slopes and low positions. The included soils make up 8 to 15 percent of this map unit.

Permeability is rapid, and the available water capacity is low. The water intake rate is very high. The organic matter content and natural fertility are low. The surface layer is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of this soil are in native grassland and are used for range. The remainder is used for cultivated crops.

If this soil is used for dryland farming, it is poorly suited to cultivated crops. Grain sorghum, alfalfa, and wheat are the common crops. The production of alfalfa and small grain is more dependable because these crops grow and mature in spring and early in summer when rainfall is highest. The principal hazards are soil blowing and the droughtiness late in the growing season. Conservation tillage systems that keep crop residue on the surface, such as no-till planting and stubble mulching, help conserve soil moisture and control soil blowing. Consecutive years of row crops should be limited and close-growing crops should be included in the cropping system to conserve moisture and control blowing.

If this soil is irrigated, it is poorly suited to corn, sorghum, and alfalfa. Sprinklers are the only method of irrigation suited. The principal hazard is soil blowing. Low fertility and proper distribution of irrigation water are concerns of management. The possible leaching of plant nutrients and the low available water capacity make light, frequent applications of water necessary. Maintaining a large amount of crop residue on the surface, stripcropping, field windbreaks, and keeping tillage to a minimum help control soil blowing.

The use of this soil as rangeland is effective in controlling soil blowing. Overgrazing or untimely haying reduces the plant cover and causes deterioration of the native range, severe losses by soil blowing, and the formation of blowouts. Proper grazing use, deferred grazing, and a planned grazing system of use and rest help keep the grasses healthy and vigorous.

This soil provides a fair site for planting trees and shrubs in windbreaks. Survival and growth of adapted species is fair. Disturbed areas are subject to soil blowing. Seedlings can be planted in shallow furrows to reduce disturbance of the soil. Irrigation is needed to provide supplemental water during periods of insufficient moisture. Seedlings can be damaged or covered by blowing sand during high winds.

This soil is suited to building sites and local roads and streets. Small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. Because of the rapid permeability of the underlying material, this soil does not adequately filter waste disposal effluent. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply. Placing septic tank absorption

fields in raised fill helps provide for adequate absorption of the effluent. Lining or sealing sewage lagoons helps prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. In places, cuts and fills are needed to provide a suitable grade for roads. Areas of this soil that are disturbed during construction need to be revegetated with adapted species to prevent soil blowing.

This soil is in capability unit IVe-5 dryland and capability unit IVe-11 irrigated. It is in Sands range site and windbreak suitability group 7.

VeB—Valentine-Boelus loamy fine sands, 0 to 3 percent slopes. These deep, nearly level and very gently sloping, excessively drained and well drained soils are on uplands and stream terraces. Areas range from 10 to 40 acres.

This complex contains about 45 to 60 percent Valentine soils and 35 to 55 percent Boelus soils. Generally, the Valentine soils are on low knolls and the Boelus soils are on side slopes and in swales.

Typically, the Valentine soil has a surface layer of dark grayish brown, very friable loamy fine sand about 6 inches thick. Beneath this is a transitional layer of light brownish gray, very friable loamy fine sand about 3 inches thick. The underlying material is very pale brown fine sand to a depth of 60 inches or more.

Typically, the Boelus soil has a surface layer of loamy fine sand about 14 inches thick. The upper part of the surface layer is very friable and grayish brown, and the lower part is loose and brown. Beneath this is a layer of light yellowish brown fine sand about 18 inches thick. The subsoil is very pale brown, friable silt loam about 23 inches thick. The underlying material is very pale brown silt loam to a depth of 60 inches or more.

Included with these soils in mapping are small areas of strongly sloping Valentine and Boelus soils at a higher elevation than the major soils. The included soils make up about 5 to 10 percent of this map unit.

Permeability is rapid in the Valentine soil. It is rapid in the upper part of the profile and moderate in the lower part of the profile in the Boelus soil. The available water capacity is low in the Valentine soil and moderate in the Boelus soil. The water intake rate is very high in the Valentine soil and high in the Boelus soil. The organic matter content is low in the Valentine soil and moderately low in the Boelus soil. Natural fertility is low in both soils. The surface soil is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of these soils are used for cultivated crops. Some areas are in native grassland and are used for range.

If these soils are used for dryland farming, they are suited to corn, sorghum, small grain, and alfalfa. The production of small grain and alfalfa are generally more dependable than other common crops because these crops grow and mature in spring and early in summer when rainfall is highest. The principal hazards are soil blowing and droughtiness late in the growing season. Conservation tillage systems that keep crop residue on the surface, such as cultivation with a disc or chisel and no-till planting, help control soil blowing and conserve soil moisture. Consecutive row crops year after year should be limited and close-growing crops should be included in the cropping system.

If these soils are irrigated, they are suited to corn, grain sorghum, and alfalfa. Sprinkler irrigation is better suited to these soils than other methods of irrigation (fig. 10). The principal hazard is soil blowing. Low fertility and proper distribution of water are important concerns of management. The possible leaching of plant nutrients and the low available water capacity of the Valentine soil make light, frequent applications of water necessary. Maintaining a large amount of crop residue on the surface and use of conservation tillage, such as cultivation with a disc or chisel, no-till planting, and stubble mulching, help control soil blowing and conserve moisture.

Use of these soils as rangeland is effective in controlling soil blowing. Overgrazing or untimely haying reduces the plant cover and causes deterioration of the desirable range plants, severe losses by soil blowing, and the formation of small blowouts. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

If these soils are used for windbreaks, they provide a fair planting site. Growth and survival of adapted species is fair. The principal hazard is soil blowing, and this can be controlled by maintaining strips of sod or other cover crops between the rows. Cultivation should be restricted to the tree rows only, or the trees can be hoed by hand. Careful use of appropriate herbicides in the row helps control undesirable weeds and grasses. Supplemental irrigation may be needed when natural moisture is insufficient.

The Valentine soil in this complex is well suited to building sites and local roads and streets. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The moderate shrink-swell potential in the silty subsoil and underlying material in the Boelus soil is a limitation for building sites. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of the soil. The low strength of the silty material in the Boelus soil needs to be considered in the design of roads and streets. Coarse grained material for subgrade or base material can be used to ensure better performance. The Boelus soil is suited to septic tank absorption fields. Because of the rapid permeability, the Valentine soil does not adequately filter waste disposal effluent. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply.

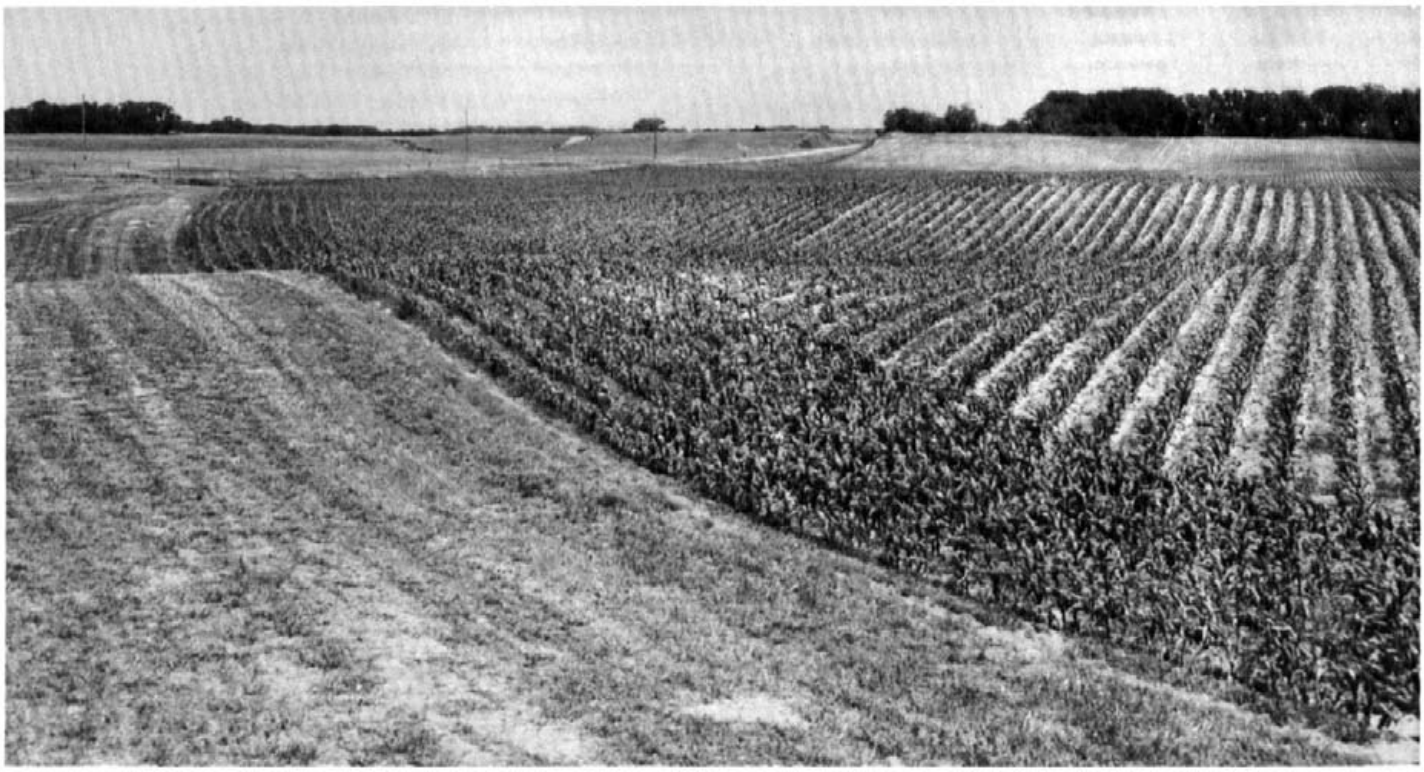

Figure 10.—An area of Valentine-Boelus loamy fine sands. Center-pivot sprinklers are used to irrigate these undulating soils.

These soils are in capability unit IIIe-5 dryland and capability unit IIIe-11 irrigated. They are in Sandy range site and windbreak suitability group 5.

VeD—Valentine-Boelus loamy fine sands, 3 to 9 percent slopes. These deep, gently sloping and strongly sloping, well drained and excessively drained soils are on uplands and stream terraces. Areas range from 50 to several thousand acres.

This complex contains about 55 to 75 percent Valentine soils and 25 to 40 percent Boelus soils. The Valentine soils generally are on the highest positions, and the Boelus soils are generally on the lower side slopes and in swales.

Typically, the Valentine soil has a surface layer of dark grayish brown, very friable loamy fine sand about 5 inches thick. Beneath this is a transitional layer of grayish brown, very friable loamy fine sand about 3 inches thick. The underlying material is pale brown fine sand to a depth of 60 inches or more.

Typically, the Boelus soil has a surface layer of loamy fine sand about 12 inches thick. The upper part of the surface layer is very friable and grayish brown, and the lower part is loose and brown. Beneath this is a layer of light yellowish brown fine sand about 16 inches thick. The subsoil is very pale brown, friable silt loam about 24 inches thick. The underlying material is very pale brown silt loam to a depth of 60 inches or more.

Included with these soils in mapping are small areas of nearly level Valentine and Boelus soils at a lower elevation. The included soils make up 5 to 15 percent of this map unit.

Permeability is rapid, the available water capacity is low, and the water intake rate is very high in the Valentine soils. In the Boelus soils permeability is rapid in the upper part of the profile and moderate in the lower part of the profile. The available water capacity is moderate, and the water intake rate is high. The organic matter content is low in the Valentine soil and moderately low in the Boelus soil. Natural fertility is low in both soils. The surface soil is very friable and can be tilled through a wide range of soil moisture. Tilth is fair.

Most areas of these soils are in rangeland and are used for grazing. The rest of the areas are used for cultivated crops.

These soils are poorly suited to dryland cultivated crops. They are sandy, droughty, and subject to soil blowing. Grain sorghum and wheat can be grown if moisture is conserved and blowing is controlled. Crop residue needs to be kept on the surface by using conservation tillage systems, such as chisel and no-till planting.

If these soils are irrigated, they are poorly suited to corn, grain sorghum, wheat, and alfalfa. Sprinkler irrigation is better suited than other methods of irrigation. The possible leaching of plant nutrients and the low available water capacity on the Valentine soil make light, frequent applications of water and fertilizer necessary. Maintaining a large amount of crop residue on the surface, stripcropping, and keeping tillage to a minimum help control soil blowing and conserve moisture.

The use of these soils as rangeland is effective in controlling soil blowing and water erosion. Overgrazing by livestock or untimely haying reduces the protective cover and causes deterioration of the desirable native plants, severe loss by soil blowing, and the formation of blowouts. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest help maintain or improve the range condition.

If used for windbreaks, these soils provide a fair planting site. Survival and growth of adapted species is fair. These soils are subject to blowing if disturbed, and this is the principal hazard. Seedlings can be planted in shallow furrows and should not be cultivated. Areas near the trees should be hoed by hand. Seedlings can be damaged or covered by blowing sand during high winds. Strips of sod or a crop between the rows help reduce soil blowing. Irrigation is needed during periods of insufficient moisture.

The Valentine soil in this complex is suited to building sites and local roads and streets. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The moderate shrink-swell potential in the silty subsoil and underlying material in the Boelus soil is a limitation for building sites. Foundations for buildings need to be strengthened and backfilled with coarse grained material to prevent damage by the shrinking and swelling of the soil. On both soils, small commercial buildings need to be properly designed to accommodate the slope, or the soil needs to be adequately graded to accommodate the structure. The low strength of the silty material in the Boelus soil needs to be considered in the design of roads and streets. Coarse grained material for subgrade or base material can be used to ensure better performance. The Boelus soil is suited to septic tank absorption fields. Because of the rapid permeability, the Valentine soil does not adequately filter waste disposal effluent. Seepage from septic tank absorption fields and sewage lagoons can contaminate the underground water supply.

These soils are in capability unit IVe-5 dryland and capability unit IVe-11 irrigated. The Valentine soil is in Sands range site, and the Boelus soil is in Sandy range site. The Valentine soil is in windbreak suitability group 7, and the Boelus soil is in windbreak suitability group 5.

Wb—Wann sandy loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 10 to 75 acres.

Typically, the surface layer is very friable sandy loam about 14 inches thick. The upper part of the surface layer is dark gray, and the lower part is calcareous and dark grayish brown. Beneath this is a transitional layer of grayish brown, very friable, calcareous sandy loam about 6 inches thick. The underlying material is light brownish gray, calcareous sandy loam to a depth of 42 inches. It contains thin strata of coarser textured material and a few olive brown mottles. Below that, the underlying material is very pale brown sand to a depth of 60 inches or more. In places, the lower part of the underlying material is fine sandy loam or sandy loam to a depth of 60 inches, or below a depth of 40 inches it is sand and has 5 to 15 percent gravel. In a few areas, carbonates have been leached to a depth below 15 inches.

Included with this soil in mapping are small areas of Alda, Janude, and Ovina soils. The Alda soils are moderately deep over gravelly sand and are at a slightly lower elevation than this Wann soil. The Janude soils are moderately well drained and at a higher elevation. The Ovina soils have finer texture in the underlying material. Also included in some low positions are small areas of soil that has a surface layer of loam. The included soils make up 5 to 15 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow. The surface layer is very friable and easily tilled through a wide range of soil moisture. The content of organic matter is moderately low, and natural fertility is medium. Moisture is released readily to plants. The seasonal water table fluctuates from a depth of about 2 feet in most wet years to about 3.5 feet in most dry years. Tilth is good.

Most areas of this soil are used for cultivated crops. A few areas are in rangeland and are used for grazing or haying.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, alfalfa, small grain, and introduced grasses. The principal limitation is soil wetness. Tillage is generally delayed in spring. The fluctuating water table provides supplemental moisture for use by crops. Conservation tillage practices that keep crop residue on the surface, such as cultivation with a disc or chisel and stubble mulching, help prevent soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Sprinkler irrigation or gravity irrigation is suited. Generally, some land leveling is needed for gravity irrigation. Tillage is generally delayed in spring in most years. Light, frequent applications of water and fertilizer are necessary because these soils have moderate available water capacity. Returning crop residue to the soil helps maintain good tilth and reduces the hazard of soil blowing during periods of low rainfall.

Rangeland for grazing or haying is suited to this soil. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the natural vegetation. Proper grazing use and timely deferment from grazing or haying, along with restricted use during very wet periods,

help maintain the plant community in good condition. If this soil is used for pasture, good management includes rotation grazing, proper stocking, and application of fertilizers.

This soil is suited to trees and shrubs in windbreaks. Species should be selected that tolerate occasional wetness. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation between the rows. Careful use of appropriate herbicides and rototilling can be used to eliminate weeds and grasses in the row.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-6 dryland and capability unit IIw-8 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

Wm—Wann loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is occasionally flooded. Areas range from 5 to 75 acres.

Typically, the surface layer is very friable, calcareous loam about 16 inches thick. The upper part of the surface layer is dark gray, and the lower part is gray. Beneath this is a transitional layer of grayish brown, very friable, calcareous loam about 4 inches thick. The underlying material is light gray, mottled sandy loam to a depth of 42 inches. Below that, it is very pale brown fine sand to a depth of 60 inches or more. In small areas salts have accumulated on the surface and the soil is saline. Also in places, the profile is noncalcareous.

Included with this soil in mapping are small areas of Alda loam that are moderately deep over gravelly sand and at a slightly lower elevation than this Wann soil, small areas of the silty Leshara soils at a lower elevation, and small areas of a soil that has a surface layer of sandy loam. The included soils make up 8 to 12 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is moderate. The water intake rate is moderately high. Runoff is slow. The content of organic matter is moderately low, and natural fertility is medium. The surface layer is friable and easily tilled through a fairly wide range of soil moisture. The seasonal high water table ranges from about 2 feet in most wet years to about 3.5 feet in most dry years. Tilth is good.

Most areas of this soil are used for cultivated crops. A few small areas in rangeland are used for grazing or haying.

If this soil is used for dryland farming, it is suited to corn, grain sorghum, small grain, alfalfa, and introduced grasses. The principal limitation is soil wetness. Tillage is generally delayed early in spring. Conservation tillage practices that keep crop residue on the surface, such as disc or chisel planting, help prevent soil blowing and conserve soil moisture.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Gravity or sprinkler irrigation is suited. Generally, some land leveling is needed for gravity irrigation. Tillage is generally delayed in spring in most years. Light, frequent applications of water and fertilizer are necessary because of the moderate available water capacity. Keeping crop residue on the soil surface helps maintain good tilth and reduces soil blowing.

This soil is suited to rangeland. Overgrazing or untimely haying reduces the protective cover and causes deterioration of the native plants. Proper grazing use, timely deferment from grazing or haying, and a planned grazing system of use and rest are needed to help maintain the range in good condition.

This soil provides a good site for trees and shrubs in windbreaks. Species should be selected that tolerate occasional wetness. Survival of adapted species is good. Competition for moisture from weeds and grasses occurs late in summer when the water table is low. Good site preparation and timely cultivation between the rows help control undesirable grasses and weeds. Rototilling and hand hoeing help control grasses and weeds in the row and near the trees.

This soil is not suitable for building sites or septic tank absorption fields because of the hazard of flooding and wetness; therefore, alternate sites on other soils that are suited to these uses should be considered. Constructing roads on suitable compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Damage to roads by frost action can be reduced by good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is in capability unit IIw-4 dryland and capability unit IIw-8 irrigated. It is in Subirrigated range site and windbreak suitability group 2S.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and windbreaks; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where wetness or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

By William E. Reinsch, conservation agronomist, Soil Conservation Service.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Farmland makes up most of the agricultural land in Merrick County. According to the 1974 Agriculture Census, 73 percent of the farmland was used for cultivated crops. In 1976, 80 percent of the cropland was irrigated. The largest acreage is used for corn, of which 85 percent is irrigated, and this is followed by alfalfa. Acreage used for small grain makes up less than 11 percent of the total cropland.

The potential of soils in Merrick County for increased production of food is good. About 214,500 acres is suited to cropland, and of this, 175,000 acres is suited to irrigation if an adequate supply of water is available. An additional 25,000 acres could be developed for irrigation, if water is available and erosion problems are controlled.

Many areas in Merrick County are affected by a widely fluctuating seasonal water table. This affects farming practices and crop production, and particularly dryfarmed crops. The high water table in spring causes cool soil temperatures, excessive soil moisture, and poor aeration which, in turn, affect root development of crop plants. After the water table recedes in summer, root development and crop growth are affected by a lack of sufficient moisture. This is particularly severe in soils that have coarse sand or gravelly sand in the lower part of the profile, such as the Fonner, Alda, Lex, Lockton, and Platte soils. Crop production is also affected by the fluctuating water table on deeper soils, such as the Merrick, Novina, Ovina, Gibbon, Caruso, Wann, and Lamo soils.

Ways to improve crop production on soils with a high water table are varied and are not always completely effective. Some of the problems caused by a fluctuating water table can be overcome by a tile drainage system. A grid tile system with a pump at the outlet can be used, but the costs and benefits of such a system need to be considered. Good natural outlets for a tile drainage system are not available in most cases. Land smoothing to improve surface drainage helps to remove surface water so that the soil can be tilled. Ridge planting and keeping crop residue on the surface can help warm the

soil in the root zone as well as develop a suitable area in which to plant the seed. When planting is delayed because of soil wetness, the selection of a short season variety or a change of crops may be the solution to the problem.

Managing dryfarmed cropland. Good management practices on dryland crops are those that reduce runoff and the risk of erosion, conserve moisture, and improve tilth. Most of the acreage in Merrick County is suitable for crop production. In places, however, the erosion hazard is severe and needs to be reduced or corrected by suitable conservation practices.

Terraces, contour farming, crop rotations, grassed waterways, and conservation tillage systems that keep crop residue on the surface help reduce water erosion and soil blowing.

Crop stubble in intensive cropping systems is an important asset for water conservation, maintenance of fertility, and erosion control. Crop stubble traps snow and limits loss of soil water by evaporation. Crop residue returned to the soil improves fertility and tilth. Two tons of crop residue per acre contains about 20 pounds of nitrogen and 5 pounds of phosphorus. Bulk density of the soil is reduced by returning crop stubble to the soil, which in turn reduces surface crusting and fuel requirements during tillage. Crop residue on the surface also helps control erosion.

Soil blowing is a hazard on the sandy soils in Merrick County. Blowing soil can damage crops in a few hours if winds are strong and the soil is dry and without a plant cover or surface mulch. Maintaining plant cover, surface mulch, or a rough surface by proper tillage minimizes soil blowing. Windbreaks of adapted shrubs or trees are effective in reducing soil blowing on sandy and loamy soils. Information for the design of erosion control practices for each soil in Merrick County is contained in the Technical Guide, which is available in the local office of the Soil Conservation Service.

Rainfall for crop production is limited in Merrick County, and wind and water act as erosive forces on the soil; therefore, a cropping system needs to be planned to fit the soils in each field.

The sequence of crops grown on a field, in combination with the practices needed for management and conservation of the soil, is known as a cropping system. On dryland soils, the cropping system should be designed to improve tilth and fertility; maintain a plant cover that protects the soil from erosion; and control weeds, insects, and diseases. Cropping systems vary according to the soils for which they are designed.

For dryland farming, soils need to be worked to prepare a seedbed, control weeds, and provide a favorable place for plants to grow. Excess tillage, however, breaks down the granular structure in the surface layer that is needed for good tilth. Various methods of conservation tillage can be used in Merrick County, and cultivation should be limited to those methods that are essential. The till-plant method is well suited to row crops. Grasses can generally be established by drilling into a cover of stubble without further seedbed preparation.

Soil tilth is an important factor in germination of seeds and determining the infiltration of water into the soil. Soils that have good tilth are granular, high in organic matter, and porous. Conservation practices, such as a cropping system that uses legumes and grasses in a rotation, and conservation tillage that keeps crop residue on the surface, are effective in improving tilth.

The overall hazards of erosion can be reduced by using the least erodible soils for row crops and most erodible for close-growing crops, such as wheat, oats, and alfalfa, or for hay and pasture. Proper use alone can reduce the potential for erosion in many areas.

Under dryland farming, the kind and amount of fertilizer to be applied should be based on results of soil tests and on the content of soil moisture at the time of application. If the subsoil is dry and rainfall is low, the rate at which fertilizer is applied should be slightly lower than the rate applied if the soil is moist. For nonlegume crops, nitrogen fertilizer is beneficial on all soils.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration of water. A cropping system that keeps plant cover on the soil for extended periods can reduce soil erosion so that the productive capacity of the soil is maintained.

On livestock farms, the cropping system can include grasses and legumes in the rotation, and barnyard manure can be added to the soil to improve fertility. These practices also reduce erosion and improve tilth. On soils that have short, irregular slopes and on soils that have a sandy surface layer, conservation tillage practices that leave crop residue on the surface after planting are effective in reducing soil blowing. For row crops, a minimum of 1,500 pounds per acre of residue is required on the surface after planting if a significant amount of reduction in erosion is to be obtained.

Managing irrigated cropland. Merrick County ranks as one of the upper ten counties in Nebraska in acres of land under irrigation. Corn is the principal irrigated crop. Gently sloping soils, such as the Kenesaw silt loam, 2 to 6 percent slopes, are subject to serious water erosion if irrigated. Coarser textured soils, such as Thurman loamy fine sand, are subject to soil blowing. Conservation practices that control water erosion and soil blowing on dryfarmed cropland can also be applied to irrigated soils. These practices include terraces, contour farming, and conservation tillage systems that leave a protective cover or crop residue on the surface after planting the row crop. These practices improve intake of moisture, slow runoff, and reduce erosion, as well as improve tilth of the soil.

Sprinkler irrigation can be used on some of the more sloping soils, provided adequate conservation practices are used to control erosion. Gravity irrigation is more suitable on the nearly level and very gently sloping soils. For surface irrigation, land leveling increases the

efficiency of water management because an even distribution of water is provided. The efficiency of an older irrigation system can be improved by addition of a tailwater recovery system.

Contour bench leveling or contour furrow irrigation can be used on irrigated soils that have slopes of 2 to 6 percent. Maximum efficiency is obtained if irrigation is begun when about one-half the stored water has been used by plants. Thus, if a soil holds 8 inches of available water, irrigation should be started when 4 inches of water has been removed by the crop. Irrigation sets or systems should be planned so that they replace the amount of water used by the crop.

A management system should be selected that controls or regulates the application of irrigation water in such a way as to obtain good crop growth without wasting water or eroding soil. Surface irrigation is the most efficient if the maximum stream size is used for each row and a tailwater recovery system is used to catch and reuse the water. Sprinkler irrigation is most efficient if used on moderately coarse and coarse textured soils or on undulating areas. The upper 12 inches of soil should be kept moist. Center-pivot sprinklers are effective in applying small amounts of water at frequent intervals.

Irrigated soils generally produce higher yields than dryland soils. Consequently, more plant nutrients, particularly nitrogen and phosphorus, are removed in the harvest of crops. Returning all crop residue to the soil and adding barnyard manure and commerical fertilizer help replace needed plant nutrients. Soils disturbed during land leveling, particularly where the topsoil has been removed, respond to phosphorus and zinc, as well as to nitrogen. The kinds and amount of fertilizer needed for specific crops should be determined by soil tests.

All of the soil series in Nebraska are placed in an irrigation design group. These design groups are described in the Nebraska Irrigation Guide (*6*) which is part of the Technical Guide for conservation practices in Nebraska. The Arabic numbers in the irrigation capability unit indicate the irrigation design group to which the soil belongs. Assistance in planning and design of an irrigation system is available at the local office of the Soil Conservation Service. Estimates concerning cost of equipment can be obtained from local dealers and manufacturers of irrigation equipment.

Managing pasture and hayland. Areas that are in hay or pasture should be managed for maximum production. Once the pasture is established, the grasses need to be kept productive. A rotation grazing system that meets the needs of the plants and promotes uniform utilization of forage is important if high returns are expected. Many forages are a good source of minerals, vitamins, proteins, and other nutrients. A well managed pasture can thus provide a balanced ration throughout the growing season. Irrigated pasture requires a high level of management if it is to produce maximum returns.

A mixture of grasses and legumes can be grown on many kinds of soils and be economically productive if properly managed. Grasses and legumes are ideal crops for use in a conservation cropping system. They are compatible with grain crops in a crop rotation, and they have beneficial effects, such as improving tilth, adding organic matter, and reducing erosion.

Grasses and legumes used for pasture and hayland, both dryland and irrigated, require additional plant nutrients to obtain maximum production. The kinds and amount of fertilizer needed should be determined by a soil test.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive

landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined 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. The classes are defined as follows:

Class I soils have slight 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 or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that 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.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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 that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw-4 or IIIe-5.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and an acceptable level of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 148,950 acres in Merrick County, nearly 48 percent of the total acreage, meets the soil requirements for prime farmland.

A recent trend in land use in some parts of the county has been the loss of some prime farmlands to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty and difficult to cultivate, and usually less productive.

The map units that make up prime farmland in Merrick County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is listed in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have limitations, such as a high water table, flooding, or inadequate rainfall, may qualify as prime farmland if these limitations are overcome by such measures as drainage, flood control, or irrigation. In the following list, these limitations are shown in parentheses after the name of some of the map units. Onsite evaluation is necessary to determine if these limitations have been overcome by corrective measures.

The map units that meet the soil requirements for prime farmland are:

Bd—Blendon fine sandy loam, 0 to 2 percent slopes
BdC—Blendon fine sandy loam, 2 to 6 percent slopes
Bf—Blendon Variant fine sandy loam, 0 to 2 percent slopes
Br—Brocksburg loam, 0 to 1 percent slopes (where irrigated)
Co—Cozad loam, wet substratum, 0 to 1 percent slopes
Gg—Gibbon loam, 0 to 2 percent slopes
Ha—Hall silt loam, sandy substratum, 0 to 1 percent slopes
Hb—Hobbs silt loam, 0 to 2 percent slopes
Hg—Holder silt loam, 0 to 1 percent slopes
HrB—Hord silt loam, 1 to 3 percent slopes
Hs—Hord silt loam, sandy substratum, 0 to 1 percent slopes
Jm—Janude sandy loam, 0 to 2 percent slopes
Ks—Kenesaw silt loam, 0 to 2 percent slopes
KsC—Kenesaw silt loam, 2 to 6 percent slopes
Lb—Lamo clay loam, sandy substratum, 0 to 1 percent slopes (where drained)
Le—Leshara silt loam, 0 to 2 percent slopes (where drained)
Lg—Lex loam, 0 to 1 percent slopes
Lk—Lex clay loam, 0 to 1 percent slopes
Lp—Lockton loam, 0 to 1 percent slopes
LrB—Loretto fine sandy loam, 0 to 3 percent slopes
Me—Merrick loam, 0 to 1 percent slopes
Nv—Novina sandy loam, 0 to 2 percent slopes
Ow—Ovina loam, 0 to 1 percent slopes
Ru—Rusco silt loam, 0 to 2 percent slopes
Wb—Wann sandy loam, 0 to 2 percent slopes
Wm—Wann loam, 0 to 1 percent slopes

rangeland

By Peter N. Jensen, range conservationist, Soil Conservation Service.

Rangeland makes up approximately 23 percent of the total agricultural land in Merrick County. It is mainly in the sandy and loamy upland areas in the northern part of the county and in areas that have a high water table and are associated with Platte River, Silver Creek, and Prairie Slough. Rangeland is common in the Valentine-Thurman-Boelus association, the Crofton-Nora association, the Lamo-Caruso-Gayville association, and the Gothenburg-Platte-Barney association.

The majority of the rangeland is in the Wet Land, Wet Subirrigated, Subirrigated, Sandy, Sands, Silty, and Limy Upland range sites. The remainder is in the Saline Subirrigated, Sandy Lowland, Silty Overflow, Silty Lowland, and Shallow to Gravel range sites. The average size of livestock farms and ranges in Merrick County is about 480 acres.

The raising of livestock, mainly cow and calf herds with calves sold in the fall as feeders, is the second largest agricultural industry in the county (fig. 11). Generally, livestock graze the rangeland from late in spring to early in fall, graze corn aftermath in fall and early in winter, and are fed alfalfa or native hay, silage, or both of these for the remainder of the winter.

Some of the rangeland has been depleted by overuse. The overused range supports low forage producing plants, and commonly has an abundance of broadleaf weeds. The productivity of the range can be increased by proper management practices; namely proper use, deferred grazing, a planned grazing system, and brush and weed control.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

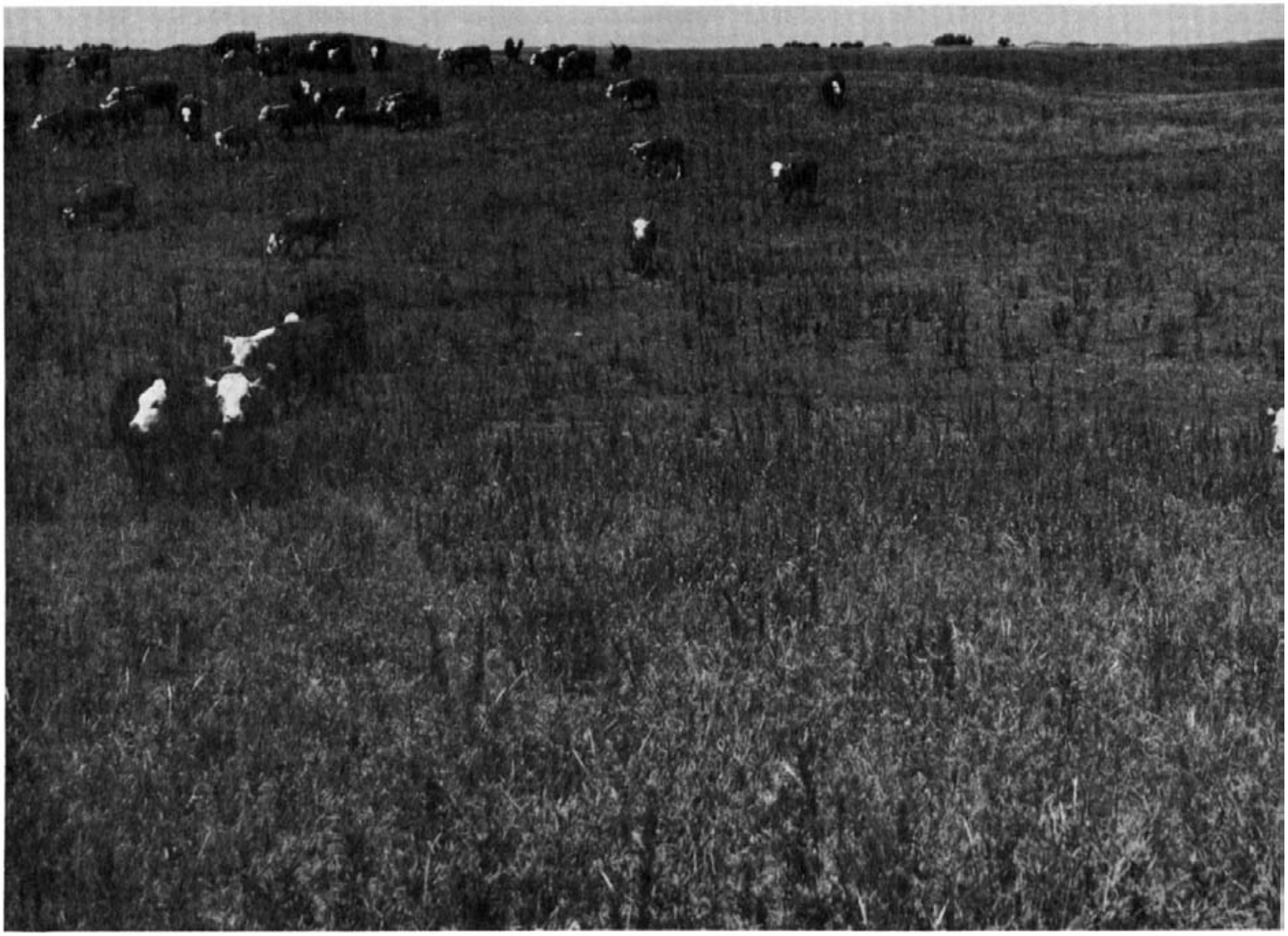

Figure 11.—Cattle grazing native range in an area of Valentine fine sand.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of water erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Native Meadows. A large percentage of the rangeland in Merrick County is used for production of native hay.

The rangeland is generally used for meadow where the water table is high in the Wet Land, Wet Subirrigated, and Subirrigated range sites. The dominant vegetation is big bluestem, indiangrass, switchgrass, little bluestem, prairie cordgrass, and various members of the sedge family. Mowing has reduced the large population of native forbs.

Production from native meadow can be maintained or improved by proper management. The optimum time for mowing is prior to the emergence of the grass flowers. Maximum storage of carbohydrate occurs when the seed is ripe or mature. This period coincides with the frost period for the dominant grasses. When the meadow is cut earlier, the grasses are higher in quality, and this is reflected later through larger livestock gains.

Mowing height is important in maintaining the stand of grasses and a high forage production. The meadow should not be mowed closer than 3 inches to maintain high plant vigor.

Meadow should not be grazed when the soil is wet or when the water table is within a depth of 6 inches. Grazing when the soil is wet causes formation of small bogs or mounds and the consequent difficulty in mowing during subsequent years. Meadow can be grazed for the aftermath or regrowth after frost.

At the end of each map unit description, the soil or soils in that unit are placed in an appropriate range site according to the kind and amount of vegetation that is grown on the soil when the site is in climax condition. The interpretations for each range site in the county are in the technical guide which is in the local office of the Soil Conservation Service. Farmers who want technical help with reseeding presently cropped land to grass, or with setting up a planned grazing system, or with other aspects of a range program can obtain that help from the local office of the Soil Conservation Service.

woodland

By Keith A. Ticknor, forester, Soil Conservation Service.

Woodland in Merrick County is mainly along the channels of the Platte River, Loup River, Prairie Creek, Silver Creek, Warm Slough, and Wood River. The lower side slopes and narrow bottoms of the drainageways that are in the uplands part of the county have a cover of trees in most places. Some wooded areas are capable of producing commercial wood products, but most of them are unmanaged and are retained for watershed protection and wildlife habitat.

Eastern cottonwood, black willow, American elm, green ash, common hackberry, boxelder, black walnut, and eastern redcedar are the major species in the wooded areas of the Platte Valley. Bur oak, eastern redcedar, boxelder, and green ash are the main species in the uplands. Of the numerous species of trees in the county, only eastern cottonwood, green ash, and black walnut currently have value for commercial wood products.

windbreaks and environmental plantings

By Keith A. Ticknor, forester, Soil Conservation Service.

Most of the farmsteads in Merrick County have trees around them that have been planted at various times since the farmstead was established. In addition, many shelterbelts and livestock windbreaks have been planted in the county.

In order for windbreaks to fulfill their intended purpose, the species of trees or shrubs selected must be suited to the soils in the site to be planted. Matching the proper trees with the soils is the first step towards ensuring survival. This also helps to ensure that a maximum rate of tree growth is obtained. Permeability, available water capacity, and fertility of the soil greatly affect the rate of growth for trees and shrubs.

Moisture is a limiting factor for survival of trees in Merrick County. Therefore, proper site preparation prior to planting and controlling weeds or other competition after planting are the major concerns when establishing and managing a windbreak. Supplemental watering with drip irrigation or another suitable method is needed during some seasons to overcome a deficiency of moisture.

Many of the older windbreaks are deteriorating because of crowded growing conditions or because they were composed of short-lived trees and shrubs that have reached or passed their maturity. Renovation practices are needed to restore the effectiveness of these plantings.

Windbreaks protect livestock, buildings, and yards from wind and snow (fig. 12). They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

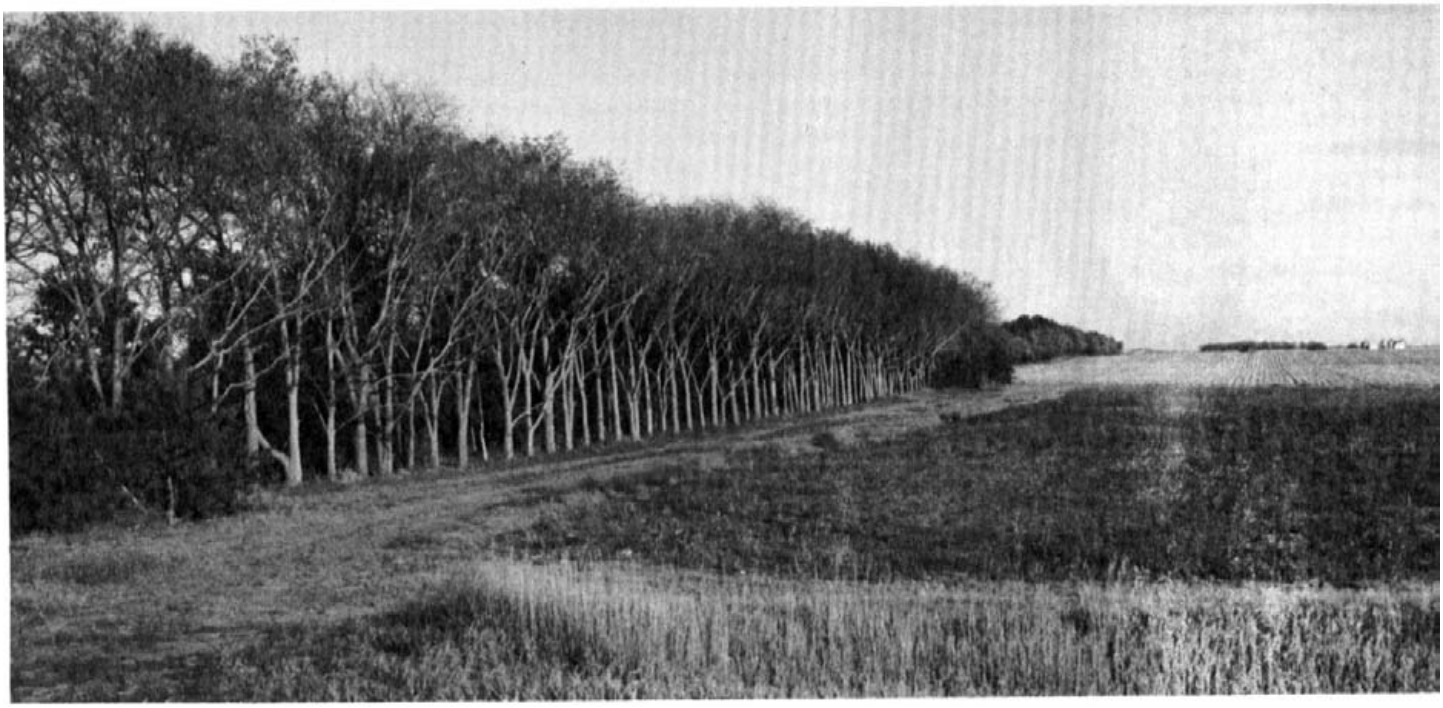

Figure 12.—A field windbreak helps reduce soil blowing in a cultivated area of Blendon fine sandy loam.

recreation

Prepared by Robert O. Koerner, biologist, Soil Conservation Service.

Outdoor recreation in Merrick County consists primarily of hunting and fishing during regular seasons. Hunting for deer and waterfowl is especially good along the Platte River and in areas of wetlands in the sandhills. Hunting for pheasant and bobwhite quail is mainly in areas of the loess uplands.

Hord Lake State Recreation Area has 64 acres of land and 20 acres of water. Picnicking, camping, and swimming are offered. Nonpower boating and fishing, along with hunting of small game and waterfowl during regular seasons, are also offered. Other recreational areas include the Mormon Trail State Wayside Area with 3 acres of land and 1 acre of water. This area has picnic tables, and fishing is permitted.

The Lone Tree Special Use Area has 21 acres of land. Hunting for waterfowl, small game, and big game is permitted during regular seasons.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best

soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

By Robert O. Koerner, biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants (fig. 13).

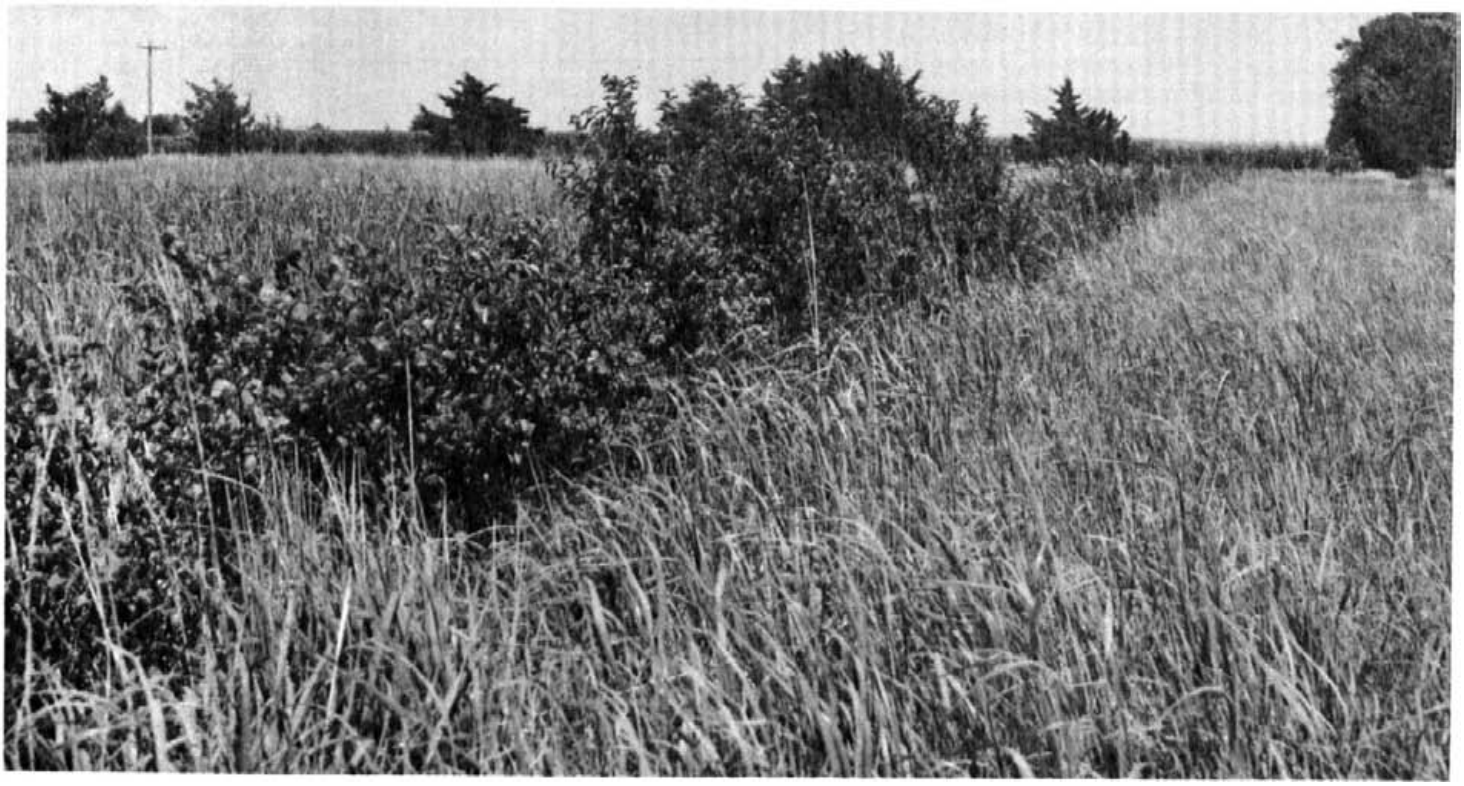

Figure 13.—A planting of native grass and coralberry for wildlife habitat on Brocksburg loam.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, smooth brome, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and blue grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, green ash, honeylocust, apple, hawthorn, dogwood, hickory, eastern cottonwood, and willow. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are common chokecherry, sumac, autumn-olive, and wild plum.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are American plum, Peking cotoneaster, common chokecherry, and Tatarian honeysuckle.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, prairie cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, skunk, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include cottontail, opossum, woodcock, thrushes, woodpeckers, squirrels, fox, raccoon, deer, and coyote.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include badger, antelope, deer, prairie grouse, and meadowlark.

The fifteen soil associations in Merrick County are discussed in relation to wildlife in the following paragraphs:

The Crofton-Nora association consists of deep, intermittent drainageways and rolling hills. Scattered clumps of trees are in the drainageways. White-tailed deer frequent this association, traveling to and from the Loup River. Other wildlife common in the area are songbirds, small mammals, hawks, owls, and other predator species.

The Valentine-Thurman-Boelus and the Ipage-Els-Libory association are a combination of openland, rangeland, and wetland wildlife habitats. Many species of wildlife are present, including pheasants, bobwhite quail, songbirds, coyotes, badger, skunks, and other small mammals. Upland game birds are common in the Ipage-Els-Libory association because much of the area is farmed.

The Valentine-Lorett-Kenesaw association is openland wildlife habitat in which about 80 percent of the acreage is farmed. The topography is undulating, and many center-pivot sprinklers are in use. Irrigated corn provides food for pheasant and bobwhite quail. Corners of some center-pivot irrigation areas can be used for wildlife habitat by planting grasses and woody plants.

The Hord-Hall and the O'Neill-Brocksburg-Blendon associations are openland wildlife habitat. The predominant wildlife species are pheasants and bobwhite quail along with songbirds and small mammals. Woody cover is common around farmsteads, and scattered trees are near fence lines and in roadside ditches.

The Leshara-Lex-Janude, the Lamo-Caruso-Gayville, the Lockton, the Fonner, the Lamo-Gayville Variant, the Wann-Novina, and the Cozad associations are openland and wetland wildlife habitats. Pheasants, bobwhite quail, songbirds, and small mammals are common in these associations. The landscape in each is similar, and the majority of the land is farmed. A smaller acreage is in native rangeland or hayland. In places during spring, and especially in years of high rainfall, the water table is at the surface. These conditions are ideal for waterfowl and shore birds as well as upland game birds. Other habitat includes windbreaks around farmsteads and scattered trees along fence lines and in roadside ditches. Some shelterbelts and border plantings in fields also provide cover in winter.

The Boel-Inavale and the Gothenburg-Platte-Barney associations are woodland and wetland wildlife habitats. White-tailed deer, along with cottontail rabbits, tree squirrels, and songbirds, are common in wooded areas along the Platte River. In the wet meadows adjacent to the rivers, muskrat, mink, shore birds, and waterfowl are common. Wildlife travel to upland areas for food, returning to the escape cover along the river when pressured by hunters. Mourning doves are throughout the county, generally not far from areas of water and patches of weeds.

Technical assistance is available for designing installations to improve the habitat for wildlife as well as facilities for recreation within Merrick County. The Soil Conservation Service has a field office in Central City and can provide this assistance, or they can direct applicants to an appropriate Federal or State agency that can provide the needed assistance.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and

topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils.

Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of

suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment.

Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic

matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely gray̆ish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

physical and chemical analyses of selected soils

Samples from soil profiles were collected for physical and chemical analyses by the Soil Conservation Service, Soil Survey Laboratory, Lincoln, Nebraska. The Leshara series was sampled in Merrick County and soils of the Crofton, Hall, Hord, Kenesaw, Leshara, Nora, Thurman, Valentine, and Wann series were sampled in nearby counties. These data are recorded in Soil Survey Investigations Report Number 5 (*5*).

This information is useful to soil scientists in classifying soils and developing concepts of soil genesis. It is also helpful in estimating available water capacity, susceptibility to soil blowing, fertility, tilth, and other aspects of soil management.

engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T (AASHTO), D 424 (ASTM); and Specific gravity, Method A—T 100-70 (AASHTO). The group index number, which is part of the AASHTO classification, is computed by using the Nebraska Modified system.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is then compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil that is typical of the series in the survey area, is described. The detailed description of each soil horizon follow standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*7*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units, of each soil series are described in the section "Detailed soil map units."

Alda series

The Alda series consists of somewhat poorly drained soils on bottom lands. These soils are moderately deep over coarse sand or gravelly sand. They formed in stratified alluvium. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Alda soils are similar to Wann soils and are commonly associated with Fonner, Inavale, Lex, Platte, and Wann soils. Fonner soils are moderately well drained and at a slightly higher elevation than Alda soils. Inavale soils have more sand in the control section, do not have a mollic epipedon, and are at a slightly higher elevation.

Lex soils have more clay in the control section. Wann soils do not have gravelly sand or coarse sand above a depth of 40 inches. Platte soils are 10 to 20 inches deep over coarse sand or gravelly sand and are generally at a slightly lower relative elevation.

Typical pedon of Alda loam, 0 to 1 percent slopes, 2,400 feet north and 100 feet east of southwest corner sec. 34, T. 14 N., R. 5 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

A12—7 to 10 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard; very friable; strong effervescence; mildly alkaline; clear smooth boundary.

AC—10 to 14 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; few medium distinct reddish brown and yellowish red (5YR 4/3 and 5YR 5/6 moist) mottles; weak fine and medium subangular blocky structure; soft, friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—14 to 26 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, friable; mildly alkaline; gradual wavy boundary.

IIC2—26 to 36 inches; white (10YR 8/2) coarse sand; pale brown (10YR 6/3) moist; single grained; loose; neutral; gradual wavy boundary.

IIC3—36 to 60 inches; white (10YR 8/2) gravelly sand; pale brown (10YR 6/3) moist; single grained; loose; neutral.

The solum ranges from 14 to 25 inches in thickness. Thickness of the mollic epipedon ranges from 10 to 20 inches. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches. Typically, the pedon is calcareous at the surface, but depth to carbonates can range from 0 to 10 inches. Distinct or prominent mottles are associated with the AC horizon or lower part of the control section.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2. Typically, it is fine sandy loam or loam but in places is silt loam or very fine sandy loam. The A horizon is slightly acid to mildly alkaline. Some pedons do not have an AC horizon.

The C horizon has value of 4 through 8 dry and 3 through 6 moist and chroma of 1 through 3. It is mildly to moderately alkaline. The IIC horizon is coarse sand that has 3 to 15 percent gravel or is gravelly sand.

Barney series

The Barney series consists of poorly drained soils in old flat-bottomed, abandoned channels on bottom lands. These soils are shallow over gravelly sand or coarse sand. They formed in stratified fine, medium, and coarse textured alluvium. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Barney soils are similar to Platte soils and are commonly associated with Alda, Gothenburg, Lex, and Platte soils. Alda and Lex soils have a lower water table, are deeper to gravelly sand, and are at a higher elevation than Barney soils. Gothenburg soils do not have a mollic epipedon and are generally less than 10 inches thick to the gravelly sand. Platte soils have a lower water table, are less frequently flooded, and are at a higher elevation.

Typical pedon of Barney loam, 0 to 2 percent slopes, 2,500 feet west and 100 feet south of northeast corner sec. 2, T. 14 N., R. 5 W.

A1—0 to 9 inches; gray (10YR 5/1) loam, very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; hard, very friable; few thin strata of finer and coarser texture; strong effervescence; mildly alkaline; smooth boundary.

C1—9 to 18 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; common fine distinct yellowish brown (10YR 5/4, moist) mottles; massive; hard, very friable; many thin strata of loamy fine sand; slight effervescence; mildly alkaline; clear smooth boundary.

IIC2—18 to 60 inches; light gray (10YR 7/2) gravelly sand, light brownish gray (10YR 6/2) moist; common fine distinct dark brown (10YR 4/3, moist) mottles in upper part; single grained; loose; neutral.

The depth to coarse sand or gravelly sand ranges from 10 to 20 inches. Depth to carbonates ranges from 0 to 15 inches, but some wet areas do not have free carbonates.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2. It is 7 to 10 inches thick and is neutral to moderately alkaline. The A horizon commonly is loam but ranges to silty clay loam, very fine sandy loam, sandy loam, or fine sandy loam.

The C1 horizon has value of 5 through 7 dry and 4 or 5 moist and chroma of 1 through 3. It consists of thin strata that are commonly sandy loam but range to fine sandy loam or loamy fine sand. The C1 horizon is mildly alkaline or moderately alkaline. It has common, faint to prominent, grayish or brownish mottles. The IIC horizon has mixed colors indicative of the minerals in the sand and gravel. It consists of strata of coarse sand and gravelly sand. This horizon has common mottles above the permanent level of the seasonal high water table.

Blendon series

The Blendon series consists of deep, well drained soils on stream terraces. These soils formed in alluvium

that has been reworked by wind. Permeability is moderately rapid. Slope ranges from 0 to 6 percent.

Blendon soils are similar to Thurman soils and are commonly adjacent to Brocksburg, Hord, O'Neill and Thurman soils. Brocksburg soils have more clay in the control section than Blendon soils and are underlain with gravelly sand at a depth of 20 to 40 inches. Hord soils have more clay and less sand in the control section. O'Neill soils have gravelly sand at a depth of 20 to 40 inches. Thurman soils are sandy in the control section.

Typical pedon of Blendon fine sandy loam, 0 to 2 percent slopes, 800 feet south and 100 feet west of northeast corner sec. 4, T. 14 N., R. 6 W.

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

A12—7 to 16 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable; neutral; clear smooth boundary.

B2—16 to 24 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

B3—24 to 30 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C—30 to 60 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; neutral.

The mollic epipedon ranges from 20 to 36 inches in thickness. The pedon does not have free carbonates.

The A horizon has value of 3 or 4 dry and 2 moist and chroma of 1 or 2. It is fine sandy loam or sandy loam.

The B2 horizon has value of 3 or 4 dry and 2 or 3 moist and chroma of 1 or 2.

The C horizon has value of 5 or 6 dry and 3 or 4 moist and chroma of 2 or 3. It is typically sandy loam but in some pedons it is loamy sand or loamy fine sand; also, in some pedons, the C horizon is silt loam, sandy clay loam, loam, or clay loam below a depth of 40 inches.

Blendon Variant

The Blendon Variant consists of deep, well drained soils on stream terraces. These soils formed in alluvium and mixed eolian sand and silts. Permeability is moderately rapid in the upper part of the profile and moderate in the lower part. Slope ranges from 0 to 2 percent.

Blendon Variant soils are similar to Blendon soils and are commonly associated with Blendon, Brocksburg, Hord, O'Neill, and Thurman soils. Blendon soils are not silty in the lower part of the control section. Brocksburg and O'Neill soils have gravelly sand at a depth of 20 to 40 inches. Hord soils have more silt and clay in the control section than Blendon Variant soils. Thurman soils are coarser textured throughout the profile.

Typical pedon of Blendon Variant fine sandy loam, 0 to 2 percent slopes, 2,600 feet north and 300 feet west of southeast corner sec. 11, T. 15 N., R. 5 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—8 to 22 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

B2—22 to 33 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

IIC—33 to 60 inches; light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; neutral.

The mollic epipedon ranges from 20 to 36 inches in thickness. The moderately coarse textured material ranges from 26 to 40 inches in thickness over the underlying silty material. Typically, the pedon does not have free carbonates, except in some areas the silty material of the IIC horizon is calcareous.

The A horizon has value of 3 or 4 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. Typically, it is fine sandy loam, but in some pedons it is sandy loam. The A horizon is slightly acid or neutral.

The B horizon has value of 3 through 5 dry and 2 through 4 moist and chroma of 1 or 2 dry or moist. Typically, it is fine sandy loam, but in some pedons it is sandy loam or loamy fine sand. The B horizon reaction is slightly acid or neutral.

The IIC horizon has value of 5 through 7 dry and 5 or 6 moist and chroma of 2 through 4 dry or moist. Typically, it is silt loam, but in some pedons it is sandy clay loam, clay loam, or loam.

Boel series

The Boel series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in sandy and loamy alluvium. Permeability is rapid. Slope ranges from 0 to 2 percent.

The Boel soils are similar to Els and Wann soils and are associated with Els, Inavale, and Wann soils. Els soils are less stratified than Boel soils. Inavale soils are somewhat excessively drained and are at a higher elevation. Wann soils have more clay and less sand in the control section.

Typical pedon of Boel loam, 0 to 2 percent slopes, 300 feet south and 100 feet west of northeast corner sec. 20, T. 15 N., R. 8 W.

A1—0 to 8 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—8 to 17 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; slight effervesence; mildly alkaline; clear smooth boundary.

C2—17 to 60 inches; white (10YR 8/2) fine sand, light brownish gray (10YR 6/2) moist; few fine distinct dark reddish brown (5YR 3/3, moist) mottles; single grained; loose; neutral.

The solum ranges from 7 to 20 inches in thickness. Typically, free carbonates are in the A horizon.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2. It is 7 to 15 inches thick and is neutral or mildly alkaline.

The C horizon has hue of 10YR and 2.5Y, value of 6 through 8 dry and 5 through 7 moist, and chroma of 1 or 2. It has mottles that have hue of 5YR, value of 3 through 6 moist, and chroma of 3 through 7 moist. The C horizon is slightly acid to moderately alkaline. The lower part of the C horizon is loamy sand, loamy fine sand, fine sand, or coarse sand.

Boelus series

The Boelus series consists of deep, well drained soils on stream terraces. These soils formed in eolian sands over loess and alluvium (fig. 14). Permeability is rapid in the upper part of the profile and moderate in the lower part. Slope ranges from 0 to 9 percent.

Boelus soils are similar to Libory soils and are commonly adjacent to Libory, Thurman, and Valentine soils. Libory soils are moderately well drained and have distinct or prominent mottles above a depth of 40 inches. Thurman and Valentine soils have sandy texture throughout the control section.

In Merrick County, Boelus soils are mapped only in a complex with Valentine soils.

Typical pedon of Boelus loamy fine sand, in an area of Valentine-Boelus loamy fine sands, 3 to 9 percent slopes, 400 feet north and 100 feet east of southwest corner sec. 31, T. 15 N., R. 7 W.

A11—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft; very friable; neutral; clear smooth boundary.

A12—5 to 12 inches; brown (10YR 5/3) loamy fine sand; dark brown (10YR 3/3) moist; single grained; loose; neutral; gradual smooth boundary.

C1—12 to 28 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 4/3) moist; single grained; loose; neutral; clear smooth boundary.

IIB2—28 to 52 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; weak

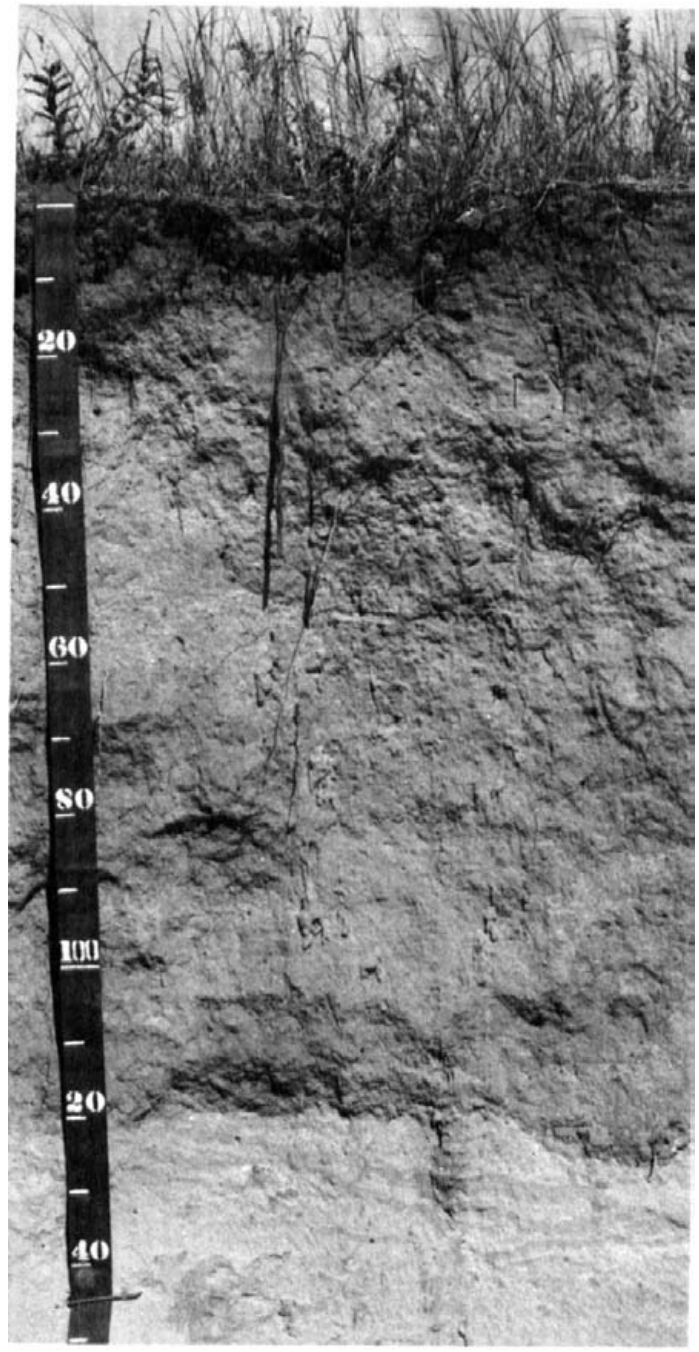

Figure 14.—Profile of Boelus loamy fine sand. This deep, well drained soil consists of sandy, wind-deposited material in the upper part and silty loess in the lower part. The tape is in centimeters.

moderate and coarse subangular blocky structure; hard, friable; neutral; gradual smooth boundary.

IIB3—52 to 60 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; weak moderate and coarse subangular blocky structure; hard, friable; neutral.

The mollic epipedon ranges from 10 to 20 inches in thickness. The sandy material over the loamy IIB horizon ranges from 20 to 36 inches in thickness. Depth to free carbonates ranges from 36 to 60 inches or more.

The A horizon has value of 3 through 5 dry and 2 through 5 moist and chroma of 1 through 3. In some pedons, the lower part of the A horizon does not have colors that qualify it for a mollic epipedon. Typically, the A horizon is loamy fine sand, but the range includes loamy sand and fine sand. It is medium acid to neutral.

The IIB horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4. It is typically silt loam, but the range includes light silty clay loam, loam, and very fine sandy loam that has 20 to 32 percent clay. This horizon ranges from slightly acid to moderately alkaline.

Brocksburg series

The Brocksburg series consists of well drained soils on stream terraces. These soils are moderately deep over gravelly sand or coarse sand (fig. 15). They formed in old alluvium and loesslike material that overlies the alluvial gravelly sands. Permeability is moderate in the subsoil and very rapid in the underlying material. Slope is 0 to 1 percent.

Brocksburg soils are similar to O'Neill soils and are commonly adjacent to Blendon, Hall, Hord, Meadin, and O'Neill soils. Blendon soils have more sand in the upper part of the control section than Brocksburg soils and do not have an appreciable amount of gravel in the lower part. Hall and Hord soils have less sand in the control section and do not have gravelly sand above a depth of 40 inches. Meadin soils are less than 20 inches thick over coarse sand and gravelly sand. O'Neill soils have more sand and less clay in the upper part of the control section.

Typical pedon of Brocksburg loam, 0 to 1 percent slopes, 1,350 feet north and 100 feet west of southeast corner sec. 17, T. 15 N.. R. 5 W.

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

A12—7 to 20 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium and coarse granular structure; slightly hard, very friable; neutral; clear smooth boundary.

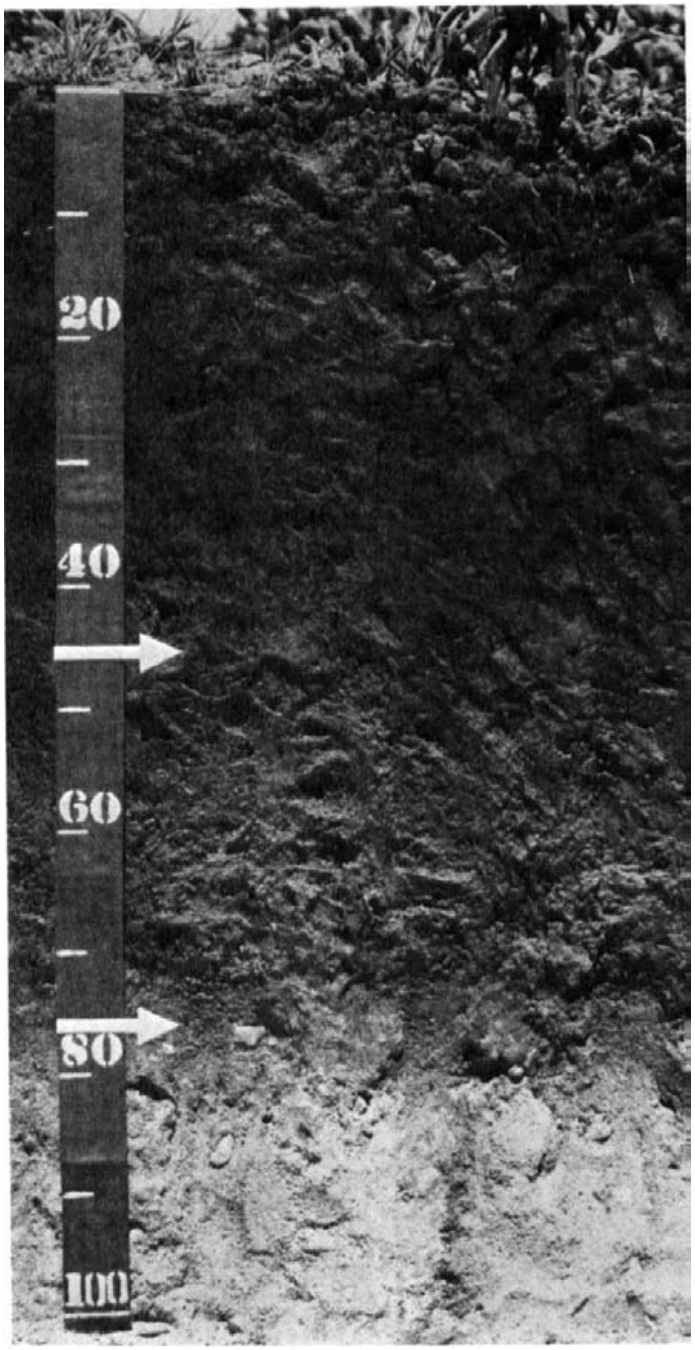

Figure 15.—Profile of Brocksburg loam. This well drained soil is moderately deep over gravelly sand. The upper and lower boundaries of the clay loam subsoil are indicated by the markers. The depth to gravelly sand is 76 centimeters, or about 30 inches.

B2t—20 to 27 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky

structure; slightly hard, friable; neutral; clear smooth boundary.

IIC—27 to 60 inches; pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; single grained; loose; neutral.

The mollic epipedon ranges from 20 to 34 inches in thickness. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches. In places, small to large pebbles are throughout the pedon.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2.

The B horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 2 or 3. It is neutral or mildly alkaline.

The IIC horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4.

Caruso series

The Caruso series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in calcareous, stratified alluvium. Permeability is moderately slow. Slope is 0 to 1 percent.

Caruso soils are similar to Gibbon and Leshara soils. They are commonly associated with Gayville, Lamo, and Saltine soils and less commonly associated with Gibbon and Leshara soils. Gibbon, Lamo, and Leshara soils have less fine and coarser sand in the control section. Gayville soils have more clay in the control section, and they have a natric horizon. Saltine soils have more sand in the control section and are very strongly alkaline.

In Merrick County, Caruso soils are mapped in a complex with Gayville soils.

Typical pedon of Caruso loam, in an area of Caruso-Gayville complex, 0 to 1 percent slopes, 450 feet north and 100 feet west of southeast corner sec. 31, T. 16 N., R. 3 W.

Ap—0 to 6 inches; gray (10YR 5/1) loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, friable; neutral; abrupt smooth boundary.

A12—6 to 14 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

AC—14 to 24 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; slightly hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—24 to 30 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine faint light yellowish brown (2.5Y 6/4, moist) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—30 to 46 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; few medium distinct strong brown (7.5YR 5/6, moist) mottles; massive; slightly hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

C3—46 to 53 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; many medium prominent brown (7.5YR 4/4, moist) mottles; massive; hard, friable; mildly alkaline; gradual wavy boundary.

C4—53 to 60 inches; light brownish gray (2.5Y 6/2) loamy sand, grayish brown (2.5Y 5/2) moist; many medium distinct dark brown (7.5YR 4/4, moist) mottles; single grained; loose, very friable; mildly alkaline.

The solum ranges from 17 to 30 inches in thickness. The thickness of the mollic epipedon ranges from 10 to 20 inches. Depth to carbonates is less than 10 inches. Soft masses of lime are throughout the control section.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically loam but ranges to silt loam. The A horizon is neutral or mildly alkaline.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 through 7 dry and 3 through 5 moist, and chroma of 1 through 3 dry or moist. The C horizon is stratified clay loam, sandy clay loam, sandy loam, loam, and loamy sand. In most areas, the C horizon has distinct mottles that have hue of 2.5Y, 7.5YR, or 10YR, value of 3 through 6 moist, and chroma of 3 through 8 moist. Reaction ranges from mildly alkaline through strongly alkaline.

Cozad series

The Cozad series consists of deep, moderately well drained soils on bottom lands. These soils formed in stratified, calcareous alluvium (fig. 16). Permeability is moderate. Slope is 0 to 1 percent.

The Cozad soils in Merrick County do not have a mollic epipedon. These soils are in the fine-loamy family but are marginal to the fine-silty, coarse-loamy, and coarse-silty families. These differences, however, do not alter the usefulness or behavior of these soils.

Cozad soils are commonly associated with Gibbon, Leshara, Lex, Wann, and Gayville Variant soils. Gibbon and Leshara soils are somewhat poorly drained. In addition, Gibbon soils have free carbonates at or near the surface. Lex soils have gravelly sand between depths of 20 and 40 inches. Wann soils have more sand in the control section than Cozad soils. Gayville Variant soils are more alkaline throughout the control section and are more strongly developed.

Typical pedon of Cozad loam, wet substratum, 0 to 1 percent slopes, 2,600 feet north and 50 feet west of southeast corner sec. 22, T. 13 N., R. 7 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine

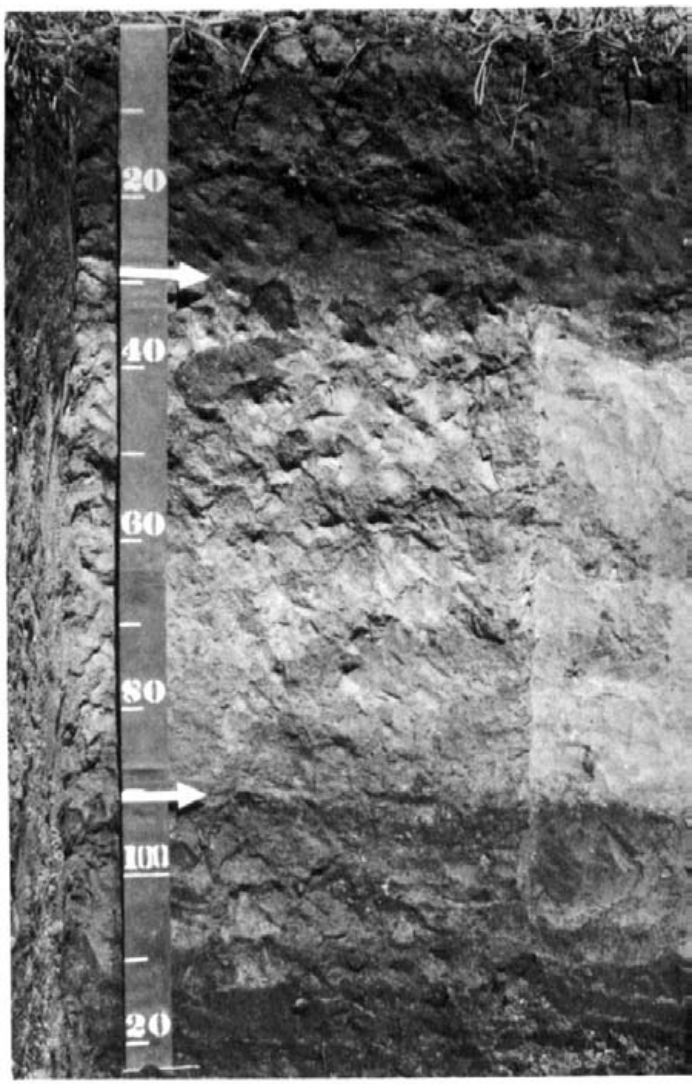

Figure 16.—Profile of Cozad loam, wet substratum. This deep, moderately well drained soil formed in silty alluvium. A buried soil is at a depth of 90 centimeters, or about 35 inches.

and medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

B2—7 to 22 inches; light brownish gray (10YR 6/2) very fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

C1—22 to 30 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable; slight effervescence; neutral; clear smooth boundary.

C2—30 to 36 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; few medium distinct brown (7.5YR 5/4, moist) mottles; massive; slightly hard, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

Ab—36 to 52 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; slightly hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

C3—52 to 60 inches; very pale brown (10YR 7/4) fine sandy loam, brown (10YR 5/3) moist; common medium distinct reddish brown (5YR 5/4, moist) mottles; massive; very friable, soft; neutral.

The solum ranges from 17 to 26 inches in thickness. The thickness of the mollic epipedon ranges from 7 to 14 inches. Most pedons are calcareous within a depth of 10 to 30 inches. Typically, the pedon has a buried soil, but in some pedons the buried soil is below a depth of 60 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2. It is typically loam but ranges to silt loam and very fine sandy loam.

The B horizon and upper part of the C horizon have value of 5 through 7 dry and 4 through 6 moist and chroma of 2 or 3. They are very fine sandy loam or silt loam. The lower part of the C horizon is fine sandy loam, but thin strata of finer and coarser textured materials are common. The C horizon has few to many reddish brown or brown mottles.

Crofton series

The Crofton series consists of deep, well drained and somewhat excessively drained soils on uplands. These soils formed in calcareous loess. Permeability is moderate. Slope ranges from 6 to 30 percent.

Crofton soils are similar to Nora soils and are commonly associated with Hobbs, Holder, and Nora soils. Hobbs soils are stratified, occasionally flooded, and on bottom lands of narrow drainageways. Holder soils have a mollic epipedon, a well developed B horizon, and generally, do not have carbonates in their solum. Nora soils have a mollic epipedon and a B horizon and have free carbonates below a depth of 12 inches.

Typical pedon of Crofton silt loam, 15 to 30 percent slopes, 1,400 feet south and 100 feet east of northwest corner sec. 19, T. 16 N., R. 8 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse granular structure; slightly hard, friable; mildly alkaline; clear smooth boundary.

AC—4 to 8 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable; mildly alkaline; clear smooth boundary.

C—8 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; few small lime concretions; strong effervescence; moderately alkaline.

The solum ranges from 6 to 15 inches in thickness. Depth to free carbonates ranges from 0 to 8 inches. Reaction is mildly alkaline or moderately alkaline throughout.

The A horizon has value of 4 through 6 dry and 3 or 4 moist and chroma of 2 or 3. Some pedons do not have an AC horizon.

The C horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4. In some pedons this horizon has fine to coarse, reddish, brownish, or yellowish mottles.

Els series

The Els series consists of deep, somewhat poorly drained soils. These soils are in sandhill valleys and on stream terraces adjacent to the sandhills. They formed in material of eolian or alluvial origin. Permeability is rapid. Slope ranges from 0 to 2 percent.

Els soils are similar to Ipage soils and are commonly adjacent to Ipage, Marlake, Ovina, Thurman, and Valentine soils. Ipage soils are moderately well drained and at a higher elevation than Els soils. Marlake soils are very poorly drained and support marshy type vegetation. Ovina soils have loamy layers in the control section. Thurman soils have a mollic epipedon, are somewhat excessively drained, and at a higher elevation. Valentine soils are excessively drained and at a higher elevation.

Typical pedon of Els loamy fine sand, 0 to 2 percent slopes, 350 feet north and 150 feet west of southeast corner sec. 8, T. 16 N., R. 3 W.

A1—0 to 8 inches; dark gray (10YR 4/1) loamy fine sand, black (10YR 2/1) moist; weak medium granular structure; soft, very friable; neutral; clear smooth boundary.

AC—8 to 11 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak medium prismatic structure; loose, very friable; neutral; clear smooth boundary.

C1—11 to 20 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; common coarse distinct reddish brown (5YR 5/4, moist) mottles; single grained; loose; very friable; neutral; clear smooth boundary.

C2—20 to 60 inches; light gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) moist; single grained; loose, very friable; neutral.

The solum ranges from 10 to 18 inches in thickness. In some pedons carbonates are in the lower horizons. Reaction is neutral or mildly alkaline throughout.

The A horizon has value of 4 through 6 dry and 2 through 4 moist and chroma of 1 or 2. It is dominantly loamy fine sand, but the range includes fine sandy loam, loamy sand, and fine sand. The A horizon is 10 to 18 inches thick. Some pedons do not have an AC horizon.

The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 dry and 5 or 6 moist, and chroma of 2 or 3. It has few to many distinct mottles of high chroma.

Fonner series

The Fonner series consists of moderately well drained soils on bottom lands. These soils are moderately deep over coarse sand and gravelly sand. They formed in noncalcareous, stratified alluvium. Permeability is rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Fonner soils are similar to Alda soils and are commonly associated with Alda, Leshara, Lockton, Novina, and Platte soils. Alda soils are somewhat poorly drained, are calcareous at or near the surface, and are at a slightly lower elevation than Fonner soils. Leshara soils have a fine-silty control section, do not have gravelly sand above a depth of 40 inches, and are somewhat poorly drained. Novina soils do not have gravelly sand above a depth of 40 inches and are at a slightly higher elevation. Lex and Lockton soils have more clay in the control section, and the Lex soils are somewhat poorly drained. Platte soils have coarse sand or gravelly sand at a depth of 10 to 20 inches are are somewhat poorly drained.

Typical pedon of Fonner sandy loam, 0 to 2 percent slopes, 1,450 feet south and 100 feet east of northwest corner sec. 9, T. 14 N., R. 5 W.

Ap—0 to 7 inches; gray (10YR 5/1) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; strongly acid; abrupt smooth boundary.

A12—7 to 20 inches; dark gray (10YR 4/1) sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable; strongly acid; clear wavy boundary.

AC—20 to 26 inches; gray (10YR 5/1) loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; medium acid; clear wavy boundary.

C1—26 to 30 inches; light brownish gray (10YR 6/2) gravelly sand; dark grayish brown (10YR 4/2) moist; single grained; loose, very friable; slightly acid; gradual wavy boundary.

C2—30 to 60 inches; light gray (10YR 7/2) coarse sand, brown (10YR 5/3) moist; single grained; loose; medium acid.

The solum ranges from 20 to 34 inches in thickness. The thickness of the mollic epipedon ranges from 20 to 30 inches. In some pedons, carbonates are at a depth of 30 to 40 inches. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. Typically, it is sandy loam or loam but ranges to silt loam and fine sandy

loam. The A horizon is strongly acid through slightly acid. Some pedons do not have an AC horizon.

The C horizon has hue of 10YR or 2.5Y, value of 4 through 8 dry and 3 through 6 moist, and chroma of 1 through 3 dry or moist. Typically, it is gravelly sand and has strata of finer and coarser textured material throughout. The C1 horizon is strongly acid through neutral. It has mottles in some pedons.

Fonner Variant

The Fonner Variant consists of moderately well drained soils on bottom lands. These soils are shallow over gravelly sand or coarse sand. They formed in stratified sandy alluvium. Permeability is rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Fonner Variant soils are similar to Alda and Fonner soils and are commonly associated with Alda, Fonner, Lockton, Platte, and Wann soils. Alda soils are somewhat poorly drained, have gravelly sand at a depth of 20 to 40 inches, and are calcareous at or near the surface. Fonner and Lockton soils are moderately deep over gravelly sand or coarse sand and are at a slightly higher elevation than Fonner Variant soils. Platte soils are somewhat poorly drained or poorly drained, are calcareous at the surface, and are at a slightly lower elevation. Wann soils do not have gravelly sand or coarse sand above a depth of 40 inches, are somewhat poorly drained, and are calcareous at or near the surface.

Typical pedon of Fonner Variant loamy sand, 0 to 2 percent slopes, 1,300 feet south and 100 feet east of the northwest corner sec. 19, T. 14 N., R. 5 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable; neutral; abrupt smooth boundary.

A12—5 to 9 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable; neutral; clear smooth boundary.

AC—9 to 18 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; clear smooth boundary.

IIC1—18 to 24 inches; pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; few fine faint yellowish brown (10YR 5/4, moist) mottles; single grained; loose; neutral; gradual wavy boundary.

IIC2—24 to 60 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; common medium distinct strong brown (7.5YR 5/6, moist) mottles; single grained; neutral.

The solum ranges from 8 to 16 inches in thickness. Depth to coarse sand or gravelly sand ranges from 10 to 20 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically loamy sand or loamy fine sand but ranges to fine sandy loam and sandy loam. The A horizon is slightly acid or neutral. Some pedons do not have an AC horizon.

The IIC horizon has value of 5 through 8 dry and 4 through 6 moist and chroma of 1 through 3 dry or moist. It is coarse sand that has 3 to 15 percent gravel, or it is gravelly sand. The IIC horizon is commonly stratified. It is medium acid through neutral. In some pedons this horizon is not mottled.

Gayville series

The Gayville series consists of deep, somewhat poorly drained sodic soils on bottom lands. These soils formed in silty, loamy, and clayey alluvium. Permeability is very slow. Slope is 0 to 1 percent.

Gayville soils are similar to Gayville Variant soils and commonly are associated with Caruso, Gibbon, Leshara, Lex Variant, and Saltine soils. All of these soils except Saltine soils have lower amounts of soluble salts and exchangeable sodium throughout the solum than Gayville soils. Gibbon and Leshara soils do not have a B horizon and have less clay in the control section. Lamo soils are silty and do not have a natric horizon. Lex Variant soils have less clay in the control section and have gravelly sand at a depth of 20 to 40 inches. Saltine soils have less clay in the control section and do not have a natric horizon.

In Merrick County, Gayville soils are mapped only in a complex with Caruso soils.

Typical pedon of Gayville silt loam, in an area of Gayville-Caruso complex, 0 to 1 percent slopes, 1,500 feet west and 100 feet north of southeast corner sec. 17, T. 14 N., R. 7 W.

A2—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine platy structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

B21t—2 to 7 inches; dark gray (10YR 4/1) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium subangular blocky structure; very hard, firm; strongly alkaline; clear smooth boundary.

B22t—7 to 14 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong medium and coarse subangular blocky structure; very hard, very firm; slightly saline; slight effervescence; strongly alkaline; clear smooth boundary.

B23t—14 to 22 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; strong medium and coarse subangular blocky structure; very hard, very firm; slightly saline; strong effervescence; strongly alkaline; clear smooth boundary.

B3—22 to 28 inches; gray (10YR 5/1) sandy clay loam, very dark gray (10YR 3/1) moist; common medium distinct light olive gray (5Y 6/2, moist) mottles;

moderate medium and coarse subangular blocky structure; very hard, very firm; violent effervescence; strongly alkaline; clear smooth boundary.

C1—28 to 45 inches; olive (5Y 5/3) sandy loam, olive (5Y 4/3) moist; few medium distinct pale yellow (5Y 7/3, moist) mottles; massive; very hard, firm; violent effervescence; strongly alkaline; clear smooth boundary.

C2—45 to 53 inches; pale olive (5Y 6/3) sandy clay loam, olive (5Y 5/3) moist; many medium distinct pale yellow (5Y 7/3, moist) mottles; massive; very hard, firm; soft masses of carbonates; violent effervescence; moderately alkaline; clear smooth boundary.

C3—53 to 60 inches; light olive gray (5Y 6/2) sandy loam, olive gray (5Y 5/2) moist; massive; slightly hard, friable; moderately alkaline.

The solum ranges from 18 to 30 inches in thickness. Depth to carbonates ranges from 2 to 8 inches. Salinity throughout the pedon is slight or moderate.

The A horizon is 1 to 4 inches thick. It has value of 5 through 7 dry and 3 through 5 moist and chroma of 1 dry or moist. The A horizon is slightly acid through mildly alkaline.

The B horizon has hue of 10YR or 2.5Y, value of 3 through 5 dry and 2 or 3 moist, and chroma of 1 or 2 dry or moist. In some pedons this horizon has thin patchy or thin continuous dark colored films on faces of peds. The B horizon has sodium absorption ratio ranging from 13 to 35 percent and is strongly alkaline or very strongly alkaline.

The C horizon has hue of 2.5Y or 5Y, value of 5 through 7 dry and 3 through 5 moist, and chroma of 2 through 4 dry or moist. The C horizon ranges from sandy clay loam to clay loam, sandy loam, loam, and loamy sand. It is moderately alkaline to very strongly alkaline.

Gayville Variant

The Gayville Variant consists of deep, somewhat poorly drained, sodic soils on bottom lands. These soils formed in calcareous alluvium. Permeability is slow. Slope ranges from 0 to 2 percent.

Gayville Variant soils are similar to Gayville soils and are commonly associated with Caruso, Gayville, Lamo, and Saltine soils. Caruso and Lamo soils are not so strongly alkaline as Gayville Variant soils. Gayville soils have more clay in the control section. Saltine soils do not have an argillic horizon.

Typical pedon of Gayville Variant silt loam, 0 to 2 percent slopes, 600 feet west and 100 feet north of southeast corner sec. 2, T. 12 N., R. 8 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A2—4 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium platy structure parting to weak fine granular; slightly hard, friable; neutral; abrupt smooth boundary.

B2t—6 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; strong medium and coarse subangular blocky structure; hard, firm; strong effervescence; very strongly alkaline; clear smooth boundary.

C1—13 to 38 inches; pale olive (5Y 6/3) silt loam, olive (5Y 5/3) moist; massive; slightly hard, very friable; strong effervescence; very strongly alkaline; clear smooth boundary.

C2—38 to 60 inches; pale olive (5Y 6/4) silt loam, olive (5Y 5/4) moist; massive; slightly hard, very friable; slight effervescence; very strongly alkaline.

The solum ranges from 12 to 20 inches in thickness. Depth to carbonates ranges from 4 to 10 inches; typically, the surface layer does not have carbonates.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. Typically, it is silt loam but ranges to loam and less commonly clay loam. The A horizon is slightly acid or neutral.

The B horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is strongly alkaline or very strongly alkaline.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 through 6 dry and 3 through 5 moist, and chroma of 2 through 4 dry or moist. It is strongly alkaline or very strongly alkaline. This horizon is typically silt loam. In places it is loam or clay loam. In some pedons strata of finer or coarser textures are below a depth of 40 inches.

Gibbon series

The Gibbon series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in loamy, calcareous alluvium. Permeabilty is moderate. Slope ranges from 0 to 2 percent.

Gibbon soils are similar to Leshara and Lex soils and are commonly associated with Alda, Janude, Lamo, Leshara, Lex, and Merrick soils. Alda soils have less clay and more sand in the control section than Gibbon soils and have gravelly sand or coarse sand at a depth of 20 to 40 inches. Janude soils are better drained, contain more sand in the control section, and are at a slightly higher elevation. Lamo soils are cumulic. Leshara soils have carbonates below a depth of 15 inches. Lex soils have more sand in the control section. Merrick soils are better drained, do not have carbonates above a depth of 30 inches, and are at a slightly higher elevation.

Typical pedon of Gibbon loam, 0 to 2 percent slopes, 1,100 feet west and 100 feet north of southeast corner sec. 12, T. 14 N., R. 5 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine and medium

granular structure; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A12—7 to 14 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear wavy boundary.

ACca—14 to 22 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; many medium prominent gray (2.5Y 6/0, moist) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable; violent effervescence; moderately alkaline; clear wavy boundary.

C1ca—22 to 37 inches; gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; few fine faint yellowish brown (10YR 5/4, moist) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable; strong effervescence; strongly alkaline, gradual wavy boundary.

C2—37 to 44 inches; gray (5Y 5/1) loam, olive gray (5Y 4/2) moist; common medium distinct yellowish brown (10YR 5/4, moist) and many medium distinct light olive gray (5Y 6/2, moist) mottles; moderate medium and coarse subangular blocky structure; slightly hard, friable; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—44 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many medium distinct strong brown (7.5YR 5/6, moist) mottles; weak fine subangular blocky structure; soft, very friable; moderately alkaline.

The solum ranges from 15 to 30 inches in thickness. The mollic epipedon ranges from 7 to 20 inches in thickness. Free carbonates are typically at the surface but range to a depth of 10 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2. It is mildly alkaline to moderately alkaline. Typically, the A horizon is loam but ranges to silt loam and silty clay loam. Some pedons do not have an AC horizon.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 dry and 4 through 6 moist, and chroma of 1 or 2. In some pedons, this horizon has distinct mottles that have hue of 7.5YR through 5Y, value of 4 through 6 moist, and chroma of 0 through 6 moist. The C horizon is moderately alkaline or strongly alkaline, and in places below a depth of 40 inches, it is sandier than the control section.

Gothenburg series

The Gothenburg series consists of soils on bottom lands, generally near meandering stream channels. These soils are very shallow over coarse sand and gravelly sand. They formed in recent alluvium. Permeability is very rapid. Slope ranges from 0 to 3 percent.

Gothenburg soils are similar to Platte soils and are commonly associated with Alda, Inavale, and Platte soils. Inavale soils are deep and do not have an appreciable amount of gravel in the control section. Alda soils are moderately deep over gravelly sand. Platte soils are thicker over coarse sand or gravelly sand and have a darker, thicker A horizon than Gothenburg soils. The associated soils are at a slightly higher elevation and are flooded less frequently than Gothenburg soils.

Typical pedon of Gothenburg loamy sand in an area of Gothenburg soils, 0 to 3 percent slopes, 800 feet north and 450 feet east of southwest corner sec. 23, T. 15 N., R. 4 W.

A1—0 to 3 inches; dark gray (10YR 4/1) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable; neutral; abrupt smooth boundary.

C1—3 to 11 inches; light gray (10YR 7/2) coarse sand, light brownish gray (10YR 6/2) moist; single grained; loose; neutral; gradual smooth boundary.

IIC2—11 to 60 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; common medium prominent strong brown (7.5YR 5/6, moist) mottles; single grained; neutral; loose.

The solum ranges from 1 to 5 inches in thickness and corresponds to the thickness of the A horizon. In some pedons, calcium carbonate is in the surface layer. Depth to the gravelly sand or coarse sand ranges from 3 to 20 inches. Reaction is neutral or mildly alkaline throughout.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2. Texture of the A horizon is variable, it includes loamy sand, loam, fine sandy loam, and loamy fine sand, and in some pedons thin layers of finer textured material.

Some pedons have a thin C1 horizon of fine sand. The IIC horizon has value of 6 through 8 dry and 4 through 7 moist and chroma of 1 through 3. It has common, distinct brown, strong brown, yellowish brown, or reddish yellow mottles in most pedons.

Hall series

The Hall series consists of deep, well drained soils on stream terraces. These soils formed in old alluvium or loesslike material. Permeability is moderately slow. Slope is 0 to 1 percent.

In Merrick County, the Hall soils typically have sandy material at a depth of 45 to 60 inches.

Hall soils are similar to Hord soils and are commonly associated with Blendon, Brocksburg, Hord, and O'Neill soils. Blendon soils have more sand and less clay in the control section than Hall soils. Brocksburg soils have more sand in the control section and are underlain with gravelly sand at a depth of 20 to 40 inches. Hord soils do not have an argillic horizon. O'Neill soils have more sand and less clay in the control section and are

underlain with gravelly sand at a depth of 20 to 40 inches.

Typical pedon of Hall silt loam, sandy substratum, 0 to 1 percent slopes, 2,400 feet west and 100 feet north of southeast sec. 5, T. 12 N., R. 8 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—6 to 16 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak medium and coarse granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B21t—16 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B22t—23 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B3—32 to 40 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—40 to 46 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; few fine faint yellowish brown (10YR 5/6, moist) mottles; weak medium and coarse subangular blocky structure; slightly hard, friable; slight effervescence; neutral; clear smooth boundary.

IIC2—46 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; slightly acid.

The solum ranges from 24 to 54 inches in thickness. The mollic epipedon is 20 to 35 inches thick and extends into the upper part of the B horizon. Free carbonates are not in the solum but are in the C horizon in many pedons. Depth to fine sand or gravelly sand ranges from 45 to 60 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2. It dominantly is silt loam but is also silty clay loam. The A horizon is slightly acid or neutral.

The B horizon has value of 3 through 6 dry and 3 or 4 moist and chroma of 1 through 3. It is silty clay loam and has 28 to 35 percent clay. The B horizon is slightly acid or neutral.

The C horizon has value of 6 or 7 dry and 5 or 6 moist and chroma of 2 or 3. It dominantly is silt loam but ranges to fine sandy loam, loam, and silty clay loam. The C horizon is neutral or mildly alkaline.

Hobbs series

The Hobbs series consists of deep, well drained, stratified soils on bottom lands of intermittent drainageways. These soils formed in noncalcareous, silty alluvium. Permeability is moderate. Slope ranges from 0 to 3 perecent.

Hobbs soils are similar to Hord soils. They are commonly associated with Crofton and Nora soils on uplands and with Hord and Kenesaw soils on stream terraces. Crofton soils do not have a mollic epipedon and have free carbonates at a depth of less than 8 inches. Hord soils have a B horizon and a regular decrease in organic matter as depth increases. Nora soils are more strongly developed than Hobbs soils, contain free carbonates at a depth of 10 to 30 inches, and are not stratified. Kenesaw soils have a B horizon and contain less clay in the control section. The associated soils are not subject to flooding; Hobbs soils are.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 1,320 feet south and 100 feet east of northwest corner of sec. 6, T. 16 N., R. 8 W.

Ap—0 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—6 to 16 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak fine and medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

C2—16 to 24 inches; dark gray (10YR 4/1) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse granular structure; slightly hard, friable; neutral; clear smooth boundary.

C3—24 to 37 inches; dark grayish brown (10YR 4/2) light silty clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

C4—37 to 48 inches; brown (10YR 5/3) silt loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C5—48 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; neutral.

Typically, the pedon does not have free carbonates above a depth of 40 inches. Some areas have a buried soil because of the recent deposition of alluvial material. Reaction ranges from slightly acid to mildly alkaline in all parts of the pedon.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is 6 to 9 inches thick. The A horizon has apparent stratification in undisturbed areas.

The C horizon has value of 4 through 7 dry and 3 through 6 moist and chroma of 1 through 3 dry or moist. It also contains thin strata that are higher or lower in value.

Holder series

The Holder series consists of deep, well drained soils on uplands (fig. 17). These soils formed in silty loess. Permeability is moderate. Slope is 0 to 1 percent.

Holder soils are similar to Nora soils and are commonly associated with Crofton, Hobbs, and Nora soils. Crofton soils do not have a B horizon or a mollic epipedon and have lime at a depth of less than 8 inches. They are on side slopes below Holder soils. Hobbs soils are stratified above a depth of 10 inches, occasionally flooded, and on bottom lands of upland drainageways. Nora soils have less clay in the B horizon than Holder soils, have free carbonates higher in the profile, and are on side slopes on loess uplands.

Typical pedon of Holder silt loam, 0 to 1 percent slopes, 1,100 feet south and 100 feet east of northwest corner sec. 31, T. 16 N., R. 8 W.

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

A12—6 to 18 inches; dark grayish brown (10YR 4/2) silt loam; very dark grayish brown (10YR 3/2) moist; moderate medium and coarse granular structure; slightly hard, friable; neutral; clear smooth boundary.

B2t—18 to 32 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

B3—32 to 40 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C—40 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; mildly alkaline.

The solum ranges from 25 to 48 inches in thickness. The mollic epipedon is 10 to 20 inches thick. Carbonates are below a depth of 60 inches in most pedons.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2. It is slightly acid or medium acid.

The B horizon has value of 4 through 7 dry and 2 through 4 moist in the upper part and 4 or 5 moist in the lower part and chroma of 2 through 4. The B2t horizon ranges from 27 to 35 percent clay. The B horizon is neutral or slightly acid.

The C horizon has value of 6 or 7 dry and 5 or 6 moist and chroma of 2 or 3. It is moderately alkaline or mildly alkaline.

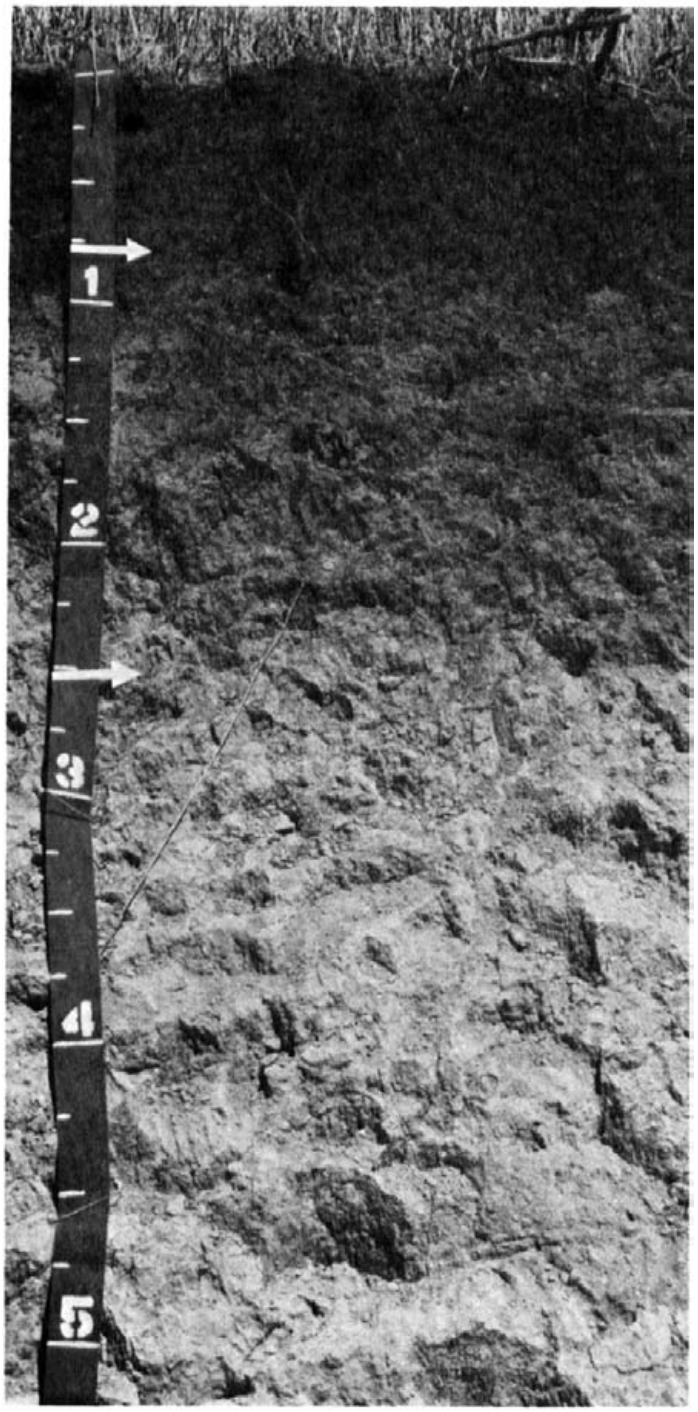

Figure 17.—Profile of Holder silt loam. The markers indicate the lower boundaries of the surface layer and subsoil. The tape is in feet.

Hord series

The Hord series consists of deep, well drained soils on stream terraces. These soils formed in old alluvium or loesslike material (fig. 18). Permeability is moderate. Slope ranges from 0 to 3 percent.

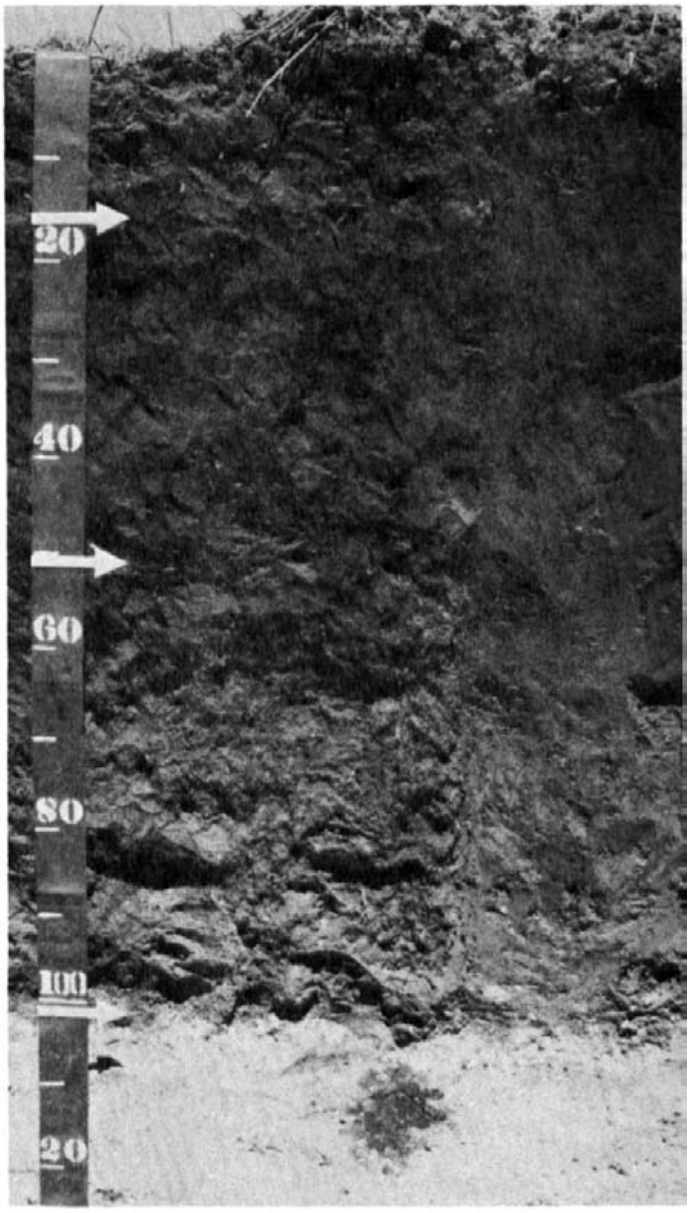

Figure 18.—Profile of Hord silt loam, sandy substratum. The upper marker indicates the lower boundary of the surface layer, the middle marker indicates the lower boundary of the subsoil, and the lower marker indicates the upper boundary of the sandy substratum. The tape is in centimeters.

In Merrick County, carbonates have been leached from Hord soils to a depth of 60 inches or more and this is outside the range as defined for the series. This, however, does not alter the use or behavior of these soils.

Hord soils are similar to Brocksburg and Kenesaw soils and are commonly associated with Blendon, Brocksburg, Kenesaw, and O'Neill soils. Blendon soils have more fine and coarser sand and less clay in the control section than Hord soils. Brocksburg soils have more sand in the control section and are underlain with gravelly sand at a depth of 20 to 40 inches. Kenesaw soils have less clay in the control section and have a thinner solum. O'Neill soils have more sand and less clay in the control section and are underlain by gravelly sand or coarse sand at a depth of 20 to 40 inches.

Typical pedon of Hord silt loam, sandy substratum, 0 to 1 percent slopes, 1,000 feet east and 100 feet south of northwest corner sec. 11, T. 15 N., R. 4 W.

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

A12—7 to 21 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

B21—21 to 30 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

B3—30 to 42 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

IIC—42 to 60 inches; very pale brown (10YR 7/3) gravelly sand, brown (10YR 5/3) moist; single grained; loose; neutral.

The solum ranges from 30 to 55 inches in thickness. The mollic epipedon is 20 to 40 inches thick and extends into the B horizon.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is slightly acid or neutral.

The lower part of the B horizon has value of 4 through 6 dry and 3 through 5 moist and chroma of 2 or 3 dry or moist. Typically, it is silt loam, but in places it is loam or light silty clay loam. The B horizon is neutral or mildly alkaline.

The C horizon ranges from very fine sandy loam to loam and silt loam in the very gently sloping phase. It is loamy coarse sand or gravelly sand in the sandy

substratum phase. The C horizon is neutral through moderately alkaline.

Inavale series

The Inavale series consists of deep, somewhat excessively drained soils on bottom lands. These soils formed in sandy alluvium. Permeability is rapid. Slope ranges from 0 to 9 percent.

Inavale soils are similar to Wann and Ipage soils and are associated with Alda, Fonner Variant, Ipage, Platte, and Wann soils. Alda soils have less sand in the upper part of the control section than Inavale soils, have gravelly sand or coarse sand at a depth of 20 to 40 inches, and are more poorly drained. Fonner Variant soils are moderately well drained and have more gravel in the lower part of the control section. Ipage soils have less stratification, are moderately well drained, and have mottles in the lower part of the control section. Platte soils have gravelly sand or coarse sand at a depth of 10 to 20 inches. Wann soils have a mollic epipedon, less sand in the control section, and are more poorly drained.

Typical pedon of Inavale loamy fine sand, 0 to 3 percent slopes, 300 feet west and 100 feet south of northeast corner sec. 20, T. 14 N., R. 5 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine and medium granular structure; loose, very friable; neutral; clear smooth boundary.

AC—7 to 20 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose, very friable; neutral; clear smooth boundary.

C—20 to 60 inches; light brownish gray (10YR 6/2) loamy sand, grayish brown (10YR 5/2) moist; single grained; loose, very friable; thin strata of finer textured sediment; neutral.

The solum ranges from 10 to 30 inches in thickness. The A horizon ranges from 5 to 14 inches in thickness. Typically, it does not have carbonates above a depth of 60 inches.

The A horizon has value of 4 through 7 dry and 4 or 5 moist and chroma of 2 or 3. It is neutral or mildly alkaline.

The AC and C horizons have value of 5 through 7 dry and 4 through 6 moist and chroma of 2 or 3. The series control section commonly is loamy sand in the upper part and loamy coarse sand, fine sand, or sand in the lower part. Typically, it is stratified with finer and coarser textures.

Ipage series

The Ipage series consists of deep, moderately well drained soils. These soils are in sandhill valleys and on stream terraces. These soils formed in eolian material or in alluvial material. Permeability is rapid. Slope ranges from 0 to 3 percent.

Ipage soils are similar to Els and Inavale soils and are commonly adjacent to Els, Marlake, Ovina, Thurman, and Valentine soils. Els soils are somewhat poorly drained. Inavale soils are stratified and do not have mottles within a depth of 40 inches. Marlake soils are very poorly drained. Ovina soils have loamy layers in the lower part of the control section and are in the coarse-loamy family. Thurman soils have a mollic epipedon and are somewhat excessively drained. Valentine soils are excessively drained and do not have mottles within a depth of 40 inches.

Typical pedon of Ipage loamy fine sand, 0 to 2 percent slopes, 600 feet south and 100 feet west of northeast corner sec. 17, T. 16 N., R. 3 W.

A1—0 to 9 inches; gray (10YR 5/1) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; loose; very friable; neutral; clear smooth boundary.

C1—9 to 32 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; gradual smooth boundary.

C2—32 to 60 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; neutral.

The solum generally ranges from 8 to 20 inches in thickness. Thickness of the A horizon ranges from 6 to 9 inches. Reaction is slightly acid or neutral throughout.

The A horizon has value of 4 through 6 dry and 3 or 4 moist and chroma of 1 or 2 dry or moist. It is typically loamy fine sand but ranges to loamy sand and fine sand.

The C horizon has value of 6 or 7 dry and 4 through 6 moist and chroma of 2 or 3 dry or moist. It has few to common, distinct mottles of high chroma. Typically, the C horizon is fine sand. Less commonly it is sand and loamy sand, and in some pedons is finer textured below a depth of 30 inches.

Janude series

The Janude series consists of deep, moderately well drained soils on bottom lands. These soils formed in noncalcareous alluvium (fig. 19). Permeability is moderately rapid. Slope ranges from 0 to 2 percent.

Janude soils are similar to Novina and Wann soils and are commonly associated with Fonner, Leshara, Lockton, Novina, and Wann soils. Fonner soils have coarse sand and gravelly sand at a depth of 20 to 40 inches. Leshara soils have less fine and coarser sand in the control section than Janude soils. Novina soils have loam in the lower part of the control section. Wann soils are calcareous throughout the profile and have more fine and coarser sand in the control section.

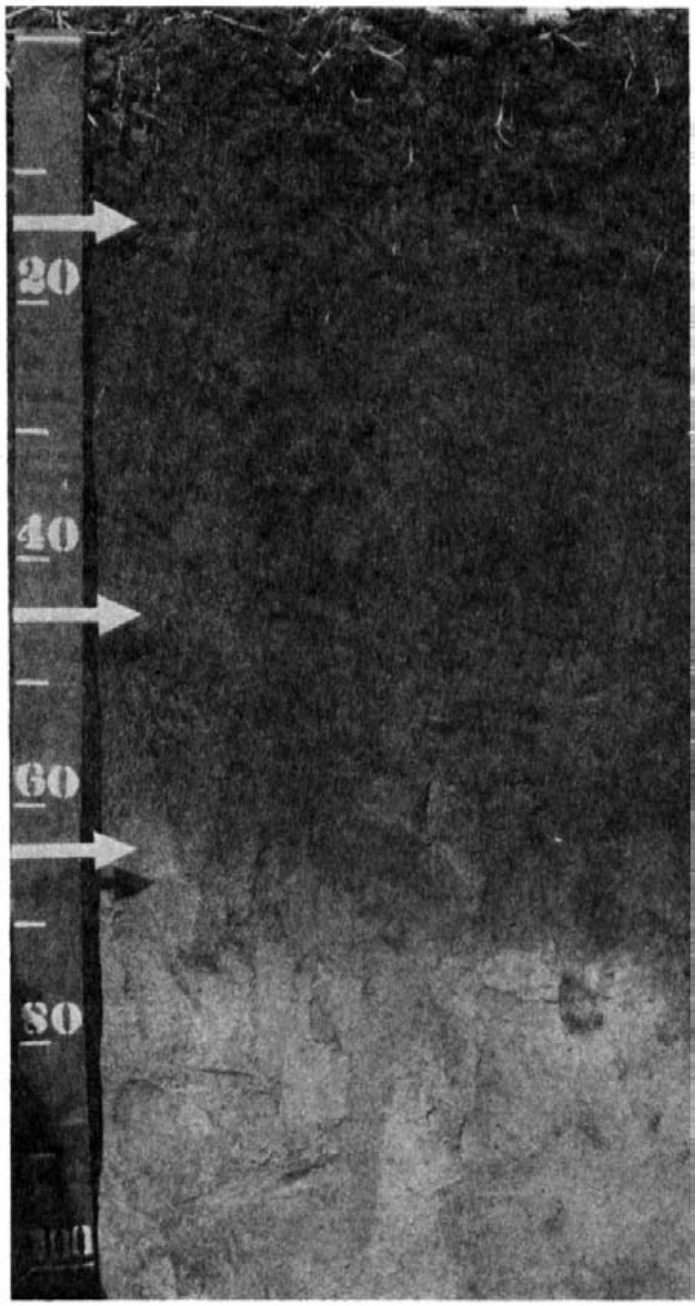

Figure 19.—Profile of Janude sandy loam. The upper marker indicates the lower boundary of the plowed layer, the middle marker indicates the lower boundary of the A12 horizon, and the lower marker indicates the lower boundary of the darkened soil material. The tape is in centimeters.

Typical pedon of Janude sandy loam, 0 to 2 percent slopes, 1,300 feet north and 100 feet east of southwest corner sec. 8, T. 12 N., R. 7 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—7 to 30 inches; gray (10YR 5/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

AC—30 to 38 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C—38 to 60 inches; light gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) moist; few fine distinct dark brown (7.5YR 4/4, moist) mottles; single grained; soft, very friable; neutral.

The solum ranges from 20 to 38 inches in thickness and corresponds with the thickness of the mollic epipedon. Typically, free carbonates are below a depth of 60 inches, but some pedons are calcareous at a depth of 24 inches. Reaction ranges from neutral through moderately alkaline.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically sandy loam, but is fine sandy loam and loam in some pedons. Some pedons do not have an AC horizon.

The C horizon has value of 6 or 7 dry and 4 or 5 moist and chroma of 1 or 2 dry or moist. In some places the C horizon has few to many, faint or distinct mottles. Typically it is loamy sand, but in places it is fine sandy loam, sandy loam, or loam.

Kenesaw series

The Kenesaw series consists of deep, well drained soils on stream terraces. These soils formed in loess or in mixed loess and alluvium. Permeability is moderate. Slope ranges from 0 to 6 percent.

Kenesaw soils are commonly associated with Loretto, Rusco, and Valentine soils. Loretto soils contain more sand in the control section than Kenesaw soils. Rusco soils are not so well drained and have a more strongly developed B horizon. Valentine soils are coarser textured, having formed in eolian sands.

Typical pedon of Kenesaw silt loam, 0 to 2 percent slopes, 1,500 feet west and 100 feet south of northeast corner sec. 22, T. 14 N., R. 8 W.

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

B2—8 to 15 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—15 to 37 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate fine and

medium subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—37 to 60 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; slight effervescence; mildly alkaline.

The solum ranges from 14 to 22 inches in thickness. Depth to carbonates ranges from 15 to 36 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist.

The B horizon is typically silt loam but ranges to loam.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 dry and 4 or 5 moist, and chroma of 2 or 3 dry or moist. The C horizon in some pedons has few to many reddish brown or brown mottles, but these do not indicate restricted drainage in the present soil.

Lamo series

The Lamo series consists of deep, somewhat poorly drained (fig. 20) and poorly drained soils on bottom lands. These soils formed in calcareous alluvium. Permeability is moderately slow. Slope is 0 to 1 percent.

Lamo soils are similar to Gibbon and Leshara soils and are commonly associated with Gibbon, Leshara, Saltine, and Wann soils. Gibbon soils have a thinner mollic epipedon than Lamo soils. Leshara soils have free carbonates below a depth of 15 inches. Saltine soils are more strongly alkaline. Wann soils have more sand between depths of 10 and 40 inches.

Typical pedon of Lamo clay loam, sandy substratum, 0 to 1 percent slopes, 1,350 feet west and 100 feet north of southeast corner sec. 28, T. 14 N., R. 6 W.

A11—0 to 13 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

A12—13 to 24 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

AC—24 to 30 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.

C—30 to 42 inches; gray (10YR 6/1) sandy clay loam, gray (10YR 5/1) moist; few fine distinct light olive brown (2.5Y 5/4, moist) mottles; moderate medium subangular blocky structure; hard, firm; slight effervescence; mildly alkaline; abrupt wavy boundary.

IIC—42 to 60 inches; light brownish gray (10YR 6/2) gravelly sand, brown (10YR 5/3) moist; single grained; mildly alkaline.

The solum ranges from 24 to 35 inches in thickness and corresponds with the thickness of the mollic epipedon. Carbonates are typically at the surface or within a depth of 10 inches. Reaction is mildly alkaline or moderately alkaline throughout.

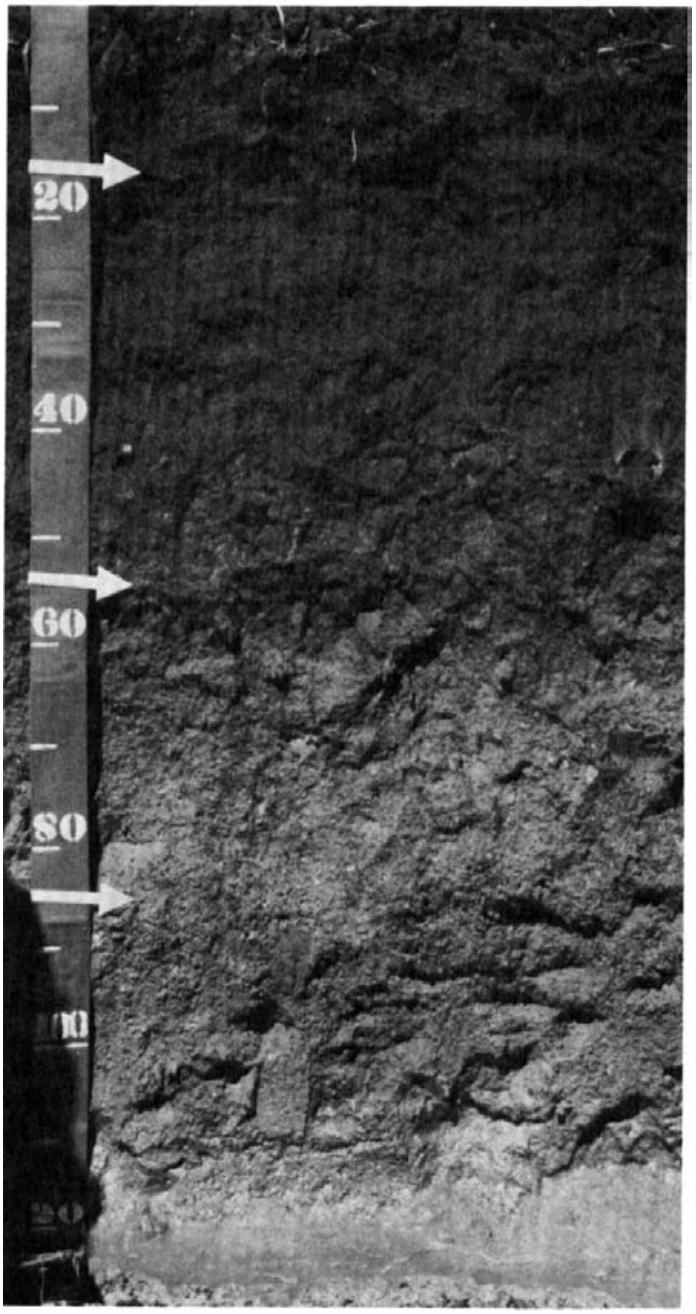

Figure 20.—Profile of Lamo clay loam, sandy substratum. The upper marker indicates the lower boundary of the plowed layer, the middle marker indicates the lower boundary of the darkened surface layer, and the lower marker indicates the upper boundary of a darkened soil layer in the underlying material. The gravelly sand is saturated at the bottom of the profile. The tape is in centimeters.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is dominantly clay loam but ranges to silty clay loam and silt loam.

The AC horizon has hue of 10YR or 2.5Y, value of 4 or 5 dry and 3 moist and chroma of 1 or 2 dry or moist. It is typically silty clay loam but ranges to silt loam. Some pedons do not have an AC horizon.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 through 7 dry and 4 through 6 moist, and chroma of 1 or 2 dry or moist. It contains few to many, brown and reddish brown mottles. The IIC horizon is gravelly sand or sand and has 5 to 15 percent gravel. It ranges from 40 to 60 inches or more in depth.

Lawet Variant

The Lawet Variant consists of deep, poorly drained soils on bottom lands. These soils formed mainly in loamy alluvium. Permeability is moderately slow. Slope is 0 to 1 percent.

Lawet Variant soils are associated with Alda, Fonner, Gibbon, Leshara, Lex, and Wann soils. Alda and Fonner soils have less clay in the control section than Lawet Variant soils and have gravelly sand or coarse sand at a depth of 20 to 40 inches. Gibbon and Leshara soils have less sand in the control section. Lex soils have gravelly sand or coarse sand at a depth of 20 to 40 inches. Wann soils have more sand in the control section and are not so poorly drained.

Typical pedon of Lawet Variant fine sandy loam, 0 to 1 percent slopes, 2,500 feet south and 100 feet west of northeast corner sec. 19, T. 14 N., R. 5 W.

A11—0 to 10 inches; dark gray (10YR 4/1) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; moderately saline; clear smooth boundary.

A12—10 to 19 inches; gray (10YR 5/1) fine sandy loam, dark gray (10YR 4/1) moist; many medium distinct olive (5Y 4/4, moist) mottles; moderate fine subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

Ab—19 to 29 inches; very dark gray (10YR 3/1) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—29 to 40 inches; light gray (5Y 7/2) silt loam, light olive gray (5Y 6/2) moist; many medium distinct dark brown (7.5YR 4/4, moist) mottles; massive; slightly hard, friable; strong effervescence; mildly alkaline; clear smooth boundary.

C2—40 to 46 inches; gray (5Y 6/1) very fine sandy loam, olive gray (5Y 5/2) moist; massive; slightly hard, friable; strong effervescence; mildly alkaline; clear wavy boundary.

IIC3—46 to 60 inches; gray (2.5Y 6/0) gravelly sand; dark gray (2.5Y 4/0) moist; many medium distinct olive gray (5Y 4/2, moist) mottles; single grained; loose; neutral.

The solum ranges from 16 to 34 inches in thickness. Thickness of the mollic epipedon ranges from 10 to 20 inches. Free carbonates occur throughout the solum and upper part of the C horizon.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 0 or 1 dry or moist. It is mildly alkaline or moderately alkaline and has moderate or high salinity. Some pedons have an AC horizon.

The C horizon has hue of 2.5Y or 5Y, value of 5 through 7 dry and 4 through 7 moist, and chroma of 0 through 2 dry or moist. In some pedons, the C horizon has distinct mottles that have hue of 7.5YR or 5Y, value of 3 through 6, and chroma of 2 through 6 dry or moist. In places, it has thin layers of sandy loam above a depth of 40 inches. The C horizon is neutral or mildly alkaline. Commonly it is loamy sand and sand below a depth of 40 inches.

Leshara series

The Leshara series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in silty alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Leshara soils are similar to Gibbon and Lex soils and are commonly associated with Gibbon, Janude, Lex, Merrick, and Wann soils. Gibbon soils have free carbonates at a depth of less than 10 inches. Janude soils are moderately well drained and have less clay and more sand in the control section than the Leshara soils. Lex soils have more sand in the control section and gravelly sand or coarse sand at a depth of 20 to 40 inches. Merrick soils do not have carbonates in the control section and are moderately well drained. Wann soils have more sand and less clay in the control section.

Typical pedon of Leshara silt loam, 0 to 2 percent slopes, 1,000 feet east and 100 feet north of southwest corner sec. 1, T. 14 N., R. 5 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—6 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.

AC—12 to 20 inches; gray (2.5Y 6/1) silt loam, dark gray (2.5Y 4/1) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—20 to 26 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; few medium distinct yellowish red (5YR 5/6, moist) and dark reddish brown (5YR 3/3, moist) mottles; massive; very hard, firm; violent effervescence; moderately alkaline; clear smooth boundary.

C2—26 to 46 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct dark reddish brown (5YR 3/3 moist) mottles; massive; very hard, firm; violent effervescence; moderately alkaline; clear smooth boundary.

IIC3—46 to 60 inches; very pale brown (10YR 7/3) coarse sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

The solum ranges from 12 to 28 inches in thickness. The mollic epipedon is 10 to 20 inches thick. Depth to free carbonates ranges from 12 to 20 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is neutral or mildly alkaline. Some pedons do not have an AC horizon.

The C1 and C2 horizons have value of 5 through 7 dry and 4 or 5 moist and chroma of 1 or 2 dry or moist. The C horizon has mottles with hue of 10YR or 5YR, value of 3 through 6 moist, and chroma of 3 through 8 dry or moist. It is mildly alkaline or moderately alkaline. The IIC horizon typically is coarse sand but ranges to include fine sand and sand.

Lex series

The Lex series consists of somewhat poorly drained soils on bottom lands. These soils are moderately deep over coarse sand and gravelly sand. They formed in stratified alluvium. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Lex soils are similar to Alda soils and are commonly associated with Alda, Gibbon, Leshara, Lockton, and Platte soils. Alda soils have less clay in the upper part of the control section than Lex soils. Gibbon and Leshara soils have less sand in the control section and do not have coarse sand and gravelly sand above a depth of 40 inches. Lockton soils are noncalcareous and moderately well drained. Platte soils have coarse sand or gravelly sand at a depth of 10 to 20 inches and are at a relatively slightly lower elevation.

Typical pedon of Lex loam, 0 to 1 percent slopes, 1,600 feet north and 100 feet west of southeast corner sec. 6, T. 14 N., R. 4 W.

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

A12—7 to 13 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

A13—13 to 17 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; few fine distinct pale brown (10YR 6/3, moist) mottles; moderate medium and coarse granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—17 to 24 inches; light gray (10YR 7/2) loam, grayish brown (2.5Y 5/2) moist; few fine distinct light reddish brown (5YR 6/3, moist) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

IIC2—24 to 60 inches; very pale brown (10YR 7/3) stratified coarse sand and gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

The A horizon ranges from 10 to 20 inches in thickness. Depth to the coarse sand or gravelly sand ranges from 20 to 40 inches. Depth to free carbonates ranges from 0 to 10 inches.

The A horizon is dominantly loam or clay loam. It has value of 3 through 5 dry and 2 or 3 moist and chroma of 0 through 2 dry or moist. The A horizon is neutral to moderately alkaline.

The C horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 or 3 dry or moist. In most pedons, the C horizon has distinct mottles with hue of 5YR, 7.5YR, or 10YR, value of 3 through 6 moist, and chroma of 3 through 6 moist. It is slightly acid through mildly alkaline. The IIC horizon ranges from coarse sand to gravelly sand.

Lex Variant

The Lex Variant consists of somewhat poorly drained soils on bottom lands. These soils formed in stratified alluvium and are moderately deep over coarse sand or gravelly sand. They are strongly alkaline or very strongly alkaline. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope is 0 to 1 percent.

Lex Variant soils are similar to Lex soils and are commonly associated with Caruso, Gayville, Lamo, Lex, and Saltine soils. Lex soils are less alkaline throughout the solum than Lex Variant soils and are at a slightly higher elevation. Gayville soils are deep and have more clay in the control section. Caruso and Lamo soils are deep, do not have contrasting textures in the control section, and are not so highly alkaline. Saltine soils are deep and fine-silty.

Typical pedon of Lex Variant loam, 0 to 1 percent slopes, 300 feet west and 100 feet north of southeast corner sec 26, T. 14 N., R. 8 W.

A1—0 to 10 inches; grayish brown (10YR 5/2) loam, very dark gray (10YR 3/1) moist; moderate fine and

medium granular structure; hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—10 to 18 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; violent effervescence; very strongly alkaline; clear smooth boundary.

C2—18 to 26 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; common medium distinct brown (7.5YR 5/2, moist) mottles; weak fine and medium subangular blocky structure; hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

IIC3—26 to 36 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; slight effervescence; moderately alkaline; clear gradual boundary.

IIC4—36 to 60 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

The mollic epipedon ranges from 10 to 20 inches in thickness. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches. Free carbonates occur throughout the A and C horizons and are present in the upper part of the IIC horizon of some pedons.

The A horizon has hue of 10YR or 2.5Y, value of 3 through 5 dry and 2 or 3 moist, and chroma of 1 or 2 dry or moist. Typically, it is loam and less commonly clay loam and silty clay loam. The A horizon is mildly or moderately alkaline. An AC horizon is present in some pedons.

The C1 and C2 horizons have hue of 2.5Y or 10YR, value of 5 through 7 dry and 4 through 6 moist, and chroma of 2 or 3 dry or moist. Typically, they are silt loam or clay loam and less commonly are loam and fine sandy loam. The C1 and C2 horizons are strongly alkaline or very strongly alkaline.

The IIC horizon has value of 4 through 8 dry and 3 through 6 moist and chroma of 2 or 3 dry or moist. It is coarse sand, has 3 to 15 percent gravel or gravelly sand, and is commonly stratified. The IIC horizon is commonly medium acid through neutral, but some pedons are mildly alkaline or moderately alkaline in the upper part of the IIC horizon.

Libory series

The Libory series consists of deep, moderately well drained soils on stream terraces. These soils formed in eolian sands deposited over loess, loamy alluvium, or a combination of both. Permeability is rapid in the upper part of the control section and moderate in the lower part. Slope ranges from 0 to 3 percent.

Libory soils are similar to Boelus, Novina, and Ovina soils and are commonly associated with Boelus, Ipage, Novina, Ovina, Thurman, and Valentine soils. Boelus soils are well drained and do not have mottles above a depth of 40 inches. Ipage soils have sandy textures throughout the 10- to 40-inch control section. Novina soils have more sand in the lower part of the control section than Libory soils. Ovina soils have more sand in the lower part of the control section and are somewhat poorly drained. Thurman soils are somewhat excessively drained, and Valentine soils are excessively drained; both soils have sandy textures throughout the control section.

Typical pedon of Libory loamy fine sand, 0 to 3 percent slopes, 300 feet north and 150 feet west of southeast corner sec. 21, T. 15 N., R. 6 W.

A11—0 to 7 inches; gray (10YR 5/1) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

A12—7 to 16 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

C—16 to 21 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; abrupt smooth boundary.

IIBb—21 to 30 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; few medium distinct yellowish red (5YR 5/6, moist) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

IIC—30 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common coarse distinct yellowish red (5YR 5/6, moist) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; neutral.

The solum ranges from 16 to 40 inches in thickness. The mollic epipedon is 10 to 20 inches thick. Some pedons contain free carbonates at a depth of 30 to 60 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It typically is loamy fine sand but ranges to fine sandy loam and fine sand.

The C horizon is 4 to 10 inches thick. It typically is fine sand but ranges to loamy fine sand or loamy sand. The C horizon has value of 5 through 7 dry and 4 or 5 moist and chroma of 2 or 3 dry or moist.

The IIB horizon is at a depth of 15 to 30 inches. It has value of 4 through 6 dry and 3 through 5 moist and chroma of 2 or 3 dry or moist. The IIB horizon is typically silt loam but ranges to very fine sandy loam, loam, and silty clay loam. It is medium acid through neutral.

The IIC horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 through 7 dry and 2 through 6 moist, and chroma of 2 or 3 dry or moist. In places, the IIC horizon is calcareous. It is neutral or mildly alkaline.

Lockton series

The Lockton series consists of moderately well drained soils on bottom lands. These soils are moderately deep over coarse sand or gravelly sand. They formed in noncalcareous, stratified alluvium. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Lockton soils are similar to Fonner and Lex soils and are commonly associated with Alda, Cozad, Fonner, Gibbon, Leshara, and Lex soils. Lex soils are calcareous and somewhat poorly drained. Alda and Fonner soils contain more sand in the control section than Lockton soils. Also, Alda soils are calcareous and somewhat poorly drained. Cozad, Gibbon, and Leshara soils do not have gravelly sand above a depth of 40 inches.

Typical pedon of Lockton loam, 0 to 1 percent slopes, 1,800 feet north and 100 feet west of the southeast corner sec. 6, T. 13 N., R. 6 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A12—5 to 13 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium and coarse granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

AC—13 to 23 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, friable; medium acid; clear smooth boundary.

C1—23 to 27 inches; grayish brown (10YR 5/2) coarse sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable; slightly acid; clear wavy boundary.

IIC2—27 to 60 inches; very pale brown (10YR 7/3) gravelly coarse sand, pale brown (10YR 6/3) moist; common medium distinct reddish brown (5YR 4/4, moist) mottles; single grained; loose; medium acid.

The mollic epipedon and the solum range from 20 to 30 inches in thickness. In some pedons, however, carbonates are below a depth of 30 inches. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 though 5 dry and 2 or 3 moist, and chroma of 1 or 2 dry or moist. It is typically loam but ranges to silt loam, clay loam, and silty clay loam. The A horizon is medium acid or slightly acid. Some pedons do not have an AC horizon.

The C1 horizon has hue of 10YR or 2.5Y, value of 4 through 7 dry and 3 through 6 moist, and chroma of 1 thorugh 3 dry or moist. It is typically coarse sandy loam but ranges to loam or clay loam and has thin strata of coarser textured material. The C1 horizon ranges from medium acid through neutral. It has mottles in some pedons.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 through 8 dry and 4 through 6 moist, and chroma of 1 through 3 dry or moist. Typically it is gravelly coarse sand or coarse sand and has 3 to 35 percent gravel. The IIC horizon is medium acid through neutral. In some pedons it does not have mottles.

Loretto series

The Loretto series consists of deep, well drained soils on stream terraces in transitional areas between areas of loess and sandhills. These soils formed in mixed loess and eolian material. Permeability is moderate. Slope ranges from 0 to 9 percent.

In Merrick County, Loretto soils have an Ap horizon that is lighter colored than defined in the range for the series, but this does not alter the usefulness or behavior of these soils.

Loretto soils are similar to Boelus soils and are commonly associated with Boelus, Kenesaw, Rusco, and Valentine soils. Boelus soils are sandy in the upper part of the profile. Kenesaw soils are coarse-silty. Rusco soils are moderately well drained, have mottles within a depth of 40 inches, and are fine-silty. Valentine soils do not have a mollic epipedon and have sandy textures throughout the control section.

Typical pedon of Loretto fine sandy loam, 0 to 3 percent slopes, 900 feet south and 100 feet west of northeast corner sec. 30, T. 14 N., R. 8 W.

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

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

A13—10 to 19 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; slightly acid; clear wavy boundary.

B2t—19 to 44 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear wavy boundary.

C—44 to 60 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; few fine faint yellowish brown (10YR 5/4, moist) mottles; massive; slightly hard, friable; neutral.

The A horizon ranges from 5 to 19 inches in thickness. Depth to the silty B2t horizon ranges from 16 to 36 inches. Where free carbonates are present, they are generally at a depth of 36 to 50 inches.

The A horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 2 or 3 dry or moist. It is typically fine sandy loam but in places is sandy loam and loam.

The B2t horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4. It is typically silty clay loam, but in some areas it is loam or silt loam.

The C horizon has value of 6 or 7 dry and 5 or 6 moist and chroma of 3 or 4 dry or moist. It is typically clay loam but in some areas is loam, silty clay loam, or silt loam.

Marlake series

The Marlake series consists of deep, very poorly drained soils in depressions on bottom lands and stream terraces. These soils formed in alluvial sands. Permeability is rapid. Slope is 0 to 1 percent.

Marlake soils are commonly associated with Els, Ipage, Libory, Ovina, and Valentine soils. Els soils are somewhat poorly drained. Ipage soils are moderately well drained. Libory soils have silty material below a depth of 28 inches and are moderately well drained. Ovina soils have less sand in the control section than Marlake soils and are somewhat poorly drained. Valentine soils are excessively drained.

Typical pedon of Marlake loamy sand, 0 to 1 percent slopes, 1,300 feet west and 100 feet south of northeast corner sec. 18, T. 16 N., R. 3 W.

A11—0 to 3 inches; dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; 1 inch of partially decayed organic matter on surface; neutral; clear wavy boundary.

A12—3 to 8 inches; dark gray (10YR 4/1) loamy sand, very dark grayish brown (10YR 3/2) moist; single grained; loose; neutral; clear wavy boundary.

C1—8 to 30 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; common medium distinct yellowish brown (10YR 5/6, moist) mottles; single grained; loose; neutral; clear wavy boundary.

C2—30 to 60 inches; light gray (10YR 7/2) fine sand, pale brown (10YR 6/3) moist; single grained, loose; neutral.

The solum ranges from 6 to 16 inches in thickness. The A horizon is 6 to 10 inches thick. Typically, carbonates are not at the surface, but some pedons have carbonates within a depth of 6 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically loamy sand but ranges to loamy fine sand and fine sandy loam. The A horizon is neutral or mildly alkaline.

The C horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 1 through 3 dry or moist. It generally is fine sand or sand, and strata of finer and coarser textured materials are common. The C horizon has few or common mottles of high chroma. It is typically neutral or mildly alkaline.

Meadin series

The Meadin series consists of excessively drained soils on breaks of stream terraces. These soils are shallow over very gravelly sand or gravelly sand. They formed in alluvium. Permeability is very rapid. Slope ranges from 2 to 9 percent.

Meadin soils are similar to O'Neill soils and are commonly associated with Blendon, Brocksburg, Hord, and O'Neill soils. Blendon soils are deep and do not have appreciable gravel in the control section. Brocksburg soils have a mollic epipedon that extends below a depth of 20 inches and have gravelly sand at a depth of 20 to 40 inches. Hord soils are deep and have more silt and clay in the control section than the Meadin soils. O'Neill soils have gravelly sand at a depth of 20 to 40 inches.

Typical pedon of Meadin sandy loam, 2 to 9 percent slopes, 1,000 feet north and 100 feet west of southeast corner sec. 2, T. 15 N., R. 4 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—7 to 11 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; loose, very friable; neutral; abrupt smooth boundary.

IIC—11 to 60 inches; very pale brown (10YR 7/3) very gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

The A horizon ranges from 10 to 20 inches in thickness. Depth to the gravelly coarse sand or very gravelly sand ranges from 10 to 20 inches. Reaction is slightly acid or neutral throughout the pedon.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically sandy loam but ranges to loam, coarse sandy loam, and loamy sand. The A horizon has common pebbles. Some pedons have an AC horizon.

The IIC horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4 dry or moist. In places it contains thin layers of loamy coarse sand.

Merrick series

The Merrick series consists of deep, moderately well drained soils on bottom lands. These soils formed in stratified, silty and loamy alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Merrick soils are commonly associated with Fonner, Gibbon, Leshara, Lex, Novina, and Wann soils. All associated soils are on bottom lands at a slightly lower elevation, except Novina soils which are slightly higher. Fonner and Lex soils have gravelly sand at a depth of 20 and 40 inches. Gibbon and Leshara soils have free

carbonates in the control section and are somewhat poorly drained. Novina and Wann soils have a coarse-loamy control section.

Typical pedon of Merrick loam, 0 to 1 percent slopes, 100 feet south and 100 feet east of northwest corner sec. 16, T. 12 N., R. 7 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 12 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

A13—12 to 30 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

C1—30 to 42 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C2—42 to 48 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/4, moist) mottles; weak coarse blocky structure; hard, friable; neutral; clear smooth boundary.

C3—48 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; few fine distinct brown (10YR 5/4, moist) mottles; massive; slightly hard, friable; slightly acid.

The solum ranges from 20 to 38 inches in thickness and corresponds with the thickness of the mollic epipedon. Typically, most pedons do not have free carbonates in the upper 40 inches, but small amounts of free carbonates are at a depth of 30 inches in some pedons.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. Typically, it is loam but ranges to silt loam in some pedons. The A horizon is slightly acid or neutral. An AC horizon is present in some pedons.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 dry and 4 through 6 moist, and chroma of 2 or 3 dry or moist. Typically, it is loam and silt loam but ranges to clay loam. The C horizon is fine sandy loam, sandy loam, or coarser textures below a depth of 40 inches in some pedons. It is slightly acid or neutral, except in those horizons that are calcareous and are mildly alkaline or moderately alkaline. The C horizon has mottles in some pedons.

Nora series

The Nora series consists of deep, well drained soils on uplands. These soils formed in calcareous loess. Permeability is moderate. Slope ranges from 6 to 15 percent.

In Merrick County, Nora soils have a thinner A horizon than defined as the range for the series. This, however, does not influence the behavior or use of these soils.

Nora soils are similar to Crofton and Holder soils and are commonly associated with Crofton, Hobbs, and Holder soils. Crofton soils do not have a mollic epipedon or a B horizon. They are calcareous at or near the surface. Hobbs soils are stratified above a depth of 10 inches and do not have a B horizon. They are on bottom lands of narrow drainageways and are subject to occasional flooding. Holder soils have more clay in the B horizon and greater depth to free carbonates than Nora soils and are on divides above Nora soils.

In Merrick County, Nora soils are mapped only in a complex with Crofton soils.

Typical pedon of Nora silt loam, from an area of Crofton-Nora silt loams, 6 to 11 percent slopes, eroded, 2,600 feet north and 100 feet east of southwest corner sec. 7, T. 16 N., R. 8 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, friable; neutral; abrupt smooth boundary.

B2—5 to 19 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; hard, friable; neutral; clear smooth boundary.

B3—19 to 28 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, friable; neutral; clear smooth boundary.

C—28 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

The solum ranges from 20 to 36 inches in thickness. Depth to free carbonates ranges from 12 to 30 inches.

The A horizon is 4 to 6 inches thick. It has value of 3 or 4 dry and 2 or 3 moist and chroma of 2 dry or moist. The A horizon is slightly acid or neutral.

The B horizon has value of 5 or 6 dry and 2 through 4 moist and chroma of 2 or 3 dry or moist. It is typically silt loam but ranges to light silty clay loam. The B horizon is 25 to 32 percent clay and is slightly acid to mildly alkaline.

The C horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 2 through 4 dry or moist. It is mildly alkaline or moderately alkaline.

Novina series

The Novina series consists of deep, moderately well drained soils on bottom lands. These soils formed in noncalcareous, loamy alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Novina soils are similar to Alda and Ovina soils and are commonly associated with Alda, Fonner, Merrick, Ovina, and Wann soils. Alda soils are somewhat poorly drained and have gravelly sand at a depth of 20 to 40 inches. Fonner soils are in the sandy class and have coarse sand or gravelly sand at a depth of 20 to 40 inches. Ovina soils are somewhat poorly drained and calcareous throughout the profile. Merrick soils are fine-loamy. Wann soils are calcareous at or near the surface and are somewhat poorly drained.

Typical pedon of Novina sandy loam, 0 to 2 percent slopes, 1,320 feet west and 100 feet north of the southeast corner sec. 29, T. 16 N., R. 3 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—7 to 19 inches; gray (10YR 5/1) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

AC—19 to 26 inches; gray (10YR 5/1) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—26 to 33 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; few fine distinct reddish brown (5YR 5/3, moist) mottles; weak fine and medium subangular blocky structure; hard, friable; mildly alkaline; clear smooth boundary.

C2—33 to 38 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; few fine faint reddish brown (5YR 5/3, moist) mottles; weak fine and medium subangular blocky structure; hard, friable; mildly alkaline; abrupt smooth boundary.

C3—38 to 42 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.

C4—42 to 50 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct reddish brown (5YR 5/3, moist) mottles; massive; hard, friable; slight effervescence; mildly alkaline; clear wavy boundary.

C5—50 to 60 inches; white (2.5Y 8/2) loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline.

The solum ranges from 18 to 28 inches in thickness. The mollic epipedon is 7 to 20 inches thick. Typically, free carbonates are below a depth of 36 inches, and some pedons do not have carbonates above a depth of 60 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically sandy loam but ranges to fine sandy loam and loam. The A horizon is slightly acid or neutral. Some pedons do not have an AC horizon.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 8 dry and 4 through 6 moist, and chroma of 1 or 2 dry or moist. It is typically loam or sandy loam. In some pedons, the C horizon has strata that range from loamy fine sand through silty clay loam. The C horizon is neutral through moderately alkaline; however, in some pedons it is strongly alkaline in the lower part. It has mottles that have hue of 5YR or 7.5YR, value of 3 through 5, and chroma of 3 through 6 moist.

O'Neill series

The O'Neill series consists of well drained soils on stream terraces. These soils are moderately deep over coarse sand or gravelly sand (fig. 21). They formed in alluvium. Permeability is rapid through the upper part of the profile and very rapid in the underlying material. Slope ranges from 0 to 6 percent.

In Merrick County, O'Neill soils have a mollic epipedon that is thicker than 20 inches and the profile does not have contrasting textures. These characteristics are outside the defined range of the series. The differences, however, do not alter the use or behavior of these soils.

O'Neill soils are similar to Brocksburg and Simeon soils and are commonly associated with Blendon, Brocksburg, Hord, Meadin, and Simeon soils. Blendon soils are deep and do not have an appreciable amount of gravel in the control section. Brocksburg soils have more clay in the control section than O'Neill soils. Hord soils are deep and have less sand in the control section. Meadin soils have more gravel in the control section and are 10 to 20 inches thick over very gravelly sand. Simeon soils have more sand in the control section.

Typical pedon of O'Neill sandy loam, 0 to 2 percent slopes, 1,350 feet north and 100 feet west of southeast corner sec. 5, T. 15 N., R. 4 W.

A11—0 to 10 inches; dark gray (10YR 4/1) sandy loam, very dark (10YR 3/1) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

A12—10 to 23 inches; dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

B2—23 to 30 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; soft, very friable; neutral; abrupt smooth boundary.

IIC1—30 to 39 inches; light brownish gray (10YR 6/2) coarse sand, with 10 percent gravel, grayish brown (10YR 5/2) moist; single grained; loose; neutral; clear smooth boundary.

IIC2—39 to 48 inches; light gray (10YR 7/2) gravelly sand, light brownish gray (10YR 6/2) moist; single grained; loose; neutral; clear smooth boundary.

IIC3—48 to 60 inches; very pale brown (10YR 7/3) gravelly sand, light gray (10YR 7/2) moist; single grained; loose; neutral.

The solum ranges from 20 to 40 inches in thickness. The mollic epipedon generally is 20 to 30 inches thick.

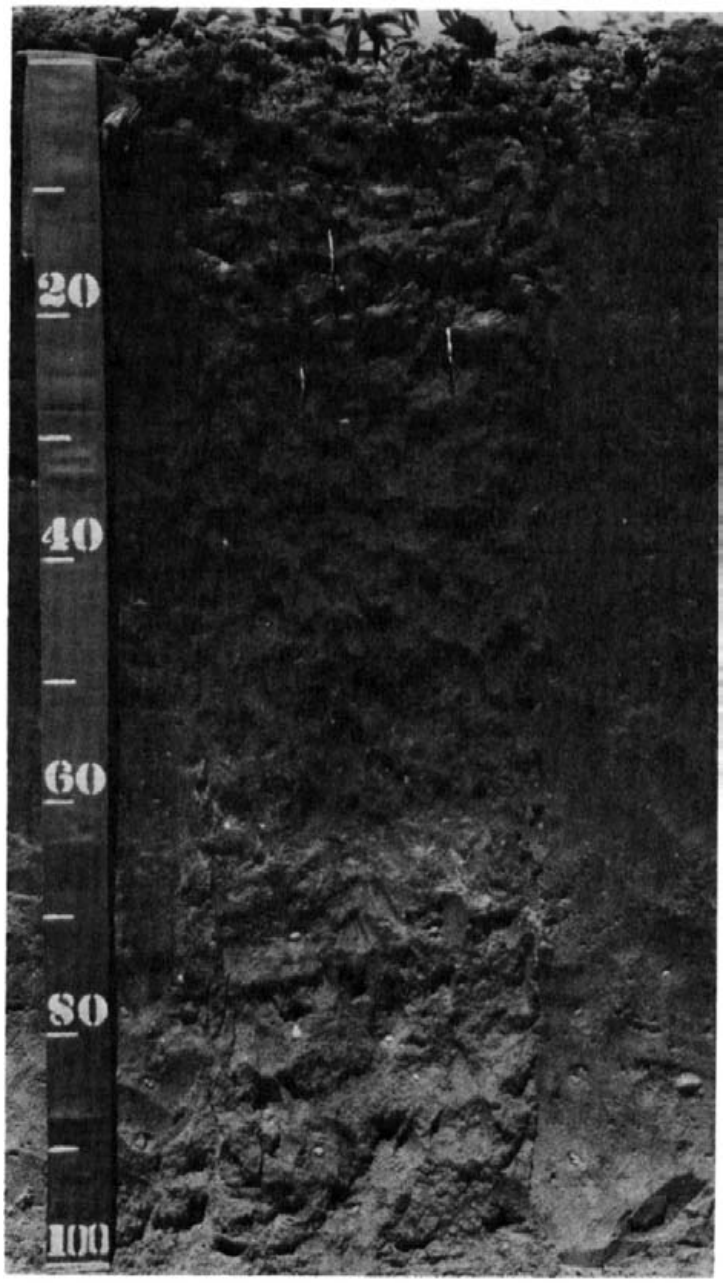

Figure 21.—Profile of O'Neill loam. This well drained soil is moderately deep over coarse sand and gravelly sand. The darkened surface layer extends to a depth of 62 centimeters, or about 25 inches.

Depth to coarse sand or gravelly sand ranges from 20 to 40 inches. Reaction is slightly acid or neutral throughout.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is typically sandy loam or loam but ranges to fine sandy loam.

The B horizon has value of 4 or 5 dry and 3 or 4 moist and chroma of 2 through 4 dry or moist. It is typically loamy sand but ranges to fine sandy loam and sandy loam. In some pedons in the lower part of the B horizon, clay has accumulated and this layer is noticeably finer textured than the layer above or below.

The IIC horizon has value of 6 or 7 dry and 5 through 7 moist and chroma of 2 or 3 dry or moist. It is sand and has 3 to 15 percent gravel or is gravelly sand and has 15 to 35 percent gravel.

Ovina series

The Ovina series consists of deep, somewhat poorly drained soils on bottom lands and stream terraces. These soils formed in alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Ovina soils are similar to Wann and Novina soils and are near Gibbon, Leshara, Ipage, Valentine, and Wann soils. Ipage soils have more sand in the control section than Ovina soils. Gibbon and Leshara soils have more clay in the control section. Novina soils are commonly noncalcareous throughout the profile and are moderately well drained. Valentine soils have more sand in the control section and are excessively drained. Wann soils have more sand in the control section and do not have layers of loam in the lower part of the control section.

Typical pedon of Ovina loam, 0 to 1 percent slopes, 1,500 feet south and 100 feet east of the northwest corner sec. 29, T. 15 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A12—6 to 12 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C1—12 to 22 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium blocky structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C2—22 to 30 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium blocky structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C3—30 to 42 inches; gray (10YR 6/1) loam, grayish brown (10YR 5/2) moist; few medium distinct dark

brown (7.5YR 4/4, moist) mottles; weak medium blocky structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C4—42 to 52 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium blocky structure; slightly hard, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C5—52 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; few fine faint brown (7.5YR 5/4, moist) mottles; weak fine and medium blocky structure; slightly hard, very friable; mildly alkaline.

The solum ranges from 10 to 20 inches in thickness. The mollic epipedon is 7 to 20 inches thick. Depth to carbonates ranges from the surface to 10 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist.

The C horizon has hue of 10YR or 2.5Y, value of 4 through 7 dry and 3 through 6 moist, and chroma of 1 or 2 dry or moist. In some pedons at a depth of 20 to 30 inches, the C horizon has strata of silty clay loam or sandy clay loam. The C horizon has reddish brown to light gray mottles.

Platte series

The Platte series consists of poorly drained or somewhat poorly drained soils on bottom lands. These soils are shallow over coarse sand or gravelly sand. They formed in stratified alluvium. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

Platte soils are similar to Barney and Lex soils and are commonly associated with Alda, Barney, Gothenburg, Leshara, and Lex soils. Alda soils have more silt and less sand in the upper part of the control section than Platte soils and have gravelly sand at a depth of 20 to 40 inches. Barney soils have a higher water table during the growing season and are more frequently flooded. Gothenburg soils have a lighter colored A horizon and are generally thinner over the gravelly sand. Leshara soils are deep and have more clay in the control section. Lex soils have more clay in the upper part of the control section and gravelly sand between a depth of 20 to 40 inches.

Typical pedon of Platte loam, 0 to 2 percent slopes, 2,000 feet south and 100 feet west of northeast corner sec. 7, T. 14 N., R. 4 W.

A1—0 to 7 inches; gray (10YR 5/1) loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

AC—7 to 12 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; common fine distinct brown (7.5YR 5/4, moist) mottles; weak fine subangular blocky structure; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

C1—12 to 15 inches; light brownish gray (10YR 6/2) loamy sand, grayish brown (10YR 5/2) moist; common medium prominent strong brown (7.5YR 5/6, moist) mottles; single grained; loose; mildly alkaline; clear smooth boundary.

IIC2—15 to 60 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

The solum ranges from 7 to 12 inches in thickness. Depth to the coarse sand or gravelly sand ranges from 10 to 20 inches. Typically carbonates are at the surface, but some pedons do not have carbonates.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is loam, fine sandy loam, sandy loam, or loamy fine sand. The A horizon is neutral to moderately alkaline. Some pedons do not have an AC horizon.

The C1 horizon has value of 6 or 7 dry and 5 or 6 moist and chroma of 1 or 2 dry or moist. It is sandy loam to sand. The AC, C1 and IIC2 horizons have common or many grayish and brownish mottles. The IIC2 horizon is coarse sand or gravelly sand, and the content of gravel ranges from 2 to 35 percent.

Rusco series

The Rusco series consists of deep, moderately well drained soils on stream terraces and in shallow basins and depressions. These soils formed in silty or loamy alluvium or in loess. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

Rusco soils are commonly associated with Hord, Kenesaw, and Loretto soils. Those soils are well drained and generally are at a slightly higher elevation than Rusco soils. Hord soils are darker in the upper part of the B horizon than Rusco soils and do not have free carbonates in the control section. Kenesaw soils have less clay in the B horizon. The Loretto soils have more sand in the control section.

Typical pedon of Rusco silt loam, 0 to 2 percent slopes, 600 feet north and 100 feet east of southwest corner sec. 1, T. 14 N., R. 8 W.

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

A12—5 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; hard, friable; neutral; clear smooth boundary.

B21t—12 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2)

moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B22t—16 to 24 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct brown (7.5YR 5/6, moist) mottles; weak fine and medium subangular blocky structure; hard, firm; mildly alkaline; clear smooth boundary.

C1—24 to 36 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct strong brown (7.5YR 5/6, moist) mottles; massive; slightly hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

C2—36 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; common medium distinct strong brown (7.5YR 5/6, moist) mottles; massive; slightly hard, very friable; strong effervescence; few small masses of calcium carbonate; moderately alkaline.

The solum ranges from 20 to 32 inches in thickness. The mollic epipedon is 7 to 14 inches. The depth to free carbonates ranges from 16 to 30 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. The A horizon typically is silt loam, but in some pedons it is silty clay loam.

The B horizon has value of 4 through 6 dry and 3 through 5 moist and chroma of 1 through 3 dry or moist. The darker colors are in the upper part of the B horizon.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 dry and 4 through 6 moist, and chroma of 1 through 3 dry or moist. It typically has few or common, faint or distinct, strong brown, dark yellowish brown, or reddish yellow (moist) mottles. The C horizon in some pedons commonly contains strata of loamy textures.

Saltine series

The Saltine series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in calcareous alluvium and are strongly alkaline or very strongly alkaline. Permeability is moderately slow. Slope is 0 to 1 percent.

Saltine soils are similar to Caruso soils and are commonly associated with Caruso, Lamo, Leshara, Gibbon, and Gayville soils. Caruso soils have more sand in the control section and are not so strongly alkaline as Saltine soils. Lamo, Leshara, and Gibbon soils are less alkaline and have a mollic epipedon. Gayville soils have more clay in the control section and have a natric horizon.

In Merrick County, Saltine soils are mapped only in a complex with Lamo soils.

Typical pedon of Saltine silt loam, in an area of Lamo-Saltine complex, 0 to 1 percent slopes, 2,200 feet north and 100 feet east of southwest corner sec. 6, T. 14 N., R. 5 W.

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

A12—6 to 12 inches; gray (10YR 5/1) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; hard, friable; slight effervescence; strongly alkaline; clear smooth boundary.

B21—12 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, firm; slight effervescence; strongly alkaline; clear smooth boundary.

B22—18 to 24 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, firm; slight effervescence; strongly alkaline; clear smooth boundary.

B3ca—24 to 42 inches; gray (2.5Y 6/1) silty clay loam, dark gray (2.5Y 4/1) moist; common medium distinct light gray (10YR 7/1, moist) mottles; moderate medium and coarse subangular blocky structure; very hard, firm; strong effervescence; strongly alkaline; clear smooth boundary.

C1ca—42 to 48 inches; gray (2.5Y 6/1) silty clay loam, dark gray (2.5Y 4/1) moist; common medium distinct light gray (10YR 7/1, moist) mottles; moderate coarse subangular blocky structure; very hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.

C2—48 to 60 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; few fine distinct brown (7.5YR 5/2, moist) mottles; weak fine subangular blocky structure; soft, friable; mildly alkaline.

The solum ranges from 24 to 42 inches in thickness. Typically carbonates are not in the surface layer, but in some pedons depth to carbonates ranges from 0 to 10 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6 dry and 2 through 5 moist, and chroma of 1 or 2 dry or moist. Typically it is silt loam, but ranges to silty clay loam and less commonly to loam and clay loam. The A horizon is mildly alkaline or moderately alkaline.

The B horizon has hue of 10YR or 2.5Y, value of 4 through 7 dry and 3 through 6 moist, and chroma of 1 or 2 dry or moist. Typically it is silty clay loam, but in some pedons it has layers of clay loam or silty clay. The B horizon is strongly alkaline or very strongly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 6 dry and 2 through 5 moist, and chroma of 1 through 3 dry or moist. It is typically silty clay loam, but ranges to silt loam and very fine sandy loam. In some pedons below a depth of 40 inches, the C horizon has strata of finer or coarser textures.

Simeon series

The Simeon series consists of deep, excessively drained soils on stream terraces. These soils formed in sandy alluvium that has been reworked by wind. Permeability is rapid. Slope ranges from 0 to 3 percent.

Simeon soils are similar to O'Neill soils and are commonly associated with O'Neill, Thurman, and Valentine soils. The associated soils are generally higher in the landscape than Simeon soils. O'Neill soils are moderately deep over gravelly sand and have a mollic epipedon. Thurman soils have a mollic epipedon. Thurman and Valentine soils do not have an appreciable amount of gravel in the underlying material.

Typical pedon of Simeon loamy sand, 0 to 3 percent slopes, 1,320 feet south and 150 feet east of northwest corner sec. 13, T. 16 N., R. 6 W.

A1—0 to 9 inches; gray (10YR 5/1) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose, very friable; neutral; clear smooth boundary.

AC—9 to 15 inches; grayish brown (10YR 5/2) loamy sand with about 4 percent gravel, dark grayish brown (10YR 4/2) moist; single grained; loose, very friable; neutral; clear smooth boundary.

C1—15 to 30 inches; very pale brown (10YR 7/3) coarse sand with about 4 percent gravel, pale brown (10YR 6/3) moist; single grained; loose; neutral; clear smooth boundary.

C2—30 to 42 inches; white (10YR 8/2) sand with about 7 percent gravel, very pale brown (10YR 7/3) moist; single grained; loose; neutral; gradual wavy boundary.

C3—42 to 60 inches; very pale brown (10YR 8/3) coarse sand with about 10 percent gravel, very pale brown (10YR 7/3) moist; single grained; loose; neutral.

The solum ranges from 7 to 20 inches in thickness. Reaction ranges from slightly acid to neutral throughout the pedon. The pedon does not have free carbonates.

The A horizon has value of 3 through 6 dry and 2 through 5 moist and chroma of 1 or 2 dry or moist. It typically is loamy sand but ranges to loamy fine sand and sand.

The C horizon has value of 6 through 8 dry and 5 through 7 moist and chroma of 2 or 3 dry or moist. It ranges from sand to coarse sand with 2 to 15 percent gravel. The percentage of gravel in the C horizon generally increases below a depth of 40 inches.

Thurman series

The Thurman series consists of deep, somewhat excessively drained soils on stream terraces. These soils formed in sandy eolian material. Permeability is rapid. Slope ranges from 0 to 6 percent.

Thurman soils are similar to Inavale and Valentine soils and are commonly adjacent to Boelus, Els, Libory, and Valentine soils. Inavale soils have a thinner A horizon than Thurman soils and are stratified. Boelus soils have more silt and clay in the lower part of the control section. Els soils are somewhat poorly drained. Libory soils have more silt and clay in the lower part of the control section and have mottles above a depth of 40 inches. Valentine soils have a thinner A horizon.

Typical pedon of Thurman loamy fine sand, 0 to 3 percent slopes, 400 feet north and 100 feet east of southwest corner of sec. 7, T. 15 N., R. 6 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—6 to 14 inches; dark gray (10YR 4/1) loamy fine sand, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

AC—14 to 19 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C1—19 to 30 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; clear smooth boundary.

C2—30 to 60 inches; pale brown (10YR 6/3) loamy fine sand; grayish brown (10YR 5/2) moist; single grained; loose; neutral.

The solum ranges from 12 to 28 inches in thickness. The mollic epipedon is 7 to 20 inches thick. The pedon does not have carbonates above a depth of 5 feet. Reaction is slightly acid or neutral throughout.

The A horizon has value of 3 through 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. Some pedons do not have an AC horizon.

The C horizon has value of 5 or 6 dry and 4 or 5 moist and chroma of 3 or 4 dry or moist. Typically, it is loamy fine sand but ranges to fine sand.

Valentine series

The Valentine series consists of deep, excessively drained soils on uplands and stream terraces. These soils formed in sandy, eolian material. Permeability is rapid. Relief ranges from 1 to 50 feet. Slope ranges from 0 to 20 percent.

Valentine soils are similar to Inavale and Thurman soils and are commonly adjacent to Boelus, Els, Ipage, Libory, Marlake, and Thurman soils. Boelus soils have a sandy over loamy control section. Els soils have a mollic epipedon and are more poorly drained than Valentine soils. Inavale soils formed in stratified alluvium. Ipage soils have a mollic epipedon, are moderately well drained, and have mottles within a depth of 40 inches. Libory soils have a sandy over loamy control section and have mottles above a depth of 40 inches. Marlake soils

are very poorly drained and are in basins that are commonly ponded. Thurman soils have a mollic epipedon.

Typical pedon of Valentine fine sand, 3 to 9 percent slopes, 2,550 feet north and 50 feet east of southwest corner sec. 16, T. 15 N., R. 6 W.

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

AC—4 to 8 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable; medium acid; clear smooth boundary.

C—8 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose, very friable; medium acid.

The solum ranges from 5 to 17 inches in thickness. The thickness of the surface layer ranges from 3 to 9 inches.

The A horizon has value of 4 through 6 dry and 3 through 5 moist and chroma of 2 dry or moist. It is medium acid through neutral. Some pedons do not have an AC horizon.

The C horizon has value of 6 or 7 dry and 5 or 6 moist and chroma of 2 through 4 dry or moist. It dominantly is fine sand but ranges to loamy sand.

Wann series

The Wann series consists of deep, somewhat poorly drained soils on bottom lands. These soils formed in alluvium. Permeability is moderately rapid. Slope ranges from 0 to 2 percent.

Wann soils are similar to Alda, Janude, and Ovina soils and are commonly associated with Alda, Inavale, Janude, Lex, Ovina, and Platte soils. Alda soils have gravelly sand and coarse sand at a depth of 20 to 40 inches. Inavale soils have more sand in the control section than Wann soils. Janude soils are not calcareous and are moderately well drained. Lex soils have gravelly sand and coarse sand at a depth of 20 to 40 inches and have less fine and coarser sand in the upper part of the control section. Ovina soils have less sand in the control section. Platte soils have gravelly sand or coarse sand at a depth of 10 and 20 inches.

Typical pedon of Wann sandy loam, 0 to 2 percent slopes, 2,300 feet west and 100 feet south of northeast corner sec. 15, T. 14 N., R. 5 W.

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

A12—7 to 14 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

AC—14 to 20 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—20 to 42 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; few fine distinct olive brown (2.5Y 4/4, moist) mottles; thin strata of coarser textures; weak fine subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—42 to 60 inches; very pale brown (10YR 7/2) sand, pale brown (10YR 6/2) moist; single grained; loose; mildly alkaline.

The solum ranges from 10 to 20 inches in thickness and corresponds with the thickness of the mollic epipedon. Depth to free carbonates ranges from the surface to 10 inches.

The A horizon has value of 4 or 5 dry and 2 or 3 moist and chroma of 1 or 2 dry or moist. It is neutral or mildly alkaline. Some pedons do not have an AC horizon.

The C horizon has value of 5 through 7 dry and 4 through 6 moist and chroma of 1 or 2 dry or moist. It is mildly alkaline or moderately alkaline.

formation of the soils

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly 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 effects 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. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects 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 disintegrated and partly weathered rock in which soil forms. It determines the mineral and chemical composition of the soil. The soils in Merrick County formed in four kinds of parent material: Peoria Loess, a younger loess than Peoria Loess, eolian sand, and alluvium.

The Peoria Loess is brown or yellowish brown, friable, and calcareous. It was blown out of the river and stream valleys and deposited on uplands. This loess is mostly silt but contains some clay and a small amount of sand. It is commonly 15 to 30 feet thick but ranges from a few feet to more than 60 feet. The Holder, Nora, and Crofton soils formed in Peoria Loess.

The sandy soils in the northern part of Merrick County formed in eolian sand and a loess that is younger than the Peorian Loess. The sand was blown out of the Loup River Valley by northwesterly winds and deposited over the loess and old stream sediment. This mantle of sand and loess ranges from a few feet to 30 feet in thickness. The Valentine and Thurman soils formed mainly in the eolian sands. The Boelus soils formed in sands thinly deposited over the loess. The Loretto and Libory soils formed in a mixture of sands and silty loess or a loesslike deposit.

Alluvium is water-deposited sediment on stream terraces and bottom lands. In Merrick County, alluvium ranges from clay to sand in texture. It is commonly stratified. This alluvium was deposited to a depth of 1 foot to 8 feet over coarse sand or gravelly sand. The most recent alluvium is in the narrow upland drainageways and along the major streams where fresh material is deposited by flooding after heavy rains. The Gothenburg and Hobbs soils formed in the most recent alluvium.

The alluvium on the flood plains and stream terraces in the Platte and Loup River Valleys is mixed deposits transported by the streams. This alluvium is derived from the adjacent uplands and from more distant areas outside the county. The Blendon, Brocksburg, Hord, and O'Neill soils formed in alluvium on stream terraces. The Alda, Fonner, Gibbon, Inavale, Lamo, Lex, and Wann soils formed in alluvium on bottom lands.

There are no formations of bedrock exposed at the surface in Merrick County.

climate

Climate affects the formation of soils through its influence on the rate of weathering and reworking of parent material by rainfall, temperature, and wind. Because soil formation progresses slowly when the soil is dry, soils in arid regions generally are less well developed than those in humid regions. The amount of moisture, the length of the growing season, and the prevailing temperature during the growing season affect the amount of vegetation, which is the principal source of organic matter in soils. These same factors directly affect the activity of the micro-organisms that convert organic matter to humus. Wind also is an important factor, in that it can remove the top layer of soil or it can deposit a mantle of sediment on soil.

Merrick County has a continental climate characterized by wide day-to-day and season-to-season variations. The average annual temperature is 50 degrees F. The average annual precipitation is approximately 25 inches. Damaging hail storms are infrequent. The frost-free season averages 160 days and thus provides an adequate growing season for most common grain and forage crops. If moisture is sufficient, frost penetrates to a depth of 2 to 3.5 feet. The prevailing direction of the wind is from the south or southwest from May through September and from northwest during the remainder of the year.

The climate is fairly uniform throughout the county. Thus, differences in the soils from one place to another are not the result of climate alone, but of the interrelationship of climate and other soil forming factors. The amount of leaching, for example, is dependent not only on the amount of precipitation, but also on the relief in the area. Because runoff and evaporation are greater, leaching is less in the steeper soils and on soils that are exposed more directly to the wind than in the nearly level soils that receive the same amount of rainfall. Erosion caused by rain, melting snow, and wind can prevent development of a thick surface layer, especially on the steeper areas.

plant and animal life

After the parent material was deposited, bacteria, fungi, and other simple forms of life invaded it. After a time, prairie grasses began to grow, sending fibrous roots into the upper few feet of the soil. The roots of the grasses helped to keep the soils productive by bringing water from the deeper horizons and thus contributing soluble minerals, such as calcium, iron, phosphorus, nitrogen, and sulfur. Plant roots not only produced useful nutrients for plants, but also helped to develop better soil structure and helped to aerate the soil.

When plants decay, micro-organisms, such as bacteria, nematodes, and protozoa, act upon the organic matter and decompose it into stable humus. Nitrogen-fixing bacteria in nodules on the roots of certain legumes remove nitrogen from the air. When the bacteria die, the nitrogen becomes available in the soil. Fungi and such small animals as millipedes, spiders, and mites also act upon organic matter and decompose it into humus. Earthworms, insects, and small burrowing animals affect the formation of soils by mixing and working the organic and mineral matter. The mixing and working speed soil development and make the soil more friable.

The accumulation of decayed organic matter gradually darkens the color and changes the physical and chemical characteristics of the surface layer. The soil is enriched with plant nutrients from the decaying organic matter. The tilth is improved, permeability to air and water is established, and water movement into the soil and through the soil is increased. In Merrick County, Lamo silt loam, wet, is an example of a soil with a high content of organic matter. The Crofton and Valentine soils are low in content of organic matter.

relief

Relief, or the lay of the land, influences soil formation mainly through its effect on drainage, runoff, and plant growth. The degree of slope, shape of the surface, and permeability of the soil determine the rate of runoff, internal drainage, and moisture content of the soil. Internal drainage and availability of moisture are important factors in forming the horizons of a soil.

The nearly level and gently sloping soils on uplands have stronger development and more distinct soil horizons than the strongly sloping to steep soils on uplands. Also, lime and plant nutrients are leached to greater depths, and a B horizon develops. The Holder, Kenesaw, and Nora soils have distinct subsoil horizons. The Crofton soils are not so well developed because water runs off these soils faster and erosion is greater. Less water has been absorbed by the Crofton soils, and soil formation is slow.

On steep slopes, where runoff is rapid and little moisture penetrates the soil, development of the soil is slower than on the gentler slopes. Erosion removes the surface soil almost as fast as it is formed. Lime and other elements are not leached so deeply. In Merrick County, the moderately steep and steep Crofton soils have little development in their profile other than a slightly darkened, thin surface layer.

The nearly level stream terraces in the central part of Merrick County receive little or no additional moisture from runoff of adjacent slopes or from the water table. Soil development on the stream terraces is slower than in soils that receive additional moisture. Development is moderate in these soils; however, the lime and plant nutrients are generally leached from the normal plant root zone. Examples of soils that have a moderate degree of development in their profiles are the Brocksburg, Blendon, and O'Neill soils.

Nearly level soils on bottom lands may receive extra water through flooding from adjacent creeks and streams. In these areas the soils are moderately well drained to poorly drained because of slow runoff or the fluctuating water table. The water table provides additional moisture to the root zone by capillary action and is a benefit to the plants. The moisture in the soil affects the mineral and chemical compostion. It also affects the kind and amount of vegetation, which in turn influences soil development. In Merrick County, the Fonner, Lockton, and Novina soils are moderately well drained. The Alda, Els, Gibbon, Leshara, Lex, and Wann soils are somewhat poorly drained. The Barney, Lamo wet, and Platte wet soils are poorly drained.

Differences in the lay of the land slow some processes of horizon differentiation and hasten others. Relief is a local factor of soil formation. Ordinarily, soils on uplands and stream terraces that have gentle slopes have a thick solum and distinct horizons; soils that have steeper slopes have a thinner solum and less distinct horizons.

time

Time is required for the formation of a mature soil. Mature or old soils have a thick, dark-colored surface layer and a distinct subsoil. Soil materials in which these soils formed have been in place long enough for climate, plant and animal life, and relief to alter the parent material. They are approaching equilibrium with their environment and are considered to be mature, or old soils. In Merrick County, Holder and Nora soils are examples of mature soils with well expressed horizons.

Most of the soils on stream terraces have a more well defined sequence of genetic horizons than the soils on bottom lands. Brocksburg, Hord, and Hall are examples of soils on stream terraces. The young or immature soils have not had sufficient time to form distinct horizons. The Boel, Hobbs, Inavale, and Platte soils are examples of immature soils on bottom lands. The Crofton and Valentine soils are examples of immature soils on uplands.

The degree of profile development depends on the intensity of the different soil forming factors, on the length of time they have been active, and on the nature of the parent material. Differences in the length of time that geologic materials have been in place are commonly reflected in the distinctness of horizons in the soil profile.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

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.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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 expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

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.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. In this survey, the total thickness of soil material over coarse sand or gravelly sand. Depth classes are *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 removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.
Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.
Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.
Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

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 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 the surface.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

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.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

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.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon 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.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have 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 in which the solum 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.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

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 simple 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.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Organic matter content. The amount of organic matter in soil material. The classes in this survey are *very low*, less than 0.5 percent; *low*, 0.5 to 1.0 percent; *moderately low*, 1.0 to 2.0 percent; *moderate*, 2.0 to 4.0 percent; and *high*, 4.0 to 8.0 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good,

fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure 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
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 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.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

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. In this survey, the classes of slope are *nearly level*, 0 to 1 percent and 0 to 2 percent;*very gently sloping*, 1 to 3 percent;*gently sloping*, 2 to 6 percent and 3 to 6 percent; *strongly sloping*, 6 to 9 percent and 6 to 11 percent; *moderately steep*, 9 to 20 percent and 11 to 15 percent; and *steep*, 15 to 30 percent.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It 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.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in 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 plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or 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).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

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 water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or 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 loam, silt, 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 physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disinintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well disturbuted over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-73 at Central City, Nebraska]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	33.7	11.3	22.5	63	-19	0	.47	.13	.73	2	4.7
February---	40.3	17.4	28.9	72	-13	7	.92	.23	1.46	2	6.1
March------	48.4	25.3	36.9	81	-3	52	1.35	.33	2.17	4	5.2
April------	64.5	38.0	51.3	90	17	122	2.32	1.21	3.22	5	.7
May--------	74.8	49.2	62.0	95	29	380	4.01	2.14	5.54	7	.3
June-------	84.7	59.6	72.2	103	41	666	4.31	1.81	6.33	7	.0
July-------	89.3	63.8	76.6	104	48	825	3.44	1.92	4.68	6	.0
August-----	87.9	62.6	75.3	102	46	784	2.54	1.10	3.70	5	.0
September--	78.2	52.1	65.2	99	31	456	2.97	1.12	4.46	5	.0
October----	68.2	40.7	54.5	90	20	194	1.42	.29	2.30	3	.0
November---	51.1	27.1	39.1	75	4	6	.75	.13	1.22	2	2.7
December---	38.3	16.7	27.5	67	-13	0	.68	.20	1.05	2	6.4
Yearly:											
Average--	63.3	38.7	51.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	105	-20	---	---	---	---	---	---
Total----	---	---	---	---	---	3,492	25.18	19.60	30.43	50	26.1

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-73 at Central City, Nebraska]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 24	May 5	May 17
2 years in 10 later than--	April 19	April 29	May 11
5 years in 10 later than--	April 9	April 17	April 30
First freezing temperature in fall:			
1 year in 10 earlier than--	October 14	October 6	September 27
2 years in 10 earlier than--	October 19	October 10	October 2
5 years in 10 earlier than--	October 28	October 18	October 11

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-73 at Central City, Nebraska]

Probability	Daily minimum temperature during growing season		
	Higher than 24°F	Higher than 28°F	Higher than 32°F
	Days	Days	Days
9 years in 10	181	162	138
8 years in 10	188	169	147
5 years in 10	202	183	163
2 years in 10	215	197	179
1 year in 10	222	204	187

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ac	Alda sandy loam, 0 to 2 percent slopes	5,300	1.7
Ag	Alda loam, 0 to 1 percent slopes	6,400	2.1
Bb	Barney loam, 0 to 2 percent slopes	2,250	0.7
Bd	Blendon fine sandy loam, 0 to 2 percent slopes	2,850	0.9
BdC	Blendon fine sandy loam, 2 to 6 percent slopes	370	0.1
Bf	Blendon Variant fine sandy loam, 0 to 2 percent slopes	2,100	0.7
Bk	Boel loam, 0 to 2 percent slopes	700	0.2
Br	Brocksburg loam, 0 to 1 percent slopes	11,000	3.5
Cg	Caruso-Gayville complex, 0 to 1 percent slopes	6,700	2.1
Co	Cozad loam, wet substratum, 0 to 1 percent slopes	7,200	2.3
CrF	Crofton silt loam, 15 to 30 percent slopes	1,300	0.4
CsD2	Crofton-Nora silt loams, 6 to 11 percent slopes, eroded	640	0.2
CsE2	Crofton-Nora silt loams, 11 to 15 percent slopes, eroded	830	0.3
Eb	Els loamy fine sand, 0 to 2 percent slopes	1,950	0.6
Fn	Fonner sandy loam, 0 to 2 percent slopes	8,600	2.7
Fp	Fonner loam, 0 to 1 percent slopes	2,500	0.8
Fv	Fonner Variant loamy sand, 0 to 2 percent slopes	3,700	1.2
Gc	Gayville-Caruso complex, 0 to 1 percent slopes	4,700	1.5
Gf	Gayville Variant silt loam, 0 to 2 percent slopes	3,350	1.1
Gg	Gibbon loam, 0 to 2 percent slopes	6,600	2.1
Gt	Gothenburg soils, 0 to 3 percent slopes	8,100	2.6
Ha	Hall silt loam, sandy substratum, 0 to 1 percent slopes	2,700	0.9
Hb	Hobbs silt loam, 0 to 2 percent slopes	300	*
HcB	Hobbs silt loam, channeled, 0 to 3 percent slopes	850	0.3
Hg	Holder silt loam, 0 to 1 percent slopes	200	*
HrB	Hord silt loam, 1 to 3 percent slopes	210	*
Hs	Hord silt loam, sandy substratum, 0 to 1 percent slopes	9,200	2.9
IfD	Inavale loamy sand, 3 to 9 percent slopes	300	*
In	Inavale loamy fine sand, 0 to 3 percent slopes	3,950	1.3
Iv	Ipage loamy fine sand, 0 to 2 percent slopes	6,700	2.1
Iw	Ipage-Els loamy fine sands, 0 to 3 percent slopes	2,600	0.9
Jm	Janude sandy loam, 0 to 2 percent slopes	15,200	4.8
Ks	Kenesaw silt loam, 0 to 2 percent slopes	2,450	0.8
KsC	Kenesaw silt loam, 2 to 6 percent slopes	450	0.1
La	Lamo silt loam, wet, 0 to 1 percent slopes	5,300	1.7
Lb	Lamo clay loam, sandy substratum, 0 to 1 percent slopes	4,700	1.5
Lc	Lamo-Saltine complex, 0 to 1 percent slopes	6,700	2.1
Ld	Lawet Variant fine sandy loam, 0 to 1 percent slopes	500	0.2
Le	Leshara silt loam, 0 to 2 percent slopes	18,500	5.8
Lg	Lex loam, 0 to 1 percent slopes	13,700	4.4
Lk	Lex clay loam, 0 to 1 percent slopes	3,000	1.0
Lm	Lex Variant loam, 0 to 1 percent slopes	3,000	1.0
LoB	Libory loamy fine sand, 0 to 3 percent slopes	3,300	1.0
Lp	Lockton loam, 0 to 1 percent slopes	14,900	4.8
LrB	Loretto fine sandy loam, 0 to 3 percent slopes	3,450	1.1
LvD	Loretto-Valentine complex, 3 to 9 percent slopes	2,500	0.8
Ma	Marlake loamy sand, 0 to 1 percent slopes	290	*
MdD	Meadin sandy loam, 2 to 9 percent slopes	190	*
Me	Merrick loam, 0 to 1 percent slopes	4,350	1.4
Nv	Novina sandy loam, 0 to 2 percent slopes	8,400	2.7
Om	O'Neill sandy loam, 0 to 2 percent slopes	5,900	1.9
OmC	O'Neill sandy loam, 2 to 6 percent slopes	1,550	0.5
On	O'Neill loam, 0 to 1 percent slopes	10,600	3.4
Ow	Ovina loam, 0 to 1 percent slopes	2,700	0.9
Pb	Pits and Dumps	1,000	0.3
Pt	Platte loam, 0 to 2 percent slopes	8,000	2.6
Pv	Platte loam, wet, 0 to 1 percent slopes	3,526	1.1
PwB	Platte-Alda loams, channeled, 0 to 3 percent slopes	2,300	0.7
PxB	Platte-Gothenburg complex, channeled, 0 to 3 percent slopes	1,800	0.6
Ru	Rusco silt loam, 0 to 2 percent slopes	820	0.3
Sm	Simeon loamy sand, 0 to 3 percent slopes	1,100	0.4
ThB	Thurman loamy fine sand, 0 to 3 percent slopes	790	0.3
ThC	Thurman loamy fine sand, 3 to 6 percent slopes	2,350	0.8
VbD	Valentine fine sand, 3 to 9 percent slopes	6,600	2.1
VbE	Valentine fine sand, 9 to 20 percent slopes	4,800	1.6
VcB	Valentine loamy fine sand, 0 to 3 percent slopes	760	0.2
VcD	Valentine loamy fine sand, 3 to 9 percent slopes	4,750	1.5
VeB	Valentine-Boelus loamy fine sands, 0 to 3 percent slopes	900	0.3
VeD	Valentine-Boelus loamy fine sands, 3 to 9 percent slopes	8,200	2.7
Wb	Wann sandy loam, 0 to 2 percent slopes	4,500	1.5
Wm	Wann loam, 0 to 1 percent slopes	9,100	3.0
	Water areas	6,208	1.9
	Total	313,284	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Soybeans	Grain sorghum		Winter wheat	Alfalfa hay	
	N	I	I	N	I	N	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
Ac---------- Alda	56	125	34	60	110	30	2.5	5.0
Ag---------- Alda	62	130	37	70	115	31	2.8	5.4
Bd---------- Blendon	55	130	38	60	110	32	2.5	5.0
BdC---------- Blendon	48	110	34	50	100	25	2.0	4.5
Bf---------- Blendon Variant	58	140	40	65	130	34	2.7	5.5
Bk---------- Boel	40	115	---	45	100	25	2.4	4.5
Br---------- Brocksburg	35	140	40	45	115	26	2.0	5.4
Cg---------- Caruso-Gayville	45	95	26	30	90	28	2.5	4.0
Co---------- Cozad	70	145	50	75	125	42	4.5	6.4
CsD2---------- Crofton-Nora	56	---	---	55	---	28	2.6	4.6
CsE2---------- Crofton-Nora	35	---	---	40	---	25	2.5	---
Eb---------- Els	---	90	---	35	75	20	2.3	3.5
Fn---------- Fonner	40	120	36	40	115	27	1.8	4.5
Fp---------- Fonner	55	135	37	65	120	29	2.0	4.7
Fv---------- Fonner Variant	---	85	---	35	80	20	---	2.6
Gc---------- Gayville-Caruso	---	---	---	---	65	22	1.8	3.4
Gf---------- Gayville Variant	35	75	---	40	80	24	2.2	3.5
Gg---------- Gibbon	75	130	38	85	120	35	4.2	5.8
Ha---------- Hall	60	145	45	75	125	40	3.5	6.2
Hb---------- Hobbs	65	145	43	75	120	36	4.0	6.0
Hg---------- Holder	60	145	45	75	125	40	3.5	6.5
HrB---------- Hord	58	142	42	72	120	37	3.2	6.0

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn		Soybeans	Grain sorghum		Winter wheat	Alfalfa hay	
	N	I	I	N	I	N	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
Hs---------- Hord	60	145	45	75	125	40	3.5	6.2
IfD---------- Inavale	---	75	---	---	60	---	---	3.8
In---------- Inavale	---	90	---	30	90	19	1.4	3.8
Iv---------- Ipage	30	120	---	43	90	24	2.5	4.7
Iw---------- Ipage-Els	---	90	---	40	85	22	3.0	4.3
Jm---------- Janude	75	140	42	75	120	33	3.4	5.8
Ks---------- Kenesaw	55	140	41	60	120	35	3.0	6.0
KsC---------- Kenesaw	40	128	30	50	115	34	2.0	5.6
Lb---------- Lamo	75	125	37	80	110	31	4.0	5.6
Lc---------- Lamo-Saltine	65	105	32	75	100	27	3.7	5.0
Le---------- Leshara	75	130	38	82	120	34	4.3	5.8
Lg---------- Lex	65	135	39	75	115	32	3.2	5.5
Lk---------- Lex	65	130	37	70	110	31	3.0	5.3
Lm---------- Lex Variant	35	80	---	45	85	25	2.8	4.5
LoB---------- Libory	50	120	---	55	115	26	3.2	5.0
Lp---------- Lockton	48	135	40	70	120	33	2.4	5.0
LrB---------- Loretto	58	133	42	65	112	35	3.0	5.6
LvD---------- Loretto-Valentine	50	115	32	40	105	25	2.3	5.0
Me---------- Merrick	70	145	48	80	130	42	4.5	6.3
Nv---------- Novina	60	135	38	65	115	30	3.0	5.5
Om---------- O'Neill	---	125	33	35	110	22	---	4.8
OmC---------- O'Neill	---	100	---	32	90	20	---	3.5
On---------- O'Neill	---	135	35	40	110	23	1.5	5.0
Ow---------- Ovina	65	130	36	75	115	33	4.5	5.8

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn		Soybeans	Grain sorghum		Winter wheat	Alfalfa hay	
	N	I	I	N	I	N	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
Pt---------- Platte	35	90	---	55	85	20	2.0	2.9
Pv---------- Platte	---	80	---	---	75	---	---	---
Ru---------- Rusco	50	145	43	65	120	40	2.5	6.3
Sm---------- Simeon	---	95	---	---	90	14	---	3.6
ThB---------- Thurman	40	110	---	42	105	18	1.5	4.0
ThC---------- Thurman	35	100	---	40	102	18	1.5	3.8
VbD---------- Valentine	---	75	---	---	70	---	---	3.0
VcB---------- Valentine	---	100	---	30	100	19	1.5	3.9
VcD---------- Valentine	---	85	---	28	80	---	1.2	3.0
VeB---------- Valentine-Boelus	35	105	---	36	100	18	1.7	4.0
VeD---------- Valentine-Boelus	---	90	---	32	90	16	1.5	3.5
Wb---------- Wann	68	130	36	85	110	35	3.6	5.8
Wm---------- Wann	65	135	38	88	115	37	3.8	6.0

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	26,100	---	---	---	---
(I)	26,100	---	---	---	---
II (N)	101,030	23,810	55,620	21,600	---
(I)	101,030	23,810	55,620	21,600	---
III (N)	91,150	19,050	64,400	6,700	---
(I)	96,260	24,860	64,400	7,000	---
IV (N)	53,116	24,890	13,476	14,750	---
(I)	51,476	26,250	13,476	11,750	---
V (N)	7,550	---	7,550	---	---
VI (N)	17,940	14,100	3,150	690	---
VII (N)	9,900	---	1,800	8,100	---
VIII(N)	1,478	---	478	1,000	---

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Ac, Ag---------- Alda	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Little bluestem----------	10
		Unfavorable	4,000	Switchgrass----------	10
				Indiangrass----------	10
				Prairie cordgrass----------	5
				Western wheatgrass----------	5
				Sedge----------	5
Bb---------- Barney	Wet Land----------	Favorable	5,000	Prairie cordgrass----------	30
		Normal	4,500	Northern reedgrass----------	10
		Unfavorable	4,000	Sedge----------	10
				Rush----------	10
				Kentucky bluegrass----------	10
				Bluejoint reedgrass----------	5
				Switchgrass----------	5
				Common spikesedge----------	5
Bd, BdC---------- Blendon	Sandy----------	Favorable	3,960	Little bluestem----------	25
		Normal	3,300	Big bluestem----------	20
		Unfavorable	2,310	Prairie sandreed----------	15
				Needleandthread----------	10
				Porcupinegrass----------	10
				Blue grama----------	5
				Leadplant----------	5
				Sedge----------	5
Bf---------- Blendon Variant	Sandy----------	Favorable	3,500	Sand bluestem----------	15
		Normal	2,900	Little bluestem----------	15
		Unfavorable	2,200	Needleandthread----------	15
				Prairie sandreed----------	10
				Blue grama----------	10
				Porcupinegrass----------	5
				Switchgrass----------	5
				Sand dropseed----------	5
				Sedge----------	5
				Western wheatgrass----------	5
Bk---------- Boel	Subirrigated----------	Favorable	5,000	Big bluestem----------	30
		Normal	4,500	Indiangrass----------	15
		Unfavorable	4,200	Little bluestem----------	10
				Switchgrass----------	10
				Prairie cordgrass----------	10
				Sedge----------	5
Br---------- Brocksburg	Silty----------	Favorable	4,000	Big bluestem----------	25
		Normal	2,500	Little bluestem----------	20
		Unfavorable	1,700	Sideoats grama----------	10
				Western wheatgrass----------	10
				Indiangrass----------	5
				Switchgrass----------	5
				Blue grama----------	5
				Sedge----------	5
				Leadplant----------	5
Cg*:					
Caruso----------	Subirrigated----------	Favorable	5,500	Big bluestem----------	40
		Normal	5,000	Switchgrass----------	15
		Unfavorable	4,200	Prairie cordgrass----------	5
				Indiangrass----------	5
				Western wheatgrass----------	5
				Sedge----------	5
				Little bluestem----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Cg*:					
Gayville	Saline Subirrigated	Favorable	4,000	Cordgrass	70
		Normal	3,500	Nuttall alkaligrass	15
		Unfavorable	2,500	Western wheatgrass	10
				Saltgrass	5
Co Cozad	Silty Lowland	Favorable	4,500	Big bluestem	35
		Normal	3,500	Little bluestem	15
		Unfavorable	3,000	Switchgrass	15
				Indiangrass	5
				Western wheatgrass	5
				Porcupinegrass	5
				Sideoats grama	5
				Green muhly	5
				Sedge	5
CrF Crofton	Limy Upland	Favorable	3,200	Little bluestem	40
		Normal	2,700	Big bluestem	20
		Unfavorable	2,000	Sideoats grama	5
				Blue grama	5
				Western wheatgrass	5
				Sedge	5
				Leadplant	5
CsD2*, CsE2*:					
Crofton	Limy Upland	Favorable	4,500	Little bluestem	40
		Normal	3,500	Big bluestem	20
		Unfavorable	2,000	Sideoats grama	5
				Blue grama	5
				Western wheatgrass	5
				Sedge	5
				Leadplant	5
Nora	Silty	Favorable	4,200	Little bluestem	35
		Normal	3,500	Needlegrass	25
		Unfavorable	2,450	Big bluestem	20
				Sideoats grama	5
				Blue grama	5
				Sideoats grama	5
				Sedge	5
Eb Els	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,200	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Slender wheatgrass	5
				Sedge	5
				Kentucky bluegrass	5
Fn, Fp Fonner	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,000	Indiangrass	15
		Unfavorable	4,000	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	5
				Slender wheatgrass	5
				Sedge	5
Fv Fonner Variant	Sandy Lowland	Favorable	3,500	Big bluestem	35
		Normal	3,000	Little bluestem	15
		Unfavorable	2,500	Indiangrass	10
				Prairie cordgrass	10
				Switchgrass	5
				Sedge	5
				Slender wheatgrass	5
				Plains bluegrass	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Gc*:					
Gayville	Saline Subirrigated	Favorable	4,000	Cordgrass	70
		Normal	3,500	Nuttall alkaligrass	15
		Unfavorable	2,500	Western wheatgrass	10
				Saltgrass	5
Caruso	Subirrigated	Favorable	5,500	Big bluestem	40
		Normal	5,000	Switchgrass	15
		Unfavorable	4,200	Prairie cordgrass	5
				Indiangrass	5
				Western wheatgrass	5
				Sedge	5
				Little bluestem	5
Gf Gayville Variant	Saline Lowland	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Inland saltgrass	20
		Unfavorable	2,000	Switchgrass	10
				Buffalograss	5
				Blue grama	5
				Sedge	5
				Kentucky bluegrass	5
Gg Gibbon	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,500	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Kentucky bluegrass	5
Ha Hall	Silty Lowland	Favorable	4,500	Big bluestem	25
		Normal	3,700	Little bluestem	20
		Unfavorable	3,000	Switchgrass	10
				Indiangrass	5
				Sideoats grama	5
				Western wheatgrass	5
				Blue grama	5
				Sedge	5
Hb, HcB Hobbs	Silty Overflow	Favorable	3,500	Big bluestem	30
		Normal	3,000	Western wheatgrass	15
		Unfavorable	2,500	Switchgrass	10
				Indiangrass	5
				Little bluestem	5
				Sideoats grama	5
				Tall dropseed	5
				Sedge	5
				Blue grama	5
Hg Holder	Silty	Favorable	4,000	Big bluestem	25
		Normal	3,400	Little bluestem	20
		Unfavorable	2,300	Sideoats grama	15
				Blue grama	10
				Western wheatgrass	10
				Sand dropseed	5
				Sedge	5
HrB Hord	Silty	Favorable	4,500	Big bluestem	30
		Normal	3,500	Little bluestem	15
		Unfavorable	2,300	Switchgrass	10
				Porcupinegrass	10
				Indiangrass	5
				Sideoats grama	5
				Tall dropseed	5
				Western wheatgrass	5
				Sedge	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Hs---------- Hord	Silty Lowland----------	Favorable	5,000	Big bluestem----------	35
		Normal	3,500	Little bluestem----------	10
		Unfavorable	3,000	Indiangrass----------	10
				Switchgrass----------	10
				Kentucky bluegrass----------	5
				Sideoats grama----------	5
				Porcupinegrass----------	5
				Western wheatgrass----------	5
				Sedge----------	5
IfD---------- Inavale	Sands----------	Favorable	3,200	Little bluestem----------	25
		Normal	3,000	Sand bluestem----------	20
		Unfavorable	2,500	Needleandthread----------	15
				Prairie sandreed----------	15
				Switchgrass----------	5
				Blue grama----------	5
				Sand dropseed----------	5
In---------- Inavale	Sandy Lowland----------	Favorable	3,800	Sand bluestem----------	30
		Normal	3,000	Prairie sandreed----------	20
		Unfavorable	2,200	Little bluestem----------	15
				Needleandthread----------	15
				Switchgrass----------	5
				Porcupinegrass----------	5
				Sedge----------	5
Iv---------- Ipage	Sandy Lowland----------	Favorable	3,500	Sand bluestem----------	15
		Normal	3,000	Prairie sandreed----------	15
		Unfavorable	2,500	Little bluestem----------	10
				Needleandthread----------	10
				Kentucky bluegrass----------	5
				Indiangrass----------	5
				Prairie junegrass----------	5
				Sedge----------	5
				Switchgrass----------	5
				Blue grama----------	5
				Scribner panicum----------	5
				Leadplant----------	5
Iw*:					
Ipage----------	Sandy Lowland----------	Favorable	3,500	Sand bluestem----------	15
		Normal	3,000	Prairie sandreed----------	15
		Unfavorable	2,500	Little bluestem----------	10
				Needleandthread----------	10
				Kentucky bluegrass----------	5
				Indiangrass----------	5
				Prairie junegrass----------	5
				Sedge----------	5
				Switchgrass----------	5
				Blue grama----------	5
				Scribner panicum----------	5
				Leadplant----------	5
Els----------	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Indiangrass----------	15
		Unfavorable	4,200	Little bluestem----------	10
				Switchgrass----------	10
				Prairie cordgrass----------	10
				Slender wheatgrass----------	5
				Kentucky bluegrass----------	5
				Sedge----------	5
Jm---------- Janude	Sandy Lowland----------	Favorable	3,800	Big bluestem----------	30
		Normal	3,000	Little bluestem----------	15
		Unfavorable	2,800	Prairie sandreed----------	10
				Indiangrass----------	5
				Switchgrass----------	5
				Porcupinegrass----------	5
				Kentucky bluegrass----------	5
				Sedge----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Ks---------- Kenesaw	Silty Lowland----------	Favorable	4,500	Big bluestem----------	35
		Normal	3,500	Little bluestem----------	15
		Unfavorable	2,500	Switchgrass----------	15
				Indiangrass----------	5
				Western wheatgrass----------	5
				Porcupinegrass----------	5
				Sideoats grama----------	5
				Green muhly----------	5
				Sedge----------	5
KsC---------- Kenesaw	Silty----------	Favorable	4,000	Big bluestem----------	25
		Normal	3,500	Little bluestem----------	15
		Unfavorable	2,200	Sideoats grama----------	10
				Blue grama----------	10
				Western wheatgrass----------	10
				Switchgrass----------	5
				Buffalograss----------	5
				Sand dropseed----------	5
				Sedge----------	5
La---------- Lamo	Wet Subirrigated----------	Favorable	6,000	Switchgrass----------	25
		Normal	5,000	Indiangrass----------	20
		Unfavorable	4,700	Big bluestem----------	10
				Prairie cordgrass----------	10
				Slender wheatgrass----------	5
				Sedge----------	5
				Spikesedge----------	5
				Plains bluegrass----------	5
				Canada wildrye----------	5
Lb---------- Lamo	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Indiangrass----------	15
		Unfavorable	4,200	Switchgrass----------	10
				Little bluestem----------	10
				Prairie cordgrass----------	10
				Slender wheatgrass----------	5
				Plains bluegrass----------	5
				Sedge----------	5
Lc*:					
Lamo----------	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Little bluestem----------	10
		Unfavorable	4,200	Indiangrass----------	10
				Switchgrass----------	10
				Prairie cordgrass----------	10
				Sedge----------	10
				Canada wildrye----------	5
				Kentucky bluegrass----------	5
Saltine----------	Saline Subirrigated----------	Favorable	4,500	Switchgrass----------	20
		Normal	3,500	Western wheatgrass----------	20
		Unfavorable	2,000	Indiangrass----------	10
				Inland saltgrass----------	10
				Sedge----------	10
				Blue grama----------	10
				Canada wildrye----------	5
				Buffalograss----------	5
Ld---------- Lawet Variant	Saline Subirrigated----------	Favorable	4,500	Western wheatgrass----------	20
		Normal	4,000	Switchgrass----------	20
		Unfavorable	3,000	Inland saltgrass----------	15
				Indiangrass----------	10
				Plains bluegrass----------	10
				Canada wildrye----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Le---------- Leshara	Subirrigated----------	Favorable	5,500	Big bluestem----------	25
		Normal	5,000	Little bluestem----------	10
		Unfavorable	4,000	Switchgrass----------	10
				Indiangrass----------	10
				Prairie cordgrass----------	10
				Slender wheatgrass----------	5
				Sedge----------	5
Lg, Lk---------- Lex	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Little bluestem----------	10
		Unfavorable	4,000	Switchgrass----------	10
				Indiangrass----------	10
				Prairie cordgrass----------	10
				Western wheatgrass----------	5
				Sedge----------	5
Lm---------- Lex Variant	Saline Subirrigated----------	Favorable	4,000	Alkali sacaton----------	15
		Normal	3,500	Switchgrass----------	15
		Unfavorable	2,500	Western wheatgrass----------	15
				Inland saltgrass----------	10
				Canada wildrye----------	5
				Blue grama----------	5
				Slender wheatgrass----------	5
				Sedge----------	5
LoB---------- Libory	Subirrigated----------	Favorable	5,500	Big bluestem----------	35
		Normal	5,000	Little bluestem----------	15
		Unfavorable	4,200	Switchgrass----------	15
				Plains bluegrass----------	10
				Indiangrass----------	10
				Sedge----------	5
Lp---------- Lockton	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Little bluestem----------	15
		Unfavorable	4,200	Switchgrass----------	10
				Indiangrass----------	10
				Prairie cordgrass----------	5
				Plains bluegrass----------	5
				Slender wheatgrass----------	5
				Sedge----------	5
LrB---------- Loretto	Sandy----------	Favorable	3,500	Big bluestem----------	20
		Normal	3,000	Little bluestem----------	20
		Unfavorable	2,000	Indiangrass----------	10
				Switchgrass----------	10
				Needleandthread----------	10
				Sideoats grama----------	5
				Blue grama----------	5
				Prairie sandreed----------	5
				Western wheatgrass----------	5
LvD*:					
Loretto----------	Sandy----------	Favorable	3,500	Big bluestem----------	20
		Normal	3,000	Little bluestem----------	20
		Unfavorable	2,000	Indiangrass----------	10
				Switchgrass----------	10
				Needleandthread----------	10
				Sideoats grama----------	5
				Blue grama----------	5
				Prairie sandreed----------	5
				Western wheatgrass----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
LvD*:					
Valentine	Sands	Favorable	3,300	Sand bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
				Sand dropseed	5
MdD Meadin	Shallow To Gravel	Favorable	1,800	Blue grama	20
		Normal	1,200	Prairie sandreed	10
		Unfavorable	750	Sand bluestem	10
				Sand dropseed	10
				Needleandthread	10
				Clubmoss	10
				Little bluestem	5
				Switchgrass	5
				Purple lovegrass	5
				Sedge	5
Me Merrick	Subirrigated	Favorable	5,000	Big bluestem	35
		Normal	4,500	Indiangrass	15
		Unfavorable	3,750	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	5
				Plains bluegrass	5
				Sedge	5
				Slender wheatgrass	5
Nv Novina	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,000	Little bluestem	10
		Unfavorable	4,500	Switchgrass	10
				Prairie cordgrass	10
				Indiangrass	5
				Plains bluegrass	5
				Slender wheatgrass	5
				Sedge	5
Om, OmC, On O'Neill	Sandy	Favorable	3,500	Sand bluestem	20
		Normal	3,000	Little bluestem	15
		Unfavorable	2,200	Prairie sandreed	15
				Blue grama	10
				Needleandthread	10
				Switchgrass	5
				Sand dropseed	5
				Sedge	5
				Gray sagewort	5
Ow Ovina	Subirrigated	Favorable	5,700	Big bluestem	25
		Normal	5,000	Little bluestem	15
		Unfavorable	4,200	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Canada wildrye	5
				Kentucky bluegrass	5
Pt Platte	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Switchgrass	15
		Unfavorable	4,000	Indiangrass	10
				Prairie cordgrass	10
				Little bluestem	5
				Kentucky bluegrass	5
				Green muhly	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Pv---------- Platte	Wet Subirrigated----------	Favorable	5,800	Switchgrass----------	25
		Normal	5,500	Indiangrass----------	15
		Unfavorable	4,700	Big bluestem----------	10
				Prairie cordgrass----------	10
				Sedge----------	10
				Slender wheatgrass----------	5
				Spikesedge----------	5
				Plains bluegrass----------	5
				Canada wildrye----------	5
PwB*:					
Platte----------	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Prairie cordgrass----------	15
		Unfavorable	4,200	Little bluestem----------	10
				Switchgrass----------	10
				Indiangrass----------	10
				Sedge----------	5
				Slender wheatgrass----------	5
				Plains bluegrass----------	5
Alda----------	Subirrigated----------	Favorable	5,500	Big bluestem----------	30
		Normal	5,000	Little bluestem----------	15
		Unfavorable	4,000	Switchgrass----------	10
				Indiangrass----------	10
				Prairie cordgrass----------	10
				Western wheatgrass----------	5
				Sedge----------	5
PxB*:					
Platte----------	Subirrigated----------	Favorable	5,000	Big bluestem----------	30
		Normal	4,200	Prairie cordgrass----------	15
		Unfavorable	3,000	Little bluestem----------	10
				Switchgrass----------	10
				Indiangrass----------	10
				Sedge----------	5
				Slender wheatgrass----------	5
				Plains bluegrass----------	5
Gothenburg.					
Ru---------- Rusco	Silty Overflow----------	Favorable	3,500	Big bluestem----------	30
		Normal	3,000	Western wheatgrass----------	15
		Unfavorable	2,500	Switchgrass----------	10
				Indiangrass----------	10
				Little bluestem----------	5
				Canada wildrye----------	5
				Prairie junegrass----------	5
				Sedge----------	5
Sm---------- Simeon	Shallow To Gravel----------	Favorable	1,800	Blue grama----------	20
		Normal	1,200	Sand bluestem----------	15
		Unfavorable	750	Prairie sandreed----------	10
				Needleandthread----------	10
				Hairy grama----------	5
				Little bluestem----------	5
				Sand dropseed----------	5
				Scribner panicum----------	5
				Sedge----------	5
				Leadplant----------	5
				Clubmoss----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
ThB, ThC Thurman	Sandy	Favorable	3,500	Little bluestem	25
		Normal	2,500	Sand bluestem	20
		Unfavorable	1,800	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Blue grama	5
				Scribner panicum	5
				Sedge	5
VbD, VbE Valentine	Sands	Favorable	3,300	Sand bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
				Sand dropseed	5
VcB Valentine	Sandy	Favorable	3,500	Sand bluestem	20
		Normal	3,200	Prairie sandreed	15
		Unfavorable	2,200	Little bluestem	15
				Blue grama	10
				Needleandthread	10
				Sand dropseed	5
				Switchgrass	5
				Prairie junegrass	5
VcD Valentine	Sands	Favorable	3,300	Sand bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
				Sand dropseed	5
VeB*:					
Valentine	Sandy	Favorable	3,500	Little bluestem	20
		Normal	3,200	Prairie sandreed	20
		Unfavorable	2,200	Sand bluestem	10
				Blue grama	10
				Needleandthread	10
				Sand dropseed	10
				Switchgrass	5
				Prairie junegrass	5
Boelus	Sandy	Favorable	3,500	Sand bluestem	25
		Normal	3,000	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
VeD*:					
Valentine	Sands	Favorable	3,300	Sand bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
				Sand dropseed	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
VeD*:					
Boelus	Sandy	Favorable	3,500	Sand bluestem	25
		Normal	3,000	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
Wb, Wm Wann	Subirrigated	Favorable	6,000	Big bluestem	35
		Normal	5,000	Little bluestem	15
		Unfavorable	4,500	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	10
				Sedge	10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ac, Ag: Alda	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, Russian mulberry, Austrian pine, Scotch pine, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Bd, BdC: Blendon	Lilac, American plum, common chokecherry.	Skunkbush sumac	Russian mulberry, green ash, common hackberry, Austrian pine, ponderosa pine, eastern redcedar, honeylocust.	---	Eastern cottonwood.
Bf: Blendon Variant	Lilac, American plum, common chokecherry.	Skunkbush sumac	Common hackberry, eastern redcedar, Russian mulberry, green ash, honeylocust, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Bk: Boel	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, Scotch pine, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Br: Brocksburg	Skunkbush sumac	Russian-olive, Rocky Mountain juniper, eastern redcedar.	Siberian elm, ponderosa pine, Austrian pine, bur oak.	---	---
Cg*:					
Caruso	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, green ash, Russian mulberry, Scotch pine.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Gayville.					
Co: Cozad	Tatarian honeysuckle, lilac.	Amur honeysuckle, common chokecherry.	Russian mulberry, common hackberry, eastern redcedar.	Ponderosa pine, green ash, honeylocust, Austrian pine.	Eastern cottonwood.
CsD2*, CsE2*:					
Crofton	Skunkbush sumac	Russian-olive, Rocky Mountain juniper, eastern redcedar.	Austrian pine, bur oak, Siberian elm, ponderosa pine.	---	---
Nora	Amur honeysuckle, American plum, skunkbush sumac, lilac.	Common chokecherry, Russian mulberry.	Green ash, honeylocust, eastern redcedar, common hackberry, ponderosa pine, Austrian pine.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Eb----------Els	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Russian mulberry, Scotch pine, Austrian pine, green ash.	Silver maple, honeylocust, golden willow.	Eastern cottonwood.
Fn, Fp----------Fonner	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, Scotch pine, green ash.	Silver maple, honeylocust, golden willow.	Eastern cottonwood.
Fv----------Fonner Variant	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, Scotch pine, green ash.	Golden willow, honeylocust, silver maple.	Eastern cottonwood.
Gc*: Gayville.					
Caruso----------	American plum, redosier dogwood.	Common chokecherry.	Austrian pine, eastern redcedar, green ash, Russian mulberry, Scotch pine.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Gg----------Gibbon	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, green ash, Russian mulberry, Austrian pine, Scotch pine.	Golden willow, honeylocust, silver maple.	Eastern cottonwood.
Ha----------Hall	Lilac, American plum, common chokecherry, American honeysuckle, skunkbush sumac.	Russian mulberry, common choke-cherry.	Green ash, common hackberry, Austrian pine, ponderosa pine, honeylocust, eastern redcedar.	---	---
Hb----------Hobbs	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Scotch pine, Austrian pine, Russian mulberry, green ash.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Hg----------Holder	Lilac, American plum, skunkbush sumac, Amur honeysuckle.	Common chokecherry, Russian mulberry.	Eastern redcedar, common hackberry, Austrian pine, ponderosa pine, honeylocust, green ash.	---	---
HrB, Hs----------Hord	Amur honeysuckle, lilac, skunkbush sumac, American plum.	Common chokecherry, Russian mulberry.	Common hackberry, eastern redcedar, ponderosa pine, Austrian pine, green ash, honey-locust.	---	---
IfD----------Inavale	---	Eastern redcedar, Rocky Mountain juniper, Scotch pine, jack pine.	Austrian pine, ponderosa pine.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
In---------- Inavale	American plum, common choke-cherry, lilac.	Skunkbush sumac---	Eastern redcedar Russian mulberry, common hackberry, honeylocust, green ash, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Iv---------- Ipage	Lilac, common chokecherry, American plum.	Skunkbush sumac---	Eastern redcedar, Russian mulberry, common hackberry, honeylocust, green ash, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Iw*:					
Ipage----------	Lilac, common chokecherry, American plum.	Skunkbush sumac---	Eastern redcedar, Russian mulberry, green ash, ponderosa pine, Austrian pine, honeylocust, common hackberry.	---	Eastern cottonwood.
Els----------	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Russian mulberry, Scotch pine, Austrian pine, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Jm---------- Janude	Lilac, Tatarian honeysuckle.	Amur honeysuckle, common choke-cherry.	Eastern redcedar, common hackberry, Russian mulberry.	Austrian pine, green ash, honey-locust, ponderosa pine.	Eastern cottonwood.
Ks, KsC---------- Kenesaw	American plum, Amur honeysuckle, skunkbush sumac, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, common hackberry, Austrian pine, ponderosa pine, honeylocust, green ash.	---	---
La---------- Lamo	Redosier dogwood	---	---	Golden willow-----	Eastern cottonwood.
Lb---------- Lamo	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Lc*:					
Lamo----------	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Saltine----------	Silver buffalo-berry, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper.	Green ash, honeylocust.	Golden willow-----	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Le---------- Leshara	Redosier dogwood, American plum.	Common chokecherry.	Green ash, eastern redcedar, Russian mulberry, Austrian pine, Scotch pine.	Silver maple, honeylocust, golden willow.	Eastern cottonwood.
Lg, Lk---------- Lex	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, Scotch pine, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Lm---------- Lex Variant	Skunkbush sumac, silver buffaloberry.	Eastern redcedar, Rocky Mountain juniper.	Green ash, honeylocust.	Golden willow-----	Eastern cottonwood.
LoB---------- Libory	Lilac, American plum, common chokecherry.	Skunkbush sumac---	Eastern redcedar, Russian mulberry, common hackberry, honeylocust, green ash, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Lp---------- Lockton	Redosier dogwood, American plum.	Redosier dogwood, common choke-cherry.	Eastern redcedar, Russian mulberry, green ash, Scotch pine, Austrian pine.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
LrB---------- Loretto	Lilac, American plum, common chokecherry.	Skunkbush sumac---	Eastern redcedar, Russian mulberry, common hackberry, honeylocust, green ash, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
LvD*:					
Loretto----------	American plum, lilac, common chokecherry.	Skunkbush sumac---	Eastern redcedar, Russian mulberry, green ash, common hackberry, honey-locust, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Valentine--------	---	Eastern redcedar, Rocky Mountain juniper, jack pine, Scotch pine.	Ponderosa pine, Austrian pine.	---	---
Me---------- Merrick	American plum, redosier dogwood.	Common chokecherry.	Green ash, eastern redcedar, Russian mulberry, Austrian pine, Scotch pine.	Silver maple, golden willow, honeylocust.	Eastern cottonwood.
Nv---------- Novina	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, green ash, Scotch pine, Austrian pine, Russian mulberry.	Silver maple, honeylocust, golden willow.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Om, OmC, On: O'Neill	Skunkbush sumac	Russian-olive, Rocky Mountain juniper, eastern redcedar.	Siberian elm, ponderosa pine, Austrian pine, bur oak.	---	---
Ow: Ovina	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, green ash, Scotch pine.	Silver maple, honeylocust, golden willow.	Eastern cottonwood.
Pt: Platte	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Scotch pine, Austrian pine, green ash, Russian mulberry.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Pv: Platte	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
Ru: Rusco	Lilac, Tatarian honeysuckle.	Common chokecherry, Amur honeysuckle.	Eastern redcedar, Russian mulberry, common hackberry.	Austrian pine, ponderosa pine, green ash, honeylocust.	Eastern cottonwood.
ThB, ThC: Thurman	American plum, lilac, common chokecherry.	Skunkbush sumac	Eastern redcedar, Russian mulberry, common hackberry, honeylocust, Austrian pine, ponderosa pine, green ash.	---	Eastern cottonwood.
VbD, VbE, VcB, VcD: Valentine	---	Eastern redcedar, Rocky Mountain juniper, jack pine, Scotch pine.	Ponderosa pine, Austrian pine.	---	---
VeB*, VeD*: Valentine	---	Eastern redcedar, Rocky Mountain juniper, jack pine, Scotch pine.	Ponderosa pine, Autrian pine.	---	---
VeB*, VeD*: Boelus	Common chokecherry, American plum, lilac.	Skunkbush sumac	Eastern redcedar, Russian mulberry, common hackberry, honeylocust, green ash, Austrian pine, ponderosa pine.	---	Eastern cottonwood.
Wb, Wm: Wann	Redosier dogwood, American plum.	Common chokecherry.	Scotch pine, green ash, Austrian pine, eastern redcedar, Russian mulberry.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ac, Ag: Alda	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
Bb: Barney	Severe: floods, ponding.	Severe: ponding.	Severe: ponding, floods.	Severe: ponding.	Severe: ponding, floods.
Bd: Blendon	Slight	Slight	Slight	Slight	Slight.
BdC: Blendon	Slight	Slight	Moderate: slope.	Slight	Slight.
Bf: Blendon Variant	Slight	Slight	Slight	Slight	Slight.
Bk: Boel	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Moderate: wetness.	Moderate: wetness, droughty, floods.
Br: Brocksburg	Slight	Slight	Slight	Slight	Slight.
Cg*:					
Caruso	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
Gayville	Severe: floods, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Co: Cozad	Severe: floods.	Slight	Slight	Slight	Slight.
CrF: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CsD2*, CsE2*:					
Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Nora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Eb: Els	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight	Moderate: droughty, wetness.
Fn, Fp: Fonner	Severe: floods.	Slight	Slight	Slight	Slight.
Fv: Fonner Variant	Severe: floods.	Slight	Slight	Slight	Moderate: droughty.
Gc*:					
Gayville	Severe: floods, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Gc*:					
Caruso	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
Gf Gayville Variant	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Gg Gibbon	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods, percs slowly.	Moderate: wetness.	Moderate: wetness, floods.
Gt* Gothenburg	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Ha Hall	Slight	Slight	Slight	Slight	Slight.
Hb Hobbs	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
HcB Hobbs	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Hg Holder	Slight	Slight	Slight	Slight	Slight.
HrB Hord	Slight	Slight	Moderate: slope.	Slight	Slight.
Hs Hord	Slight	Slight	Slight	Slight	Slight.
IfD Inavale	Severe: floods.	Slight	Severe: slope.	Slight	Moderate: droughty.
In Inavale	Severe: floods.	Slight	Slight	Slight	Moderate: droughty.
Iv Ipage	Slight	Slight	Slight	Slight	Moderate: droughty.
Iw*:					
Ipage	Slight	Slight	Slight	Slight	Moderate: droughty.
Els	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods, wetness.
Jm Janude	Severe: floods.	Slight	Slight	Slight	Slight.
Ks Kenesaw	Slight	Slight	Slight	Slight	Slight.
KsC Kenesaw	Slight	Slight	Moderate: slope.	Slight	Slight.
La Lamo	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Lb: Lamo	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods, percs slowly.	Slight	Moderate: floods.
Lc*:					
Lamo	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods, percs slowly.	Slight	Moderate: floods.
Saltine	Severe: floods, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Slight	Severe: excess salt, excess sodium.
Ld: Lawet Variant	Severe: floods, wetness, excess salt.	Severe: excess salt.	Severe: wetness, floods, excess salt.	Moderate: wetness, floods.	Severe: excess salt, floods.
Le: Leshara	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
Lg, Lk: Lex	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods, percs slowly.	Slight	Moderate: floods.
Lm: Lex Variant	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
LoB: Libory	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Lp: Lockton	Severe: floods.	Slight	Slight	Slight	Slight.
LrB: Loretto	Slight	Slight	Slight	Slight	Slight.
LvD*:					
Loretto	Slight	Slight	Severe: slope.	Slight	Slight.
Valentine	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
Ma: Marlake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MdD: Meadin	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Me: Merrick	Severe: floods.	Slight	Slight	Slight	Slight.
Nv: Novina	Severe: floods.	Slight	Slight	Slight	Slight.
Om: O'Neill	Slight	Slight	Slight	Slight	Moderate: droughty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
OmC: O'Neill	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
On: O'Neill	Slight	Slight	Slight	Slight	Slight.
Ow: Ovina	Severe: floods.	Moderate: wetness.	Severe: wetness.	Slight	Slight.
Pb*. Pits and Dumps					
Pt: Platte	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Pv: Platte	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
PwB*:					
Platte	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
Alda	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: floods.	Severe: floods.
PxB*:					
Platte	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
Gothenburg	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Ru: Rusco	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Sm: Simeon	Slight	Slight	Slight	Slight	Moderate: droughty.
ThB: Thurman	Slight	Slight	Slight	Slight	Moderate: droughty.
ThC: Thurman	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
VbD: Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty.
VbE: Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
VcB: Valentine	Slight	Slight	Slight	Slight	Moderate: droughty.
VcD: Valentine	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
VeB*:					
Valentine	Slight	Slight	Slight	Slight	Moderate: droughty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VeB*:					
Boelus	Slight	Slight	Slight	Slight	Slight.
VeD*:					
Valentine	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
Boelus	Slight	Slight	Severe: slope.	Slight	Slight.
Wb, Wm Wann	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ac, Ag---------- Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Bb---------- Barney	Very poor	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Bd, BdC---------- Blendon	Fair	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
Bf---------- Blendon Variant	Good	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good.
Bk---------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Br---------- Brocksburg	Good	Good	Good	Fair	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor	Fair.
Cg*:												
Caruso----------	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair.
Gayville----------	Very poor	Very poor	Fair	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Fair.
Co---------- Cozad	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor	Good.
CrF---------- Crofton	Poor	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
CsD2*, CsE2*:												
Crofton----------	Fair	Good	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
Nora----------	Fair	Good	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
Eb---------- Els	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
Fn, Fp---------- Fonner	Fair	Fair	Good	Good	Good	Good	Poor	Poor	Fair	Good	Poor	Good.
Fv---------- Fonner Variant	Poor	Poor	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Poor.
Gc*:												
Gayville----------	Very poor	Very poor	Fair	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Fair.
Caruso----------	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair.
Gf---------- Gayville Variant	Poor	Poor	Fair	Fair	Fair	Fair	Poor	Fair	Poor	Fair	Poor	Fair.
Gg---------- Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gt*---------- Gothenburg	Very poor	Very poor	Fair	Poor	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
Ha---------- Hall	Good	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Fair	Very poor	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Hb---------- Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HcB---------- Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair.
Hg---------- Holder	Good	Good	Good	Good	Good	Fair	Very poor	Very poor	Good	Good	Very poor	Good.
HrB---------- Hord	Good	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Hs---------- Hord	Good	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good.
IfD---------- Inavale	Poor	Fair	Good	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair.
In---------- Inavale	Fair	Fair	Good	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Good.
Iv---------- Ipage	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Iw*:												
Ipage----------	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Els----------	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
Jm---------- Janude	Good	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
Ks---------- Kenesaw	Good	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
KsC---------- Kenesaw	Fair	Good	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
La---------- Lamo	Very poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
Lb---------- Lamo	Fair	Good	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair	Fair.
Lc*:												
Lamo----------	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	Fair	Good.
Saltine----------	Poor	Poor	Good	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Poor.
Ld---------- Lawet Variant	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
Le---------- Leshara	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Lg, Lk---------- Lex	Fair	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	Good.
Lm---------- Lex Variant	Poor	Poor	Poor	Good	Good	Good	Fair	Fair	Poor	Poor	Fair	Fair.
LoB---------- Libory	Fair	Fair	Good	Good	Good	Good	Poor	Very poor	Fair	Good	Very poor	Good.
Lp---------- Lockton	Fair	Fair	Good	Good	Good	Good	Poor	Poor	Fair	Good	Poor	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
LrB---------- Loretto	Good	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	Good.
LvD*:												
Loretto----------	Fair	Good	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
Valentine---------	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
Ma---------- Marlake	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor	Good	Very poor.
MdD---------- Meadin	Very poor	Poor	Fair	Poor	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair.
Me---------- Merrick	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Nv---------- Novina	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Om, OmC---------- O'Neill	Fair	Good	Good	Fair	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor	Fair.
On---------- O'Neill	Good	Good	Good	Fair	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor	Fair.
Ow---------- Ovina	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Pb*. Pits and Dumps												
Pt---------- Platte	Fair	Good	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair.
Pv---------- Platte	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
PwB*:												
Platte----------	Poor	Poor	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair.
Alda----------	Poor	Poor	Fair	Fair	Good	Good	Fair	Fair	Poor	Good	Fair	Fair.
PxB*:												
Platte----------	Poor	Poor	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair
Gothenburg--------	Very poor	Very poor	Fair	Poor	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
Ru---------- Rusco	Good	Good	Poor	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
Sm---------- Simeon	Fair	Fair	Fair	Poor	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
ThB, ThC---------- Thurman	Fair	Good	Good	Fair	Fair	Good	Very poor	Very poor	Fair	Fair	Very poor	Fair.
VbD, VbE---------- Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
VcB---------- Valentine	Fair	Good	Fair	Poor	Fair	Fair	Very poor	Very poor	Fair	Poor	Very poor	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
VcD---------- Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
VeB*:												
Valentine---------	Fair	Good	Fair	Poor	Fair	Fair	Very poor	Very poor	Fair	Poor	Very poor	Fair.
Boelus----------	Fair	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
VeD*:												
Valentine---------	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor	Fair.
Boelus----------	Fair	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good.
Wb, Wm---------- Wann	Good	Good	Good	Good	Fair	Good	Poor	Fair	Good	Good	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ac, Ag: Alda	Severe: wetness, cutbanks cave.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
Bb: Barney	Severe: cutbanks cave, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: ponding, floods.	Severe: ponding, floods.
Bd: Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
BdC: Blendon	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Bf: Blendon Variant	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: frost action.	Slight.
Bk: Boel	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: wetness, droughty, floods.
Br: Brocksburg	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Slight.
Cg*:						
Caruso	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
Gayville	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Severe: excess sodium.
Co: Cozad	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action.	Slight.
CrF: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CsD2*, CsE2*:						
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Nora	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Eb: Els	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Moderate: wetness, floods, frost action.	Moderate: wetness, droughty.
Fn, Fp: Fonner	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.	Slight.
Fv: Fonner Variant	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
Gc*:						
Gayville	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Severe: excess sodium.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gc*:						
Caruso	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
Gf Gayville Variant	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods, frost action.	Slight.
Gg Gibbon	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Moderate: wetness, floods.
Gt* Gothenburg	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Ha Hall	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hb Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
HcB Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
Hg Holder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
HrB Hord	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Hs Hord	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Slight.
IfD, In Inavale	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
Iv Ipage	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Iw*:						
Ipage	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Els	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: floods.
Jm Janude	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
Ks Kenesaw	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
KsC Kenesaw	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
La Lamo	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Lb---------- Lamo	Severe: cutbanks cave, wetness.	Severe: floods, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.	Moderate: floods.
Lc*:						
Lamo----------	Severe: wetness.	Severe: floods, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.	Moderate: floods.
Saltine----------	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.	Severe: excess salt, excess sodium.
Ld---------- Lawet Variant	Severe: wetness, cutbanks cave.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Severe: excess salt, cutbanks cave.
Le---------- Leshara	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action, low strength.	Moderate: floods.
Lg, Lk---------- Lex	Severe: floods. cutbanks cave.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: low strength, floods, frost action.	Moderate: floods.
Lm---------- Lex Variant	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods, frost action.	Moderate: wetness, floods.
LoB---------- Libory	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Lp---------- Lockton	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action.	Slight.
LrB---------- Loretto	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
LvD*:						
Loretto----------	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
Valentine--------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Ma---------- Marlake	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MdD---------- Meadin	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Me---------- Merrick	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Nv---------- Novina	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.	Slight.
Om---------- O'Neill	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OmC---------- O'Neill	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
On---------- O'Neill	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Ow---------- Ovina	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.	Moderate: floods.
Pb*. Pits and Dumps						
Pt---------- Platte	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: wetness, floods.
Pv---------- Platte	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, droughty.
PwB*:						
Platte----------	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
Alda----------	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
PxB*:						
Platte----------	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
Gothenburg-------	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Ru---------- Rusco	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
Sm---------- Simeon	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
ThB---------- Thurman	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
ThC---------- Thurman	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VbD---------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VbE---------- Valentine	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
VcB---------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
VcD---------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VeB*:						
Valentine--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Boelus----------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
VeD*:						
Valentine	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Boelus	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Wb, Wm Wann	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ac, Ag: Alda	Severe: floods, wetness, poor filter.	Severe: wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: too sandy, seepage.
Bb: Barney	Severe: floods, ponding, poor filter.	Severe: seepage, floods, ponding.	Severe: floods, seepage, ponding.	Severe: floods, seepage, ponding.	Poor: seepage, too sandy, ponding.
Bd, BdC: Blendon	Severe: seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bf: Blendon Variant	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
Bk: Boel	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.
Br: Brocksburg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Cg*:					
Caruso	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey, wetness.
Gayville	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness, excess sodium.	Severe: floods, wetness.	Poor: excess sodium.
Co: Cozad	Moderate: wetness, floods.	Severe: seepage.	Severe: seepage, wetness.	Moderate: floods, wetness.	Fair: too clayey, thin layer.
CrF: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CsD2*, CsE2*:					
Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Nora	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Eb: Els	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Fn, Fp: Fonner	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Fv: Fonner Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Gc*:					
Gayville	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness, excess sodium.	Severe: floods, wetness.	Poor: excess sodium.
Caruso	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey, wetness.
Gf: Gayville Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Gg: Gibbon	Severe: wetness, floods, percs slowly.	Severe: wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
Gt*: Gothenburg	Severe: wetness, floods, poor filter.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Poor: wetness, too sandy, seepage.
Ha: Hall	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
Hb, HcB: Hobbs	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Hg: Holder	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
HrB: Hord	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Hs: Hord	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: thin layer.
IfD, In: Inavale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Iv: Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Iw*:					
Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Els	Severe: floods, wetness, poor filter.	Severe: seepage, wetness.	Severe: floods, depth to rock, seepage.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Jm---------- Janude	Moderate: floods, wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Good.
Ks---------- Kenesaw	Slight----------	Moderate: seepage.	Slight----------	Slight----------	Good.
KsC---------- Kenesaw	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
La---------- Lamo	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Lb---------- Lamo	Severe: floods, wetness, percs slowly.	Severe: seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness.	Poor: hard to pack.
Lc*:					
Lamo----------	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: hard to pack.
Saltine----------	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: floods, wetness, excess sodium.	Severe: floods, wetness.	Poor: excess salt, excess sodium.
Ld---------- Lawet Variant	Severe: floods, wetness.	Severe: seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, wetness.
Le---------- Leshara	Severe: floods, wetness.	Severe: seepage, wetness.	Severe: floods, seepage.	Severe: floods, wetness.	Fair: wetness, thin layer.
Lg, Lk---------- Lex	Severe: wetness, floods, poor filter.	Severe: wetness, seepage.	Severe: floods, seepage.	Severe: floods, seepage, wetness.	Poor: too sandy, seepage.
Lm---------- Lex Variant	Severe: floods, wetness, poor filter.	Severe: seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
LoB---------- Libory	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: too clayey, wetness.
Lp---------- Lockton	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
LrB---------- Loretto	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
LvD*:					
Loretto----------	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LvD*:					
Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ma Marlake	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
MdD Meadin	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Me Merrick	Moderate: floods, wetness, percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: floods, wetness.	Fair: too clayey.
Nv Novina	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Om, OmC, On O'Neill	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ow Ovina	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
Pb*. Pits and Dumps					
Pt, Pv Platte	Severe: floods, wetness, poor filter.	Severe: seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
PwB*:					
Platte	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
Alda	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.
PxB*:					
Platte	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
Gothenburg	Severe: wetness, floods, poor filter.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Poor: wetness, too sandy, seepage.
Ru Rusco	Severe: floods.	Slight	Severe: floods.	Severe: floods.	Good.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sm---------- Simeon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ThB, ThC---------- Thurman	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
VbD---------- Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VbE---------- Valentine	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VcB, VcD---------- Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VeB*:					
Valentine----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Boelus----------	Slight----------	Moderate: seepage.	Slight----------	Slight----------	Good.
VeD*:					
Valentine----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Boelus----------	Slight----------	Moderate: slope.	Slight----------	Slight----------	Good.
Wb, Wm---------- Wann	Severe: floods, wetness.	Severe: seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Fair: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ac, Ag: Alda	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Bb: Barney	Poor: wetness.	Probable	Probable	Poor: wetness.
Bd, BdC: Blendon	Good	Probable	Improbable: too sandy.	Fair: area reclaim.
Bf: Blendon Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bk: Boel	Fair: wetness.	Probable	Improbable: too sandy.	Poor: thin layer.
Br: Brocksburg	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Cg*:				
Caruso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gayville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Co: Cozad	Good	Probable	Improbable: too sandy.	Good.
CrF: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsD2*, CsE2*:				
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Eb: Els	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
Fn, Fp: Fonner	Good	Probable	Probable	Fair: area reclaim, small stones, thin layer.
Fv: Fonner Variant	Good	Probable	Probable	Poor: small stones.
Gc*:				
Gayville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Caruso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gf: Gayville Variant	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gg: Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Gt*: Gothenburg	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
Ha: Hall	Good	Probable	Improbable: too sandy.	Good.
Hb, HcB: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hg: Holder	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HrB: Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hs: Hord	Good	Probable	Probable	Fair: area reclaim.
IfD, In: Inavale	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Iv: Ipage	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Iw*:				
Ipage	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Els	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, thin layer.
Jm: Janude	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Ks, KsC: Kenesaw	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
La: Lamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lb: Lamo	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey, area reclaim.
Lc*:				
Lamo	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Saltine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Ld: Lawet Variant	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt.
Le: Leshara	Fair: wetness.	Probable	Improbable: too sandy.	Good.
Lg: Lex	Fair: wetness.	Probable	Probable	Fair: area reclaim.
Lk: Lex	Fair: wetness.	Probable	Probable	Fair: too clayey, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Lm: Lex Variant	Fair: wetness.	Probable	Probable	Poor: thin layer.
LoB: Libory	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Lp: Lockton	Good	Probable	Probable	Fair: area reclaim, small stones.
LrB: Loretto	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
LvD*:				
Loretto	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Valentine	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Ma: Marlake	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
MdD: Meadin	Good	Probable	Probable	Poor: small stones, area reclaim.
Me: Merrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Nv: Novina	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Om, OmC, On: O'Neill	Good	Probable	Probable	Fair: small stones, area reclaim.
Ow: Ovina	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pb*. Pits and Dumps				
Pt: Platte	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
Pv: Platte	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
PwB*:				
Platte	Fair: wetness.	Probable	Probable	Poor: small stones.
Alda	Fair: wetness.	Probable	Probable	Fair: small stones, area reclaim, thin layer.
PxB*:				
Platte	Fair: wetness.	Probable	Probable	Poor: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PxB*:				
Gothenburg	Poor: wetness.	Probable	Probable	Poor: small stones, wetness, area reclaim.
Ru: Rusco	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sm: Simeon	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
ThB, ThC: Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
VbD, VbE: Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VcB, VcD: Valentine	Good	Probable	Improbable: too sandy.	Fair: too sandy.
VeB*, VeD*:				
Valentine	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Boelus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Wb, Wm: Wann	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ac---------- Alda	Severe: seepage.	Severe: seepage, piping.	Floods, frost action, cutbanks cave.	Wetness, soil blowing, floods.	Wetness, too sandy, soil blowing.	Favorable.
Ag---------- Alda	Severe: seepage.	Severe: seepage, piping.	Floods, frost action, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Favorable.
Bb---------- Barney	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, floods, cutbanks cave.	Ponding, droughty.	Ponding, too sandy.	Wetness, droughty.
Bd---------- Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
BdC---------- Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
Bf---------- Blendon Variant	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
Bk---------- Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty.
Br---------- Brocksburg	Severe: seepage.	Severe: seepage.	Deep to water	Favorable------	Too sandy------	Favorable.
Cg*:						
Caruso----------	Moderate: seepage.	Severe: piping.	Floods---------	Wetness, floods.	Wetness--------	Favorable.
Gayville---------	Moderate: seepage.	Severe: piping, excess sodium.	Percs slowly, floods, excess salt.	Wetness, percs slowly, excess salt.	Erodes easily, wetness.	Excess sodium, percs slowly.
Co---------- Cozad	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable------	Erodes easily	Erodes easily.
CrF---------- Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
CsD2*, CsE2*:						
Crofton----------	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Nora----------	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
Eb---------- Els	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
Fn---------- Fonner	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
Fp---------- Fonner	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable------	Too sandy------	Favorable.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Fv: Fonner Variant	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake.	Too sandy	Droughty.
Gc*:						
Gayville	Moderate: seepage.	Severe: piping, excess sodium.	Percs slowly, floods, excess salt.	Wetness, percs slowly, erodes easily,	Erodes easily, wetness.	Excess sodium, percs slowly.
Caruso	Moderate: seepage.	Severe: piping.	Floods	Wetness, floods.	Wetness	Favorable.
Gf: Gayville Variant	Moderate: seepage.	Severe: piping.	Deep to water	Percs slowly, excess salt.	Erodes easily	Erodes easily, percs slowly.
Gg: Gibbon	Severe: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, floods.	Wetness	Favorable.
Gt*: Gothenburg	Severe: seepage.	Severe: seepage, wetness, piping.	Floods	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ha: Hall	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable	Favorable	Favorable.
Hb, HcB: Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Floods	Favorable	Favorable.
Hg: Holder	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
HrB: Hord	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Hs: Hord	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable	Favorable.
IfD, In: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Iv: Ipage	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Iw*:						
Ipage	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Els	Severe: seepage.	Severe: seepage, piping.	Floods, cutbanks cave.	Wetness, fast intake, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
Jm: Janude	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Ks: Kenesaw	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
KsC: Kenesaw	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
La: Lamo	Moderate: seepage.	Severe: wetness.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Lb---------- Lamo	Moderate: seepage.	Moderate: thin layer, hard to pack, wetness.	Floods, frost action.	Wetness, floods.	Wetness--------	Favorable.
Lc*:						
Lamo----------	Slight---------	Moderate: piping, hard to pack, wetness.	Floods, frost action.	Wetness, floods.	Wetness--------	Favorable.
Saltine----------	Moderate: seepage.	Severe: excess sodium, excess salt.	Percs slowly, floods, frost action.	Wetness, percs slowly, floods, excess salt.	Wetness--------	Excess salt, excess sodium, percs slowly.
Ld---------- Lawet Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, excess salt.	Wetness, soil blowing, floods.	Wetness, soil blowing.	Wetness, excess salt.
Le---------- Leshara	Moderate: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, floods.	Erodes easily, wetness.	Erodes easily.
Lg, Lk---------- Lex	Severe: seepage.	Severe: seepage, wetness, piping.	Floods, frost action, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Favorable.
Lm---------- Lex Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, frost action, cutbanks cave.	Wetness, floods, excess salt.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
LoB---------- Libory	Severe: seepage.	Severe: piping.	Favorable------	Wetness, droughty, fast intake.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty.
Lp---------- Lockton	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable------	Too sandy------	Favorable.
LrB---------- Loretto	Severe: seepage.	Moderate: piping.	Deep to water	Favorable------	Soil blowing---	Favorable.
LvD*:						
Loretto----------	Severe: seepage.	Moderate: piping.	Deep to water	Slope----------	Soil blowing---	Favorable.
Valentine--------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Ma---------- Marlake	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty.	Ponding, too sandy, soil blowing.	Wetness, droughty.
MdD---------- Meadin	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy, soil blowing.	Droughty.
Me---------- Merrick	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Nv---------- Novina	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
Om, OmC---------- O,Neill	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
On---------- O'Neill	Severe: seepage.	Severe: seepage.	Deep to water	Favorable------	Too sandy------	Favorable.
Ow---------- Ovina	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Favorable.
Pb*. Pits and Dumps						
Pt---------- Platte	Severe: seepage.	Severe: seepage, wetness, piping.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Pv---------- Platte	Severe: seepage.	Severe: seepage, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
PwB*:						
Platte----------	Severe: seepage.	Severe: seepage, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Alda----------	Severe: seepage.	Severe: seepage.	Floods, frost action, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Favorable.
PxB*:						
Platte----------	Severe: seepage.	Severe: seepage, wetness.	Floods, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Gothenburg-------	Severe: seepage.	Severe: seepage, wetness, piping.	Floods---------	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ru---------- Rusco	Moderate: seepage.	Severe: piping.	Deep to water	Floods---------	Erodes easily	Erodes easily.
Sm---------- Simeon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
ThB, ThC---------- Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VbD---------- Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VbE---------- Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
VcB, VcD---------- Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VeB*:						
Valentine--------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Boelus----------	Moderate: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Erodes easily, soil blowing.	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
VeD*:						
Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Boelus	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Wb Wann	Severe: seepage.	Severe: piping, wetness.	Floods, frost action.	Floods, wetness, soil blowing.	Wetness, soil blowing.	Favorable.
Wm Wann	Severe: seepage.	Severe: piping, wetness.	Floods, frost action.	Floods, wetness.	Wetness	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ac---------- Alda	0-12	Sandy loam--------	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-85	30-50	<20	NP-5
	12-25	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-85	30-50	<20	NP-5
	25-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3	0	70-95	65-95	30-65	3-10	---	NP
Ag---------- Alda	0-10	Loam----------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-95	50-75	20-35	3-10
	10-26	Very fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-85	30-50	<20	NP-5
	26-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3	0	70-95	65-95	30-65	3-10	---	NP
Bb---------- Barney	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	85-95	60-95	20-35	3-15
	9-18	Stratified loam to fine sand.	SM, ML	A-2, A-4	0	90-100	90-100	55-80	20-60	---	NP
	18-60	Coarse sand, sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3	0	80-100	60-100	30-70	3-10	---	NP
Bd, BdC---------- Blendon	0-16	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	16-30	Fine sandy loam, sandy loam.	SM	A-4	0	100	85-100	60-100	35-45	20-30	NP-5
	30-60	Sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Bf---------- Blendon Variant	0-22	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-8
	22-33	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	100	95-100	50-100	25-50	15-25	NP-8
	33-60	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	20-35	6-15
Bk---------- Boel	0-17	Loam, very fine sandy loam.	ML	A-4	0	100	100	85-95	70-95	24-35	2-10
	17-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	100	85-95	0-25	---	NP
Br---------- Brocksburg	0-20	Loam----------	CL, ML	A-6, A-4	0	100	100	90-100	70-90	25-40	3-15
	20-27	Clay loam, loam	CL	A-7, A-6	0	100	100	90-100	70-80	35-45	11-20
	27-60	Sand and gravel	SP, SP-SM, SM	A-1, A-2, A-3	0	85-95	40-90	20-60	3-15	---	NP
Cg*:											
Caruso----------	0-14	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	95-100	65-90	25-40	5-20
	14-53	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	65-85	25-45	5-20
	53-60	Loamy sand--------	SM	A-2	0	100	100	50-75	15-30	<20	NP
Gayville--------	0-2	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	3-15
	2-13	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	12-30
	13-20	Silty clay loam	CL	A-6 A-7	0	100	100	95-100	85-100	30-45	11-20
	20-28	Loam----------	ML, CL	A-4, A-6	0	100	100	95-100	65-80	25-40	3-15
	28-60	Sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	100	100	60-100	35-70	20-35	5-20
Co---------- Cozad	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-15
	7-36	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-15
	36-52	Silty clay loam, loam.	CL	A-6	0	100	100	95-100	90-100	25-40	12-25
	52-60	Sandy loam, loam, fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	80-95	80-95	20-30	NP-10

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
CrF---------- Crofton	0-8	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-48	11-20
	8-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	32-40	11-18
CsD2*, CsE2*:											
Crofton---------	0-8	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-48	11-20
	8-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	32-40	11-18
Nora----------	0-5	Silt loam--------	CL, ML	A-6, A-7	0	100	100	95-100	85-100	30-45	10-23
	5-30	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-25
	30-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-24
Eb---------- Els	0-20	Loamy fine sand	SP-SM, SM	A-2, A-3	0	100	100	70-95	5-35	---	NP
	20-60	Fine sand, loamy sand.	SP-SM, SM	A-2, A-3	0	90-100	90-100	70-95	5-30	---	NP
Fn---------- Fonner	0-20	Sandy loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	0	95-100	95-100	70-85	25-55	<20	NP-5
	20-26	Loamy sand-------	SM, SP-SM	A-2	0	95-100	90-100	70-85	10-30	<20	NP
	26-60	Coarse sand, sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	75-100	75-97	35-65	0-10	---	NP
Fp---------- Fonner	0-13	Loam----------	ML	A-4	0	95-100	95-100	85-95	50-75	25-35	2-7
	13-24	Loamy sand-------	SM, SP-SM	A-2	0	95-100	90-100	70-85	10-30	<20	NP
	24-60	Coarse sand, sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	75-100	75-97	35-65	0-10	---	NP
Fv---------- Fonner Variant	0-9	Loamy sand-------	SM, SP-SM	A-2, A-3	0	100	95-100	80-95	5-30	<20	NP
	9-18	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	90-100	70-85	5-15	<20	NP
	18-60	Gravelly sand, coarse sand.	SP, SP-SM	A-1, A-3	0	70-95	55-80	30-50	1-7	---	NP
Gc*:											
Gayville--------	0-2	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	3-15
	2-14	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-55	12-30
	14-22	Clay loam--------	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	11-20
	22-28	Sandy clay loam, loam.	ML, CL	A-4, A-6	0	100	100	95-100	50-80	25-40	3-15
	28-60	Very fine sandy loam, sandy loam, sandy clay loam.	ML, CL-ML SM, SM-SC	A-4	0	100	100	95-100	35-85	<25	NP-7
Caruso----------	0-18	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	95-100	65-90	25-40	5-20
	18-60	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	65-85	25-45	5-20
Gf---------- Gayville Variant	0-6	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	95-100	90-100	20-30	2-10
	6-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-90	30-45	11-20
	13-60	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-35	3-12
Gg---------- Gibbon	0-14	Loam----------	ML, CL	A-6, A-4	0	100	100	95-100	70-100	30-40	6-15
	14-37	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	85-100	60-95	25-48	15-28
	37-60	Stratified fine sandy loam to silty clay loam.	SM, SC, CL, ML	A-4, A-6	0	100	100	70-100	35-95	15-35	NP-15
Gt*---------- Gothenburg	0-3	Loamy sand-------	SM	A-2	0	100	100	50-80	15-35	---	NP
	3-11	Fine sand, coarse sand, gravelly sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	65-80	0-15	---	NP
	11-60	Sand and gravel	SP, SM, SP-SM	A-1, A-3	0	70-95	65-95	30-65	3-10	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ha---------- Hall	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	98-100	95-100	25-40	5-20
	16-40	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	35-50	15-30
	40-46	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-20
	46-60	Fine sand, gravelly sand.	SP, SP-SM	A-2, A-3	0	100	95-100	65-85	2-12	<20	NP
Hb, HcB---------- Hobbs	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	6-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
Hg---------- Holder	0-18	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	98-100	90-100	20-40	2-16
	18-32	Silty clay loam	CL	A-6, A-7	0	100	100	98-100	95-100	30-50	15-30
	32-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	11-20
HrB---------- Hord	0-21	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	100	90-100	20-35	3-18
	21-42	Silt loam, silty clay loam, loam.	CL	A-6, A-4	0	100	100	98-100	90-100	25-40	8-23
	42-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	6-21
Hs---------- Hord	0-21	Silt loam--------	CL	A-4, A-6	0	100	100	98-100	85-100	20-35	8-20
	21-42	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	20-40	8-25
	42-60	Gravelly sand----	SP	A-1	0	70-100	50-90	25-40	0-5	---	NP
IfD---------- Inavale	0-3	Loamy sand-------	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	3-7	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	7-60	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
In---------- Inavale	0-7	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	7-20	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	20-60	Fine sand, loamy fine sand, loamy coarse sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
Iv---------- Ipage	0-9	Loamy fine sand	SM	A-2	0	100	100	50-75	15-35	---	NP
	9-60	Fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	---	NP
Iw*:											
Ipage----------	0-5	Loamy fine sand	SM	A-2	0	100	100	50-75	15-35	---	NP
	5-60	Fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	---	NP
Els----------	0-12	Loamy fine sand	SP-SM, SM	A-2, A-3	0	100	100	75-100	5-35	<20	NP
	12-60	Loamy fine sand, loamy sand.	SP-SM, SM	A-2, A-3	0	100	100	75-100	5-35	<20	NP
Jm---------- Janude	0-30	Sandy loam-------	SM	A-4	0	100	100	75-90	36-50	<25	NP-4
	30-38	Loam, fine sandy loam.	ML	A-4	0	100	100	85-95	60-75	20-34	NP-7
	38-60	Fine sandy loam, loam, sandy loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	70-100	40-100	20-35	3-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ks, KsC---------- Kenesaw	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-12
	8-15	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	18-35	2-13
	15-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	20-35	2-12
La---------- Lamo	0-19	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	85-95	20-35	7-20
	19-25	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-95	35-55	15-35
	25-35	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-95	35-60	15-35
	35-60	Loam----------	CL	A-6, A-7	0	100	100	80-100	75-95	25-45	12-25
Lb---------- Lamo	0-30	Clay loam, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	30-42	Sandy clay loam	CL, CH	A-7	0	100	95-100	85-100	80-100	40-60	15-35
	42-60	Gravelly sand, coarse sand.	SP	A-1	0	90-100	70-90	10-25	0-5	---	NP
Lc*:											
Lamo----------	0-10	Clay loam, silty clay loam.	CL, CH, ML, MH	A-7	0	100	100	95-100	85-95	40-65	14-35
	10-60	Silty clay loam, silt loam, loam.	CL, CH	A-7, A-6	0	100	100	95-100	85-95	30-55	11-35
Saltine---------	0-12	Silt loam--------	ML	A-4	0	100	100	85-100	60-90	25-35	3-8
	12-24	Silt loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	100	100	85-100	60-95	25-50	7-25
	24-48	Silty clay loam, silt loam, silty clay.	CL, CH	A-4, A-6, A-7	0	100	100	95-100	70-95	25-55	7-35
	48-60	Silty clay loam, silt loam, very fine sandy loam.	CL	A-4, A-6, A-7	0	100	100	95-100	70-95	25-50	7-25
Ld---------- Lawet Variant	0-19	Fine sandy loam	SM, SM-SC, SC	A-4	0	100	100	70-95	35-50	<25	NP-10
	19-29	Silty clay loam	CL	A-6, A-4	0	100	100	90-100	70-100	25-40	8-20
	29-46	Silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-95	20-35	5-20
	46-60	Gravelly sand----	SP, SP-SM	A-1, A-3	0	90-100	85-100	40-70	0-8	---	NP
Le---------- Leshara	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15
	12-46	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15
	46-60	Coarse sand, gravelly sand, loamy sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	85-100	65-95	30-65	3-15	---	NP
Lg---------- Lex	0-13	Loam----------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	22-35	3-15
	13-24	Stratified sandy loam to silty clay loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	60-90	20-45	3-25
	24-60	Gravelly sand, coarse sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	60-100	60-95	30-65	3-14	---	NP
Lk---------- Lex	0-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	95-100	85-95	30-50	15-30
	19-27	Stratified sandy loam to silty clay loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	60-90	20-45	3-25
	27-60	Gravelly sand, coarse sand.	SP, SP-SM, SM	A-1, A-3	0	60-100	60-95	30-65	3-10	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Lm---------- Lex Variant	0-10	Loam----------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-100	20-35	3-15
	10-26	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	95-100	85-100	20-40	5-25
	26-60	Gravelly sand, coarse sand.	SP, SP-SM	A-1, A-3	0	80-100	65-100	30-75	3-10	---	NP
LoB---------- Libory	0-16	Loamy fine sand	SM	A-2, A-4	0	100	100	65-85	15-45	---	NP
	16-21	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	100	100	55-80	12-35	---	NP
	21-60	Silty clay loam, silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-95	20-40	4-24
Lp---------- Lockton	0-13	Loam----------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	22-40	5-18
	13-27	Loam, coarse sandy loam, sandy loam.	CL	A-4, A-6	0	95-100	95-100	70-100	40-75	25-40	10-25
	27-60	Gravelly sand, coarse sand, sand.	SW, SP-SM, SM	A-1, A-3	0	85-95	65-95	25-65	2-10	---	NP
LrB---------- Loretto	0-19	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	70-100	20-40	<25	NP-5
	19-60	Loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	85-100	80-100	30-45	11-25
LvD*:											
Loretto---------	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	70-100	20-40	<25	NP-5
	14-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	85-100	80-100	30-45	11-25
Valentine-------	0-9	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	9-60	Fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-20	---	NP
Ma---------- Marlake	0-8	Loamy sand-------	SM	A-4, A-2	0	100	100	50-85	15-50	<20	NP
	8-60	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	100	50-80	5-35	---	NP
MdD---------- Meadin	0-7	Sandy loam-------	SM, ML, CL-ML, SM-SC	A-2, A-4	0	95-100	93-100	60-80	30-55	<20	NP-5
	7-11	Sandy loam, very gravelly loamy sand, gravelly sandy loam.	SM, SP-SM, GM, GP-GM	A-1, A-3, A-2	0	40-90	35-87	17-65	5-35	---	NP
	11-60	Gravelly coarse sand, very gravelly sand.	SP-SM, SP, GP-GM, GP	A-1	0	30-80	18-60	9-35	1-8	---	NP
Me---------- Merrick	0-30	Loam, silt loam	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	8-15
	30-60	Loam, silt loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	25-45	10-20
Nv---------- Novina	0-19	Sandy loam-------	SM, ML	A-4	0	100	100	70-85	40-60	<25	NP
	19-26	Sandy loam-------	ML, SM	A-4	0	100	100	75-85	45-60	<25	NP
	26-60	Loam, sandy loam	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-35	5-15
Om, OmC---------- O'Neill	0-23	Sandy loam-------	SM, ML, SC, CL	A-2, A-4	0	95-100	95-100	70-85	30-55	<25	NP-10
	23-30	Loamy sand-------	SM	A-2, A-3	0	95-100	95-100	60-80	10-30	<25	NP
	30-60	Stratified sand to gravelly sand.	SP	A-1, A-3	0	70-100	50-90	25-60	0-5	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
On---------- O'Neill	0-21	Loam----------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	85-95	60-70	20-35	3-12
	21-27	Loamy sand-------	SM	A-2	0	95-100	95-100	60-80	10-30	<25	NP
	27-60	Stratified sand to gravelly sand.	SP, SP-SM	A-1, A-3	0	70-100	50-90	25-60	0-5	---	NP
Ow---------- Ovina	0-12	Loam----------	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
	12-22	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
	22-42	Loam----------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-35	2-15
	42-60	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
Pb*. Pits and Dumps											
Pt---------- Platte	0-7	Loam----------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	7-12	Very fine sandy loam, loam, sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	75-95	45-75	<20	NP-5
	12-60	Gravelly sand, coarse sand, loamy sand.	SP-SM, SP	A-1, A-3	0	70-95	50-95	25-65	2-10	---	NP
Pv---------- Platte	0-6	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	85-95	60-85	20-35	4-15
	6-10	Gravelly sandy loam.	SM	A-2, A-4	0	80-95	70-85	50-75	20-45	<20	NP
	10-60	Gravelly sand, sand, coarse sand.	SP, SP-SM	A-1	0	70-90	50-75	30-50	2-10	---	NP
PwB*: Platte----------	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	5-15	Sandy loam, loamy sand.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	70-90	40-65	<25	NP-10
	15-60	Stratified gravelly sand to sand.	SP, SP-SM	A-1, A-3	0	70-95	50-90	25-60	2-10	---	NP
Alda----------	0-7	Loam----------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-95	50-75	20-35	3-10
	7-25	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-85	30-50	<20	NP-5
	25-60	Gravelly sand, coarse sand.	SP, SP-SM	A-1, A-3	0	70-90	65-85	30-65	0-10	---	NP
PxB*: Platte----------	0-7	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	100	95-100	75-95	30-55	<25	NP-10
	7-12	Fine sandy loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	70-90	40-65	<25	NP-10
	12-60	Stratified gravelly sand to sand.	SP, SP-SM	A-1, A-3	0	70-95	50-90	25-60	2-10	---	NP
Gothenburg------	0-3	Loamy sand-------	SM	A-2	0	100	100	50-80	15-35	---	NP
	3-60	Sand and gravel	SP, SM, SP-SM	A-1, A-3	0	70-95	65-95	30-65	3-10	---	NP
Ru---------- Rusco	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	60-100	20-40	3-15
	12-24	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
	24-60	Loam, very fine sandy loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-100	20-35	3-15
Sm---------- Simeon	0-15	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	90-100	51-80	5-35	---	NP
	15-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	90-100	75-100	40-80	2-20	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
ThB, ThC--------- Thurman	0-19	Loamy fine sand	SM, SP-SM	A-2, A-3 A-4	0	100	100	90-100	5-40	---	NP
	19-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
VbD, VbE--------- Valentine	0-8	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	85-100	2-25	---	NP
	8-60	Fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-20	---	NP
VcB, VcD--------- Valentine	0-12	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	12-60	Fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-20	---	NP
VeB*, VeD* Valentine-------	0-9	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	9-60	Fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-20	---	NP
Boelus----------	0-28	Loamy fine sand, fine sand.	SM, SP-SM	A-2	0	100	100	50-100	10-35	---	NP
	28-52	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-95	30-40	8-15
	52-60	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	100	90-100	30-40	8-18
Wb---------- Wann	0-14	Sandy loam-------	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<25	NP-5
	14-42	Sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	60-100	20-50	<25	NP-5
	42-60	Stratified fine sandy loam to fine sand.	SM	A-2, A-4	0	95-100	95-100	70-100	15-40	<20	NP-3
Wm---------- Wann	0-16	Loam----------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	85-100	55-75	15-30	2-15
	16-42	Sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	60-100	20-50	<25	NP-5
	42-60	Stratified fine sandy loam to sand.	SM	A-2, A-4	0	95-100	95-100	70-100	15-40	<20	NP-3

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Ac---------- Alda	0-12	5-12	1.60-1.80	2.0-6.0	0.16-0.18	6.6-7.8	<2	Low--------	0.20	4	3	1-3
	12-25	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	25-60	0-2	1.50-1.70	>20.0	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ag---------- Alda	0-10	12-25	1.40-1.60	0.6-2.0	0.20-0.22	6.6-7.8	<2	Low--------	0.28	4	6	1-3
	10-26	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	26-60	0-2	1.50-1.70	>20.0	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Bb---------- Barney	0-9	10-20	1.40-1.50	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	2-4
	9-18	3-10	1.60-1.80	2.0-20	0.09-0.14	7.4-8.4	<2	Low--------	0.17			
	18-60	0-5	1.50-1.70	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.10			
Bd, BdC---------- Blendon	0-16	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3	2-3
	16-30	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-7.3	<2	Low--------	0.20			
	30-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
Bf---------- Blendon Variant	0-22	7-17	1.40-1.50	2.0-6.0	0.13-0.18	6.1-7.3	<2	Low--------	0.20	5	3	1-3
	22-33	7-17	1.40-1.50	2.0-6.0	0.12-0.17	6.1-7.3	<2	Low--------	0.20			
	33-60	17-27	1.30-1.40	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate	0.43			
Bk---------- Boel	0-17	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	6	1-3
	17-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Br---------- Brocksburg	0-20	10-20	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.28	4	5	1-3
	20-27	20-30	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	<2	Moderate	0.28			
	27-60	0-5	1.50-1.70	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.10			
Cg*:												
Caruso----------	0-14	18-27	1.30-1.40	0.6-2.0	0.19-0.23	7.4-8.4	<4	Low--------	0.28	5	4L	1-4
	14-53	18-35	1.35-1.50	0.2-2.0	0.16-0.22	7.4-8.4	<4	Low--------	0.28			
	53-60	2-8	1.50-1.70	6.0-20	0.08-0.10	6.6-7.8	<2	Low--------	0.17			
Gayville---------	0-2	20-27	1.15-1.20	0.6-2.0	0.17-0.20	7.4-9.0	<2	Low--------	0.37	3	6	2-3
	2-13	35-45	1.35-1.45	<0.06	0.10-0.16	7.9-9.0	4-16	High-------	0.37			
	13-20	27-35	1.30-1.40	0.2-0.6	0.14-0.16	7.9-9.5	4-16	High-------	0.37			
	20-28	20-27	1.30-1.40	0.2-2.0	0.16-0.18	7.9-9.5	4-16	Low--------	0.37			
	28-60	5-20	1.35-1.50	0.2-2.0	0.15-0.17	7.9-9.5	4-16	Low--------	0.37			
Co---------- Cozad	0-7	10-20	1.20-1.30	0.6-2.0	0.20-0.22	6.6-7.3	<2	Low--------	0.32	5	5	1-3
	7-36	8-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-7.3	<2	Low--------	0.43			
	36-52	20-30	1.20-1.30	0.6-2.0	0.15-0.20	7.9-8.4	<2	Moderate	0.32			
	52-60	5-15	1.40-1.50	2.0-6.0	0.11-0.19	7.9-8.4	<2	Low--------	0.24			
CrF---------- Crofton	0-8	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	8-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
CsD2*, CsE2*:												
Crofton---------	0-8	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	8-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Nora----------	0-5	20-27	1.20-1.30	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	5-30	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.3	<2	Moderate	0.43			
	30-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Eb---------- Els	0-20	2-8	1.50-1.70	6.0-20	0.07-0.12	6.6-7.8	<4	Low--------	0.15	5	2	.5-1
	20-60	0-8	1.60-1.80	6.0-20	0.10-0.15	6.6-7.8	<2	Low--------	0.15			
Fn---------- Fonner	0-20	5-15	1.50-1.70	2.0-6.0	0.16-0.18	5.1-6.5	<2	Low--------	0.20	4	3	1-3
	20-26	3-10	1.60-1.80	6.0-20	0.09-0.11	5.1-7.3	<2	Low--------	0.17			
	26-60	0-5	1.50-1.70	>20	0.02-0.04	5.1-7.3	<2	Low--------	0.10			
Fp---------- Fonner	0-13	7-20	1.40-1.60	0.6-2.0	0.20-0.22	5.1-6.5	<2	Low--------	0.32	4	5	1-3
	13-24	3-10	1.60-1.80	6.0-20	0.09-0.11	5.1-7.3	<2	Low--------	0.17			
	24-60	0-5	1.50-1.70	>20	0.02-0.04	5.1-7.3	<2	Low--------	0.10			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Fv---------- Fonner Variant	0-9	2-7	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	5	.5-1
	9-18	2-7	1.60-1.80	6.0-20	0.09-0.11	6.1-7.3	<2	Low--------	0.17			
	18-60	0-3	1.50-1.70	>20	0.02-0.04	6.1-7.3	<2	Low--------	0.10			
Gc*:												
Gayville--------	0-2	20-27	1.15-1.20	0.6-2.0	0.17-0.20	7.4-9.0	<2	Low--------	0.37	3	6	2-3
	2-14	35-45	1.35-1.45	<0.06	0.10-0.16	7.9-9.0	4-16	High-------	0.37			
	14-22	27-35	1.30-1.40	0.2-0.6	0.14-0.16	7.9-9.5	4-16	High-------	0.37			
	22-28	20-27	1.30-1.40	0.2-2.0	0.16-0.18	7.9-9.5	4-16	Low--------	0.37			
	28-60	5-20	1.35-1.50	0.2-2.0	0.15-0.17	7.9-9.5	4-16	Low--------	0.37			
Caruso----------	0-18	18-27	1.30-1.40	0.6-2.0	0.19-0.23	7.4-8.4	<4	Low--------	0.28	5	4L	1-4
	18-60	18-35	1.35-1.50	0.2-2.0	0.16-0.22	7.4-8.4	<4	Low--------	0.28			
Gf---------- Gayville Variant	0-6	7-15	1.20-1.30	0.6-2.0	0.22-0.24	6.1-7.3	<4	Low--------	0.32	5	5	2-3
	6-13	27-35	1.50-1.60	0.06-0.2	0.15-0.17	>8.4	4-8	Moderate	0.32			
	13-60	8-18	1.20-1.40	0.6-2.0	0.20-0.22	>8.4	<8	Low--------	0.43			
Gg---------- Gibbon	0-14	20-30	1.40-1.60	0.2-2.0	0.21-0.23	7.4-8.4	<2	Moderate	0.32	5	4L	1-3
	14-37	20-32	1.30-1.50	0.2-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	37-60	15-30	1.50-1.70	0.2-6.0	0.16-0.20	8.5-9.0	<2	Low--------	0.32			
Gt*---------- Gothenburg	0-3	2-8	2.00-2.20	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	2	2	<.5
	3-11	1-5	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
	11-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ha---------- Hall	0-16	20-27	1.30-1.40	0.6-2.0	0.22-0.24	6.1-6.5	<2	Moderate	0.32	5	6	2-4
	16-40	25-35	1.40-1.50	0.2-0.6	0.18-0.20	6.1-6.5	<2	Moderate	0.32			
	40-46	20-35	1.30-1.50	0.6-2.0	0.20-0.22	6.6-7.8	<2	Moderate	0.32			
	46-60	0-3	1.70-1.90	6.0-20	0.05-0.07	6.6-7.3	<2	Low--------	0.10			
Hb, HcB---------- Hobbs	0-6	15-30	1.10-1.30	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	6-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Hg---------- Holder	0-18	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.32	5	6	1-3
	18-32	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	32-60	15-30	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
HrB---------- Hord	0-21	17-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.32	5	6	2-4
	21-42	20-35	1.35-1.45	0.6-2.0	0.17-0.22	6.6-7.8	<2	Low--------	0.32			
	42-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	0.43			
Hs---------- Hord	0-21	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low--------	0.32	5	6	2-3
	21-42	20-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-7.3	<2	Low--------	0.32			
	42-60	0-5	1.50-1.70	>20	0.02-0.04	6.6-7.3	<2	Low--------	0.15			
IfD---------- Inavale	0-3	7-18	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low--------	0.17	5	2	.5-1
	3-7	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	7-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
In---------- Inavale	0-7	7-18	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low--------	0.17	5	2	.5-1
	7-20	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	20-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
Iv---------- Ipage	0-9	3-10	1.40-1.50	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	.5-1
	9-60	1-8	1.50-1.60	6.0-20	0.06-0.10	6.1-7.3	<2	Low--------	0.17			
Iw*:												
Ipage----------	0-5	3-10	1.40-1.50	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	.5-1
	5-60	1-8	1.50-1.60	6.0-20	0.06-0.10	6.1-7.3	<2	Low--------	0.17			
Els----------	0-12	2-8	1.50-1.70	6.0-20	0.10-0.12	6.6-7.8	<4	Low--------	0.15	5	2	.5-1
	12-60	2-8	1.50-1.70	6.0-20	0.09-0.11	6.6-7.8	<2	Low--------	0.15			
Jm---------- Janude	0-30	5-15	1.50-1.60	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	5	3	2-4
	30-38	7-20	1.50-1.60	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.20			
	38-60	7-20	1.60-1.70	0.6-6.0	0.14-0.16	6.6-8.4	<2	Low--------	0.20			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Ks, KsC---------- Kenesaw	0-8	12-20	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.32	5	6	1-3
	8-15	10-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	0.43			
	15-60	10-18	1.30-1.40	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
La---------- Lamo	0-19	15-27	1.40-1.50	0.6-2.0	0.22-0.24	7.4-8.4	<2	Moderate	0.32	5	6	2-4
	19-25	20-35	1.40-1.50	0.2-2.0	0.21-0.23	7.4-8.4	<2	High-------	0.32			
	25-35	20-35	1.40-1.50	0.2-0.6	0.18-0.20	7.4-8.4	<2	High-------	0.32			
	35-60	18-35	1.40-1.50	0.2-2.0	0.18-0.22	7.4-8.4	<2	Moderate	0.32			
Lb---------- Lamo	0-30	27-35	1.30-1.40	0.2-0.6	0.21-0.23	7.4-8.4	<2	High-------	0.32	5	7	1-3
	30-42	20-35	1.40-1.50	0.2-0.6	0.18-0.20	7.4-8.4	<2	High-------	0.32			
	42-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-7.3	<2	Low--------	0.10			
Lc*:												
Lamo----------	0-10	27-35	1.40-1.60	0.2-0.6	0.21-0.23	7.4-8.4	<2	High-------	0.32	5	7	1-3
	10-60	20-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	<2	High-------	0.32			
Saltine----------	0-12	15-27	1.30-1.40	0.6-2.0	0.20-0.24	7.4-9.0	>4	Low--------	0.32	4	5	.5-2
	12-24	20-40	1.20-1.30	0.6-2.0	0.17-0.22	>8.4	>4	Moderate	0.32			
	24-48	20-45	1.30-1.40	0.06-0.6	0.10-0.22	>7.3	<2	High-------	0.32			
	48-60	20-40	1.40-1.50	0.2-2.0	0.15-0.22	>7.3	<2	Moderate	0.32			
Ld---------- Lawet Variant	0-19	3-10	1.30-1.50	2.0-6.0	0.15-0.18	7.4-8.4	8-16	Low--------	0.24	5	3	2-4
	19-29	27-35	1.40-1.50	0.6-2.0	0.21-0.23	7.4-8.4	4-8	Moderate	0.32			
	29-46	15-30	1.20-1.40	0.6-20	0.20-0.22	7.4-8.4	4-8	Low--------	0.24			
	46-60	0-3	1.80-2.00	>20	0.03-0.05	6.6-7.8	<2	Low--------	0.10			
Le---------- Leshara	0-12	15-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-8.4	<2	Low--------	0.32	5	6	1-3
	12-46	12-27	1.50-1.70	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.43			
	46-60	0-8	1.70-1.90	>6.0	0.02-0.07	6.6-8.4	<2	Low--------	0.15			
Lg---------- Lex	0-13	15-27	1.40-1.60	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.28	4	4L	1-3
	13-24	18-32	1.30-1.70	0.2-6.0	0.15-0.22	6.1-7.8	<2	Low--------	0.28			
	24-60	2-5	1.50-1.70	>20	0.02-0.06	6.1-7.8	<2	Low--------	0.10			
Lk---------- Lex	0-19	27-35	1.20-1.40	0.2-0.6	0.17-0.23	7.4-8.4	<2	Moderate	0.28	4	4L	1-3
	19-27	18-32	1.30-1.70	0.2-6.0	0.15-0.22	6.1-7.8	<2	Low--------	0.28			
	27-60	2-5	1.50-1.70	>20	0.02-0.06	6.1-7.8	<2	Low--------	0.10			
Lm---------- Lex Variant	0-10	15-25	1.40-1.60	0.6-2.0	0.20-0.24	7.4-8.4	<4	Low--------	0.28	4	5	1-3
	10-26	15-30	1.40-1.60	0.6-2.0	0.17-0.22	>8.4	4-16	Low--------	0.43			
	26-60	0-5	1.50-1.70	>20	0.02-0.05	5.6-7.3	<2	Low--------	0.10			
LoB---------- Libory	0-16	2-12	1.60-1.80	6.0-20	0.07-0.12	5.6-7.3	<2	Low--------	0.17	5	2	1-3
	16-21	2-12	1.60-1.80	6.0-20	0.06-0.11	5.6-7.3	<2	Low--------	0.17			
	21-60	15-32	1.30-1.50	0.6-2.0	0.17-0.22	5.6-7.3	<2	Low--------	0.43			
Lp---------- Lockton	0-13	15-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-6.5	<2	Moderate	0.28	4	5	2-4
	13-27	15-27	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	<2	Moderate	0.28			
	27-60	0-5	1.50-1.70	>20	0.02-0.04	5.6-7.3	<2	Low--------	0.10			
LrB---------- Loretto	0-19	8-18	1.40-1.60	2.0-6.0	0.13-0.18	5.1-6.5	<2	Low--------	0.20	5	3	.5-1
	19-60	20-35	1.30-1.40	0.6-6.0	0.17-0.20	5.6-7.3	<2	Low--------	0.28			
LvD*:												
Loretto----------	0-14	8-18	1.40-1.60	2.0-6.0	0.13-0.18	5.1-6.5	<2	Low--------	0.20	5	3	.5-1
	14-60	20-35	1.30-1.40	0.6-6.0	0.17-0.20	5.6-7.3	<2	Low--------	0.28			
Valentine--------	0-9	2-10	1.50-1.60	6.0-20	0.08-0.11	5.6-7.3	<2	Low--------	0.15	5	2	.5-1
	9-60	0-8	1.50-1.60	6.0-20	0.06-0.08	5.6-7.3	<2	Low--------	0.15			
Ma---------- Marlake	0-8	5-15	1.40-1.50	2.0-6.0	0.16-0.18	6.6-7.8	<2	Low--------	0.20	2	3	4-8
	8-60	0-5	1.50-1.60	6.0-20	0.05-0.07	6.6-7.8	<2	Low--------	0.17			
MdD---------- Meadin	0-7	5-10	1.50-1.60	0.6-2.0	0.13-0.18	5.1-7.3	<2	Low--------	0.20	3	3	1-2
	7-11	3-8	1.50-1.60	6.0-20	0.09-0.11	5.1-7.3	<2	Low--------	0.10			
	11-60	0-3	1.50-1.70	>20	0.02-0.05	6.1-7.3	<2	Low--------	0.10			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Me---------- Merrick	0-30	18-25	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.28	5	6	2-4
	30-60	20-32	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.3	<2	Low--------	0.28			
Nv---------- Novina	0-19	5-15	1.70-1.90	2.0-6.0	0.13-0.18	6.1-7.3	<2	Low--------	0.24	5	3	1-3
	19-26	5-15	1.70-1.90	2.0-6.0	0.12-0.14	6.1-7.3	<2	Low--------	0.24			
	26-60	7-20	1.50-1.70	0.6-2.0	0.17-0.19	6.6-8.4	<2	Low--------	0.24			
Om, OmC---------- O'Neill	0-23	3-12	1.60-1.80	2.0-20	0.10-0.18	6.1-6.5	<2	Low--------	0.20	4	3	1-3
	23-30	6-18	1.60-1.80	6.0-20	0.15-0.17	6.6-7.3	<2	Low--------	0.20			
	30-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-7.3	<2	Low--------	0.10			
On---------- O'Neill	0-21	7-17	1.40-1.60	0.6-2.0	0.20-0.22	6.1-6.5	<2	Low--------	0.20	4	5	1-3
	21-27	6-18	1.60-1.80	6.0-20	0.15-0.17	6.6-7.3	<2	Low--------	0.20			
	27-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-7.3	<2	Low--------	0.10			
Ow---------- Ovina	0-12	7-15	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	5	5	1-3
	12-22	8-18	1.30-1.50	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.17			
	22-42	7-15	1.40-1.60	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low--------	0.28			
	42-60	5-15	1.40-1.60	2.0-6.0	0.14-0.16	7.4-8.4	<2	Low--------	0.20			
Pb*. Pits and Dumps												
Pt---------- Platte	0-7	10-20	1.50-1.70	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	1-3
	7-12	7-18	1.70-1.90	2.0-6.0	0.15-0.19	6.6-8.4	<2	Low--------	0.28			
	12-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Pv---------- Platte	0-6	5-20	1.40-1.60	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.28	2	5	1-3
	6-10	2-10	1.60-1.70	2.0-6.0	0.10-0.13	6.6-8.4	<2	Low--------	0.17			
	10-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
PwB*:												
Platte----------	0-5	8-20	1.50-1.70	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	2	5	1-2
	5-15	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20			
	15-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.15			
Alda----------	0-7	10-27	1.40-1.60	0.6-2.0	0.20-0.22	6.1-8.4	<2	Low--------	0.28	4	6	2-4
	7-25	3-10	1.60-1.80	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.20			
	25-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
PxB*:												
Platte----------	0-7	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	2	3	1-3
	7-12	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20			
	12-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.15			
Gothenburg------	0-3	2-8	1.50-1.70	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	2	2	<.5
	3-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ru---------- Rusco	0-12	17-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	5	1-3
	12-24	28-35	1.20-1.30	0.2-0.6	0.18-0.20	6.6-8.4	<2	Moderate	0.43			
	24-60	15-25	1.40-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Sm---------- Simeon	0-15	3-10	1.30-1.50	6.0-20	0.06-0.12	6.1-7.3	<2	Low--------	0.15	5	2	.5-1
	15-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.3	<2	Low--------	0.15			
ThB, ThC---------- Thurman	0-19	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	19-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
VbD, VbE---------- Valentine	0-8	0-6	1.50-1.60	6.0-20	0.06-0.11	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	8-60	0-8	1.50-1.60	6.0-20	0.06-0.08	5.6-7.3	<2	Low--------	0.15			
VcB, VcD---------- Valentine	0-12	2-10	1.50-1.60	6.0-20	0.08-0.11	5.6-7.3	<2	Low--------	0.15	5	2	.5-1
	12-60	0-8	1.50-1.60	6.0-20	0.06-0.08	5.6-7.3	<2	Low--------	0.15			
VeB*, VeD*:												
Valentine--------	0-9	2-10	1.50-1.60	6.0-20	0.08-0.11	5.6-7.3	<2	Low--------	0.15	5	2	.5-1
	9-60	0-8	1.50-1.60	6.0-20	0.06-0.08	5.6-7.3	<2	Low--------	0.15			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
VeB*, VeD*:												
Boelus----------	0-28	3-12	1.70-1.90	6.0-20	0.10-0.12	5.6-7.3	<2	Low--------	0.17	5	2	1-3
	28-52	18-35	1.40-1.60	0.6-2.0	0.20-0.22	6.1-8.4	<2	Moderate	0.43			
	52-60	15-30	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
Wb---------- Wann	0-14	5-15	1.70-1.90	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.20	5	3	1-3
	14-42	3-15	1.70-1.90	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low--------	0.20			
	42-60	3-10	1.40-1.60	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.15			
Wm---------- Wann	0-16	12-25	1.40-1.60	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	5	1-3
	16-42	3-15	1.70-1.90	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low--------	0.20			
	42-60	3-10	1.40-1.60	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.15			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[See text for definitions of terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months		Uncoated steel	Concrete
					Ft					
Ac, Ag: Alda	C	Occasional	Brief	Apr-Jul	2.0-3.0	Apparent	Nov-May	High	Moderate	Low.
Bb: Barney	D	Frequent	Long	Mar-Jun	+1-2.0	Apparent	Nov-Jun	Moderate	High	Low.
Bd, BdC: Blendon	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Bf: Blendon Variant	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Bk: Boel	A	Occasional	Brief	Mar-Jun	1.5-3.5	Apparent	Nov-May	Moderate	High	Low.
Br: Brocksburg	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Cg**:										
Caruso	C	Occasional	Very brief	Apr-Sep	2.0-3.0	Apparent	Mar-Jun	Moderate	High	Moderate.
Gayville	D	Occasional	Brief	Mar-Oct	2.0-3.0	Apparent	Oct-Jun	Moderate	High	Moderate.
Co: Cozad	B	Rare	---	---	4.0-6.0	Perched	Feb-Jun	High	Moderate	Low.
CrF: Crofton	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
CsD2**, CsE2**:										
Crofton	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Nora	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Eb: Els	A	Rare	---	---	1.5-3.5	Apparent	Nov-May	Moderate	Moderate	Low.
Fn, Fp: Fonner	B	Rare	---	---	3.0-6.0	Apparent	Nov-Mar	High	Moderate	Moderate.
Fv: Fonner Variant	D	Rare	---	---	3.0-5.0	Apparent	Mar-May	Low	High	Moderate.
Gc**:										
Gayville	D	Occasional	Brief	Mar-Oct	2.0-3.0	Apparent	Oct-Jun	Moderate	High	Moderate.
Caruso	C	Occasional	Very brief	Apr-Sep	2.0-3.0	Apparent	Mar-Jun	Moderate	High	Moderate.
Gf: Gayville Variant	C	Rare	---	---	3.0-5.0	Apparent	Dec-May	Moderate	High	Moderate.
Gg: Gibbon	B	Occasional	Very brief	Mar-Jul	1.5-3.0	Apparent	Nov-Jun	High	High	Low.
Gt**: Gothenburg	D	Frequent	Brief	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	Moderate	Low.
Ha: Hall	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Hb: Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months		Uncoated steel	Concrete
					Ft					
HcB---------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
Hg---------- Holder	B	None--------	---	---	>6.0	---	---	High-----	Low------	Low.
HrB---------- Hord	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
Hs---------- Hord	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
IfD, In---------- Inavale	A	Rare--------	---	---	>6.0	---	---	Low------	High-----	Low.
Iv---------- Ipage	A	None--------	---	---	3.0-5.0	Apparent	Dec-Jun	Moderate	Low------	Moderate.
Iw**:										
Ipage----------	A	None--------	---	---	3.0-5.0	Apparent	Dec-Jun	Moderate	Low------	Moderate.
Els----------	A	Occasional	Brief to long.	Nov-May	1.5-3.5	Apparent	Nov-May	Moderate	Moderate	Low.
Jm---------- Janude	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Ks, KsC---------- Kenesaw	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
La---------- Lamo	C	Occasional	Brief-----	Mar-May	0-2.0	Apparent	Mar-Jun	High-----	High-----	Low.
Lb---------- Lamo	C	Occasional	Brief-----	Mar-Apr	2.0-4.0	Apparent	Mar-Apr	High-----	High-----	Moderate.
Lc**:										
Lamo----------	C	Occasional	Brief-----	Mar-Aug	2.0-3.0	Apparent	Nov-May	High-----	High-----	Low.
Saltine----------	C	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apparent	Nov-Jul	High-----	High-----	High.
Ld---------- Lawet Variant	C	Frequent----	Brief-----	Apr-Nov	0-2.0	Apparent	Mar-Nov	Low------	High-----	Moderate.
Le---------- Leshara	B	Occasional	Very brief	Mar-Jul	2.0-3.0	Apparent	Mar-May	High-----	High-----	Low.
Lg, Lk---------- Lex	B	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apparent	Nov-May	High-----	High-----	Low.
Lm---------- Lex Variant	B	Occasional	Brief-----	Mar-Jul	1.0-3.0	Apparent	Nov-May	High-----	High-----	High.
LoB---------- Libory	A	None--------	---	---	1.5-3.0	Perched	Mar-Jun	Low------	Moderate	Low.
Lp---------- Lockton	B	Rare--------	---	---	3.0-5.0	Apparent	Nov-May	High-----	Moderate	Low.
LrB---------- Loretto	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
LvD**:										
Loretto----------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
Valentine--------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
Ma---------- Marlake	D	None--------	---	---	+2-1.0	Apparent	Oct-Jun	Moderate	High-----	Low.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months		Uncoated steel	Concrete
					Ft					
MdD---------- Meadin	A	None--------	---	---	>6.0	---	---	Low------	Low------	Moderate.
Me---------- Merrick	B	Rare--------	---	---	4.0-6.0	Apparent	Nov-May	Moderate	Low------	Low.
Nv---------- Novina	B	Rare--------	---	---	3.0-6.0	Apparent	Mar-Jun	High-----	Moderate	Low.
Om, OmC, On------- O'Neill	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Ow---------- Ovina	B	Rare--------	---	---	2.0-3.0	Apparent	May-Nov	High-----	Moderate	Low.
Pb**. Pits and Dumps										
Pt---------- Platte	B/D	Occasional	Brief-----	Mar-Oct	1.0-2.5	Apparent	Feb-Jun	Moderate	Low------	Low.
Pv---------- Platte	D	Occasional	Brief-----	Apr-Oct	0-2.0	Apparent	Apr-Nov	Moderate	High-----	Moderate.
PwB**:										
Platte----------	B/D	Frequent----	Brief-----	Mar-May	1.0-2.5	Apparent	Mar-Apr	Moderate	High-----	Moderate.
Alda----------	C	Frequent----	Brief-----	Mar-Jul	2.0-3.0	Apparent	Nov-May	High-----	Moderate	Low.
PxB**:										
Platte----------	B/D	Frequent----	Brief-----	Mar-May	1.0-2.5	Apparent	Mar-Apr	Moderate	High-----	Moderate.
Gothenburg-------	D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	Moderate	Low.
Ru---------- Rusco	C	Occasional	Brief-----	Mar-Jul	>6.0	---	---	High-----	High-----	Low.
Sm---------- Simeon	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
ThB, ThC---------- Thurman	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
VbD, VbE, VcB, VcD---------- Valentine	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
VeB**, VeD**:										
Valentine--------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
Boelus----------	A	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Wb, Wm---------- Wann	B	Occasional	Brief-----	Mar-Nov	2.0-3.5	Apparent	Mar-Jul	High-----	Moderate	Low.

* Plus sign under "High water table--Depth" indicates ponding.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution									Liquid limit	Plasticity index	Specific gravity
			Percentage passing sieve--						Percentage smaller than--					
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
												Pct		G/cm3
Fonner sandy loam:[1] (S74NE-121-026)														
A12------ 0 to 7	A-2-4(1)	SM	100	100	100	100	76	28	22	8	7	17	NP	2.64
AC-------20 to 26	A-2-4(1)	SM	100	100	99	96	75	20	16	8	8	16	NP	2.63
C2-------30 to 60	A-1-b(3)	SP	100	100	99	92	43	3	3	1	1	--	NP	2.65
Gibbon silt loam:[2] (S74NE-121-043)														
A12------ 7 to 14	A-6(10)	CL	100	100	100	100	98	85	75	27	22	37	15	2.62
C1ca-----22 to 37	A-7-6(16)	CL	100	100	100	100	88	86	81	38	32	47	26	2.69
C3-------44 to 60	A-4(08)	ML	100	100	100	100	99	88	66	8	8	27	NP	2.67
Lockton loam:[3] (S76NE-121-117)														
A12------ 5 to 13	A-6(09)	CL	100	100	100	99	86	65	58	26	22	37	17	2.65
B21------13 to 23	A-6(10)	CL	100	100	100	100	83	61	55	27	23	40	21	2.66
IIC2-----27 to 60	A-1-b(3)	SW	100	98	89	71	25	2	2	1	1	--	NP	2.67
O'Neill sandy loam:[4] (S74NE-121-058)														
A11------ 0 to 10	A-4(01)	SM	100	100	100	99	81	42	37	10	8	23	NP	2.62
A12------10 to 23	A-2-4(1)	SM	100	100	100	99	77	32	26	8	6	20	NP	2.63
B2-------23 to 30	A-2-4(1)	SM	100	100	99	97	77	19	16	5	4	--	NP	2.65
IIC2-----39 to 48	A-1-b(3)	SP	100	99	96	89	41	3	3	2	1	--	NP	2.66
Platte sandy loam:[5] (S75NE-121-092)														
A1------- 0 to 7	A-4(01)	SM	100	100	100	100	87	38	33	9	7	32	NP	2.58
IIC2-----15 to 60	A-1-b(3)	SP	100	97	91	84	49	2	2	--	--	--	NP	2.66
Valentine fine sand:[6] (S75NE-121-080)														
A1------- 0 to 4	A-2-4(2)	SM	100	100	100	100	99	14	10	3	2	--	NP	2.61
AC------- 4 to 8	A-3(2)	SP-SM	100	100	100	100	99	6	5	4	3	--	NP	2.65
C-------- 8 to 60	A-3(2)	SP-SM	100	100	100	100	99	8	3	4	3	--	NP	2.66

[1]Fonner sandy loam:
1,450 feet south and 100 feet east of northwest corner sec. 9, T. 14 N., R. 5 W.
[2]Gibbon silt loam:
1,100 feet west and 100 feet north of southeast corner sec. 12, T. 14 N., R. 5 W.
[3]Lockton loam:
1,800 feet north and 100 feet west of southeast corner sec. 6, T. 13 N., R. 6 W.
[4]O'Neill sandy loam:
1,350 feet north and 100 feet west of southeast corner sec. 5, T. 15 N., R. 4 W.
[5]Platte sandy loam:
1,800 feet south and 100 feet east of northwest corner sec. 8. T. 14 N., R. 4 W.
[6]Valentine fine sand:
2,550 feet northwest and 50 feet east of southwest corner sec. 16, T. 15 W., R. 6 W.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Blendon Variant	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Boelus	Sandy over loamy, mixed, mesic Udic Haplustolls
Brocksburg	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Argiustolls
Caruso	Fine-loamy, mixed, mesic Fluvaquentic Haplustolls
*Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Crofton	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Els	Mixed, mesic Aquic Ustipsamments
Fonner	Sandy, mixed, mesic Cumulic Haplustolls
Fonner Variant	Mixed, mesic Aquic Ustipsamments
Gayville	Fine, montmorillonitic, mesic Leptic Natrustolls
Gayville Variant	Fine-silty, mixed, mesic Typic Natrustolls
Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Gothenburg	Mixed, mesic Typic Psammaquents
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holder	Fine-silty, mixed, mesic Udic Argiustolls
*Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Inavale	Sandy, mixed, mesic Typic Ustifluvents
Ipage	Mixed, mesic Aquic Ustipsamments
Janude	Coarse-loamy, mixed, mesic Cumulic Haplustolls
Kenesaw	Coarse-silty, mixed, mesic Typic Haplustolls
Lamo	Fine-silty, mixed (calcareous), mesic Cumulic Haplaquolls
Lawet Variant	Fine-loamy, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Leshara	Fine-silty, mixed, mesic Typic Haplaquolls
Lex	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Lex Variant	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Libory	Sandy over loamy, mixed, mesic Aquic Haplustolls
Lockton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Cumulic Haplustolls
*Loretto	Fine-loamy, mixed, mesic Udic Argiustolls
Marlake	Sandy, mixed, mesic Mollic Fluvaquents
Meadin	Sandy-skeletal, mixed, mesic Entic Haplustolls
Merrick	Fine-loamy, mixed, mesic Cumulic Haplustolls
*Nora	Fine-silty, mixed, mesic Udic Haplustolls
Novina	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
*O'Neill	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Ovina	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Platte	Sandy, mixed, mesic Mollic Fluvaquents
Rusco	Fine-silty, mixed, mesic Aquic Argiustolls (Typic)
Saltine	Fine-silty, mixed, mesic Typic Halaquepts
Simeon	Mixed, mesic Typic Ustipsamments
Thurman	Sandy, mixed, mesic Udorthentic Haplustolls
Valentine	Mixed, mesic Typic Ustipsamments
Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls

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